

# A Geographical Assessment of Land Use Pattern in Amethi District

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## Abstract

Land use and land cover (LULC) analysis is a vital component of geographical studies as it reflects the dynamic interaction between human activities and the natural environment. The present study examines the spatial and temporal patterns of land use and land cover changes in Amethi District of Uttar Pradesh from a geographical perspective. Amethi, a predominantly agrarian district located in the eastern part of the state, has experienced noticeable transformations in its land use structure due to population growth, urban expansion, infrastructural development, agricultural intensification, and changing socio-economic conditions. The study aims to analyze the distribution of major land use and land cover categories, assess their changes over time, and identify the driving factors responsible for these transformations. The analysis is based on secondary data obtained from district statistical handbooks, agricultural surveys, census records, and satellite-based information supported by remote sensing and Geographic Information System (GIS) techniques. Various land use categories such as agricultural land, forest cover, fallow land, barren and wasteland, water bodies, and built-up areas have been systematically examined. The results indicate a gradual decline in agricultural and forest land, accompanied by an increase in non-agricultural uses such as residential, commercial, and infrastructural development. Expansion of built-up areas, reduction in water bodies, and an increase in fallow and degraded land in certain blocks highlight emerging environmental and resource management challenges. The study reveals that rapid urbanization, pressure on land resources, inadequate land management practices, and climatic variability have significantly influenced land use and land cover patterns in the district. The findings of this study can serve as a valuable base for planners, policymakers, and researchers concerned with sustainable land management and regional development.

**Keywords:** Land Use, Land Cover, Remote Sensing, Spatial Analysis, Sustainable Development

## 1. Introduction

India is predominantly an agrarian country, where land resources play a central role in shaping economic activities, social structures, ecological balance, and cultural development. Land is not merely a physical resource; it forms the foundation of livelihoods, settlement patterns, and regional development (Malaviya et al., 2009; Taloor et al., 2024). In this context, the study of land use and land cover has gained increasing importance in geographical research, particularly in regions experiencing rapid demographic and socio-economic changes. Amethi District, located in the eastern part of Uttar Pradesh within the Awadh region, represents a significant

case for such analysis due to its agricultural dominance, growing population pressure, and emerging urban–industrial activities (Mishra et al., 2018).

Amethi holds historical and political significance and has traditionally been characterized by a rural economy largely dependent on agriculture (Humbal et al., 2023). Favorable physiographic conditions, fertile alluvial soils, availability of water resources from rivers such as the Gomti and Sai, and a tropical monsoon climate have made the district suitable for the cultivation of crops like rice, wheat, mustard, gram, and sugarcane. However, over the past few decades, the district has witnessed notable transformations in its land use and land cover patterns (Singh, 2014). In Amethi District, increasing population pressure has intensified the demand for residential land, leading to the conversion of agricultural land into housing plots and commercial spaces. Simultaneously, industrial growth and improved connectivity have contributed to the expansion of built-up areas (Kushwaha et al., 2020). These changes have resulted in a gradual decline in cultivable land, fragmentation of agricultural holdings, and the emergence of fallow and degraded land in certain parts of the district (Bajpai, 2013). Moreover, climate change and irregular monsoon patterns have affected rain-fed agriculture, further influencing land use decisions at the local level. Land cover changes in the district have been equally significant (Fazal & Vashishtha, 2022). The reduction of forest patches, encroachment upon traditional ponds and wetlands, and shrinkage of green cover have adversely impacted groundwater recharge, biodiversity, and local microclimatic conditions (Mishra et al. 2018).

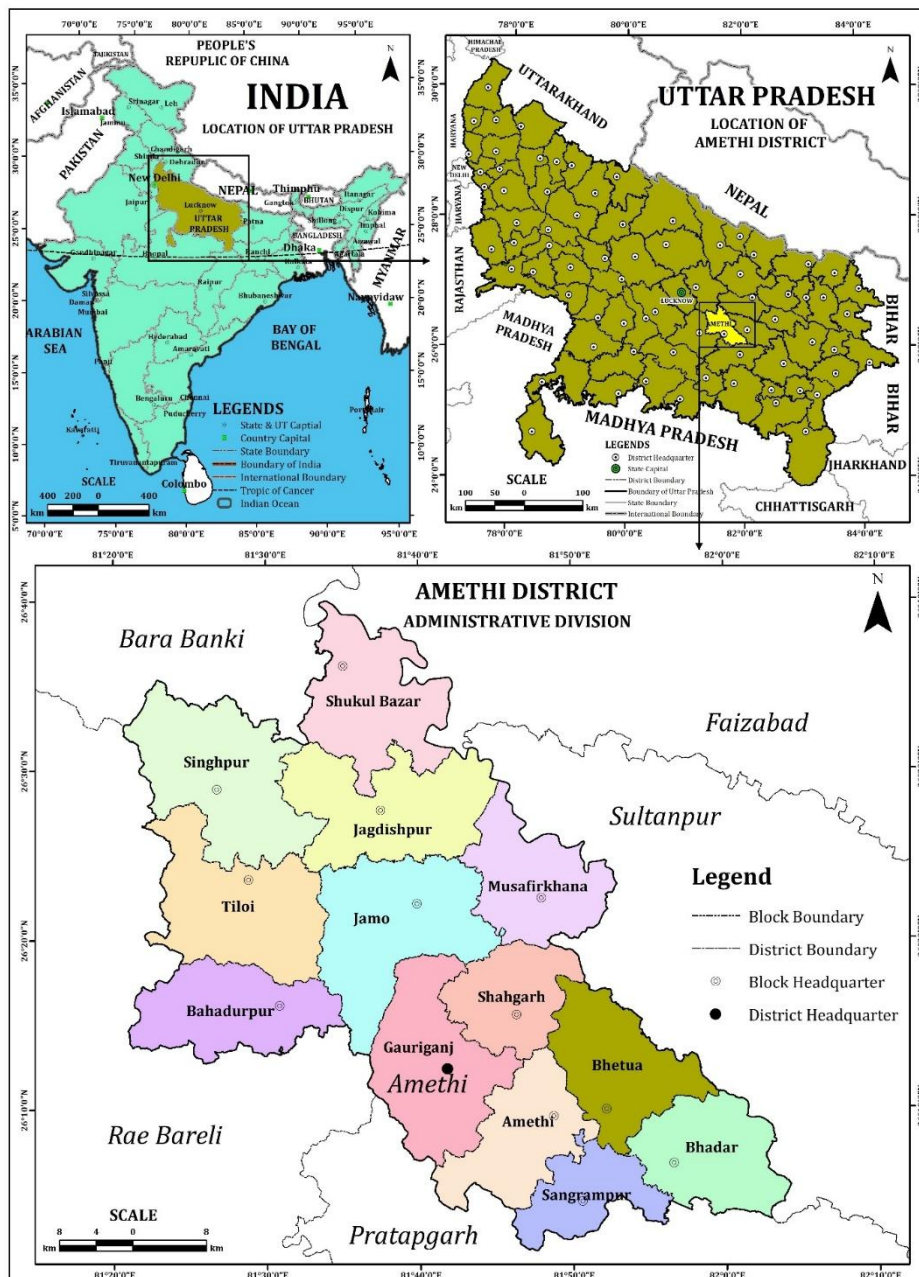
Land use refers to the various ways in which humans utilize land to fulfill their socio-economic needs, including agriculture, forestry, residential development, industrial activities, transportation networks, and water resource management. In contrast, land cover denotes the physical and biological features present on the Earth's surface, such as vegetation, water bodies, bare soil, built-up areas, and forests (Gupta & Singh, 2023). Although closely interrelated, these two concepts differ in purpose and analytical perspective. While land use reflects human decision-making and policy interventions, land cover represents the observable surface characteristics that directly influence ecological processes, hydrological cycles, and climate regulation (Goyal et al., 2013). The combined analysis of land use and land cover provides valuable insights into the nature of human–environment interactions and their implications for sustainable development (Pandey & Tewari, 1987). To understand these complex dynamics, the application of modern geospatial techniques has become indispensable. Remote sensing, satellite imagery, and Geographic Information Systems (GIS) enable accurate mapping, classification, and temporal analysis of land use and land cover categories (Aslam & Fazal, 2025). These technologies allow researchers to identify changes over time, quantify spatial patterns, and assess the impact of human activities on natural resources. District-level agricultural survey data, when integrated with geospatial analysis, further enhance the understanding of cropping patterns, irrigation status, land suitability, and resource availability (Tiwari et al., 2025). The systematic classification of land use and land cover forms the basis for environmental impact assessment, urban planning, agricultural development, and natural resource management (Areendran et. al. 2013).

## 2. Study Area

Amethi is one of the newer districts of Uttar Pradesh, officially constituted on 1 July 2010.

Situated in the historic Awadh region of eastern Uttar Pradesh, it falls under the administrative jurisdiction of the Faizabad Division. The district was carved out by merging portions of Sultanpur and Raebareli, with the objective of promoting regional development and strengthening administrative efficiency for local communities. Geographically, Amethi lies between  $26^{\circ}14'N$ – $26^{\circ}16'N$  latitude and  $81^{\circ}80'E$ – $81^{\circ}83'E$  longitude, encompassing an area of 2,329.11 square kilometers.

**Map 1: Location Map of Study Area**



The district forms part of the fertile Ganga–Yamuna Doab, which provides highly productive soils suitable for intensive agriculture. Its landscape is characterized by flat alluvial plains interspersed with small rivers and ponds that sustain the irrigation network. The Gomti River traverses the district, enriching soil fertility and supporting extensive agricultural practices. Amethi experiences a subtropical climate, with an average elevation of 101 meters above sea

level. Temperatures generally range between 23°C and 28°C, creating favorable conditions for settlement as well as crop cultivation.

### **3. Research objectives**

There are two objectives has been selected for this study. The first one is to analyze the spatial and temporal changes in land use and land cover patterns in Amethi District between 2001 and 2021 using geospatial techniques, with a focus on identifying shifts among agricultural land, forest cover, water bodies, built-up areas, and fallow land and second one is to assess development on land use and land cover dynamics in Amethi District during 2001–2021, and to evaluate their implications for agricultural sustainability and environmental management.

### **4. Data and Methodology**

The present study integrates both primary and secondary data to analyze the spatial distribution, growth pattern, and urbanization level in Amethi district from 2001 to 2021. Secondary data were primarily sourced from the Census of India (2001, 2011, and 2021 estimates) to assess Land use were extracted from census handbooks and district statistical abstracts. Spatial information such as administrative boundaries and settlement patterns was derived from Survey of India topographical sheets and satellite imagery.

### **5. Results and Discussions**

Between 2010 and 2020, Amethi district in Uttar Pradesh experienced notable transformations in its land cover due to rapid socio-economic changes. Once primarily agricultural, the district saw significant urban growth driven by population increase and infrastructure development. As a result, portions of farmland were converted into residential and commercial zones, reflecting a shift toward urbanization. Despite this, agriculture continued to expand modestly, supported by the adoption of modern farming techniques that replaced many traditional practices. Forest cover in the district exhibited mixed trends during this period some areas faced deforestation, while others benefited from reforestation initiatives implemented under government programs aimed at restoring green spaces. Water bodies, however, witnessed a decline both in number and quality, largely due to encroachment and inadequate maintenance. Efforts such as water conservation projects and the construction of artificial reservoirs helped alleviate this issue to some extent. Overall, the decade marked a clear transformation in Amethi's landscape, characterized by urban expansion, reduced water resources, agricultural development, and changes in forest areas. These shifts highlight the growing need for sustainable planning that balances environmental preservation with developmental aspirations.

#### **5.1 Land Use Change Analysis Year Wise: 2010 to 2020**

##### **Land Use 2010**

Amethi district, situated in the Awadh region of Uttar Pradesh, is primarily agrarian, with farming forming the backbone of its economy. In 2010, the land use structure reflected a traditional rural system, where nearly three-quarters of the total geographical area was devoted to cultivation. Both irrigated and rainfed lands supported major crops such as wheat, rice, maize, mustard, and pulses, with many fields sustaining double or triple cropping cycles that enhanced productivity. Forest resources were scarce, largely restricted to riverbanks and

elevated terrain. Detailed block-wise data from November 2010 highlight the distribution of land across multiple categories. Forests covered only 738 hectares, underscoring the need for afforestation to maintain ecological balance. Approximately 4,443 hectares of cultivable land remained unused, often due to limited resources or technical constraints faced by farmers. Fallow land accounted for 31,171 hectares, particularly concentrated in Simhpur, Tiloj, and Gauriganj, where soil degradation and inadequate irrigation were common. Barren and unproductive land extended over 9,393 hectares, requiring reclamation measures. Non-agricultural land, including residential and infrastructural uses, occupied 31,805 hectares, reflecting the district's predominantly rural character. Grazing land spanned 1,986 hectares, supporting livestock-based livelihoods, while 8,833 hectares under orchards, trees, and shrubs indicated potential for horticultural expansion and ecological restoration.

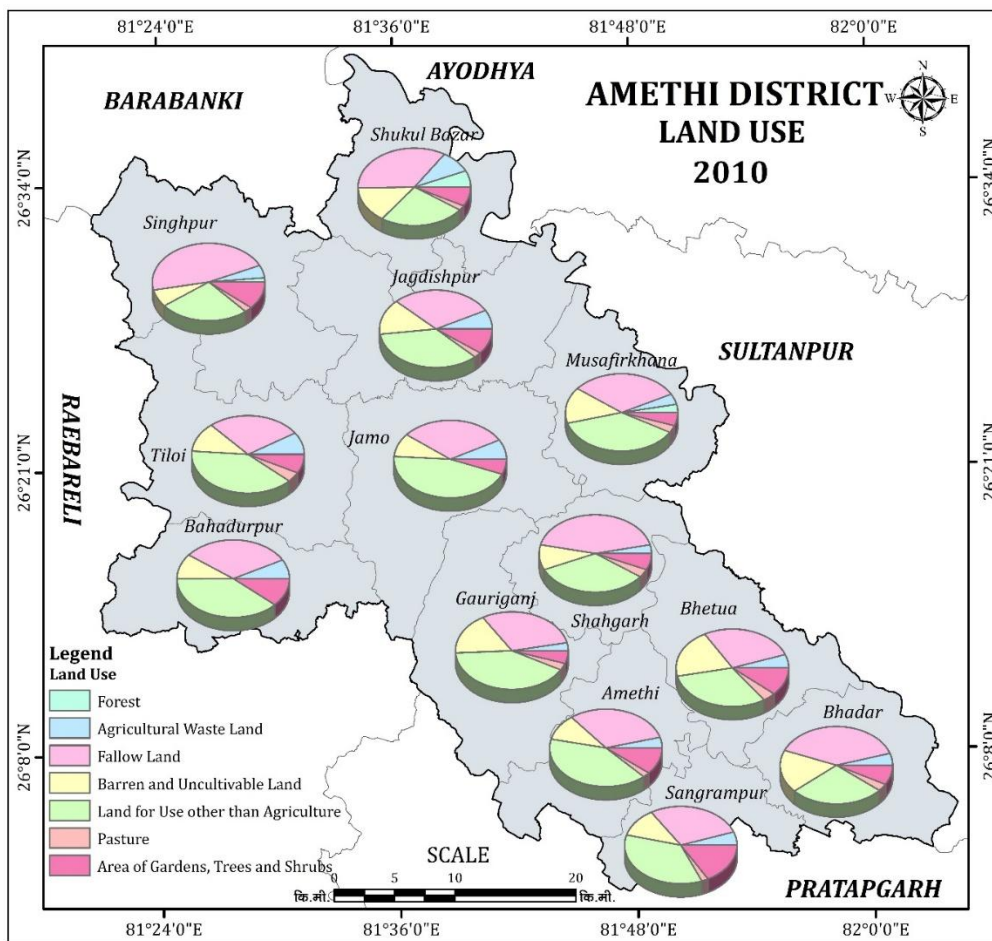
**Table 1: Land use in Amethi district (in hectares), 2010**

<i>Block</i>	<b>Fore st</b>	<b>cultiva ble waste Land</b>	<b>Fallo w Land</b>	<b>wasteland and unsuitable for cultivation</b>	<b>land for non- agricultura l purposes</b>	<b>pastu res</b>	<b>gardens, area under trees and bushes</b>
<i>Shukul Bazar</i>	336	535	2215	794	1741	108	401
<i>Jagdishpur</i>	36	449	2322	865	2637	145	616
<i>Musafirkh ana</i>	158	215	2074	725	2347	148	262
<i>Simhapur</i>	153	459	5088	657	3213	229	1036
<i>Tiloj</i>	3	746	3016	1040	4022	362	625
<i>Bahadurp ur</i>	17	393	2119	532	2431	40	599
<i>Gauriganj</i>	4	168	2125	982	2753	160	272
<i>Amethi</i>	3	166	1621	463	1983	99	442
<i>Bhetua</i>	1	266	1837	1064	2022	226	589
<i>Bhadar</i>	27	251	2598	931	1962	170	421
<i>Sangramp ur</i>	0	154	1087	382	1252	79	527
<i>Jamon</i>	0	459	2382	562	3172	68	351
<i>Shahgarh</i>	0	128	1959	369	1601	131	242

<b>Rural Total</b>	738	4389	3044 3	9366	31136	1965	6383
<b>Urban Total</b>	0	54	728	27	669	21	37
<b>District Total</b>	738	4443	31171	9393	31805	1986	8833

(Source: District Statistical Journal, 2020)

**Map 2: Land Use in Amethi District, 2010**



**Land Use 2020**

Amethi district, located in the eastern part of Uttar Pradesh, is one of the prominent agricultural regions where the local economy is primarily dependent on farming and allied activities. The land use pattern of 2020 distinctly reflected the district’s geographical, social, and economic characteristics, revealing the strong influence of population growth, soil fertility, irrigation infrastructure, climatic conditions, and gradual urbanization on land utilization. Agriculture continued to dominate the landscape, with about 75% of the district’s total geographical area under cultivation. Major crops included wheat, rice, maize, potato, mustard, and pulses, reflecting a diverse cropping system. Most of the cultivable land was utilized during both

Kharif and Rabi seasons, promoting a double-cropping pattern that enhanced land productivity and ensured food security for the local population.

Amethi district of Uttar Pradesh is a major agriculturally dominant region where land use varies according to geographical, social, and economic activities. The block-wise data for 2019–20 reveal significant spatial variations in land utilization across the district. The total forest area covers 2,114 hectares, with Shahgarh (755 ha) and Shukul Bazar (423 ha) having the largest forest cover, indicating uneven forest distribution and the need for afforestation to maintain ecological balance. About 5,788 hectares of land fall under cultivable wasteland, mostly in rural areas, highlighting potential for agricultural expansion. Fallow land accounts for 33,976 hectares, primarily in Simphur, Tiloi, Bhader, and Jamo blocks, reflecting irrigation and fertility challenges. Unproductive land spans 7,546 hectares, requiring reclamation measures. Non-agricultural land covers 35,108 hectares, driven by urbanization and infrastructure growth. Grazing land totals 2,086 hectares, while 7,011 hectares are under orchards and plantations, mainly concentrated in Tiloi, Amethi, Sangrampur, and Simphur blocks.

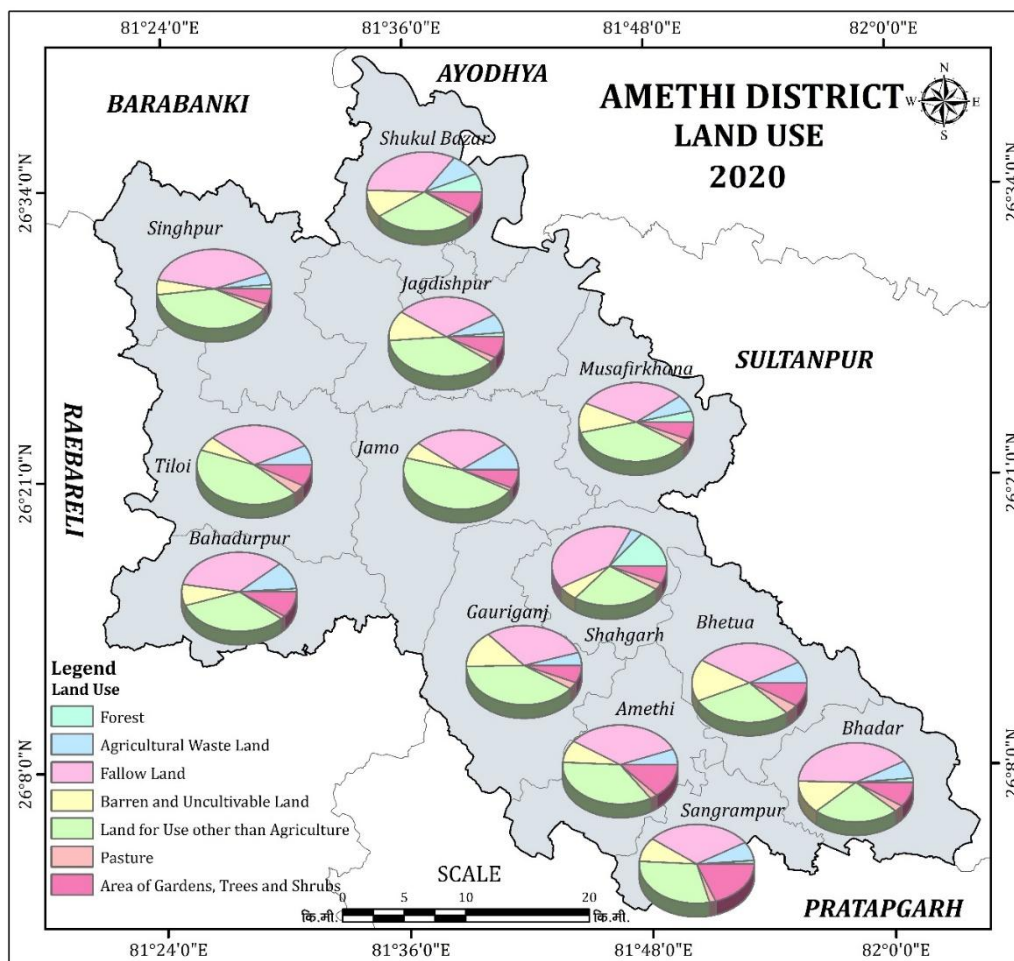
**Table 2: Land use in Amethi district (in hectares), 2020**

<i>Block</i>	<b>Fore st</b>	<b>cultiva ble waste Land</b>	<b>Fallo w Land</b>	<b>wasteland and unsuitable for cultivation</b>	<b>land for non- agricultural purposes</b>	<b>pastu res</b>	<b>gardens, area under trees and bushes</b>
<i>Shukul Bazar</i>	423	598	2453	645	2246	115	536
<i>Jagdishpur</i>	101	456	2436	732	2884	142	519
<i>Musafirkh ana</i>	221	354	2098	596	2361	152	348
<i>Simhapur</i>	167	471	5030	580	4950	233	608
<i>Tiloi</i>	56	638	3301	504	4359	341	709
<i>Bahadurp ur</i>	68	639	2473	457	2370	87	582
<i>Gauriganj</i>	57	252	2005	761	2488	149	344
<i>Amethi</i>	42	275	1997	408	1985	121	656
<i>Bhetua</i>	39	440	2168	861	1989	231	497
<i>Bhadar</i>	97	411	2923	785	1944	174	578
<i>Sangramp ur</i>	46	255	1360	335	1237	87	740
<i>Jamon</i>	42	747	2521	477	3777	84	501

<b>Shahgarh</b>	755	210	2237	313	1611	134	319
<b>Rural Total</b>	<b>2114</b>	<b>5746</b>	<b>3300</b>	<b>7454</b>	<b>34201</b>	<b>2050</b>	<b>6937</b>
<b>Urban Total</b>	<b>0</b>	<b>42</b>	<b>974</b>	<b>92</b>	<b>907</b>	<b>36</b>	<b>74</b>
<b>District Total</b>	<b>2114</b>	<b>5788</b>	<b>3397</b>	<b>7546</b>	<b>35108</b>	<b>2086</b>	<b>7011</b>

(Source: District Statistical Journal, 2020)

Map 3: Land Use in Amethi District, 2010



### 5.2 Land Use Pattern Change in Amethi District: Analysis from 2010 to 2020

Changes in land use serve as important indicators of a region’s geographical structure, socio-economic progress, and environmental conditions. A comparison of Amethi district’s land use data from 2010 and 2019–20 reveals significant transformations over the decade, reflecting the combined effects of human intervention, urban expansion, agricultural practices, and environmental policies. The forest area increased remarkably from 738 hectares in 2010 to 2,114 hectares in 2020, showing a net gain of 1,376 hectares. This growth, especially in Shahgarh, Shukul Bazar, and Simphur blocks, reflects successful afforestation programs and

community participation, contributing positively to ecological balance. Conversely, cultivable wasteland expanded from 4,443 to 5,788 hectares, indicating a decline in soil fertility and agricultural utilization, particularly in Jamo, Tilo, and Simphur. Fallow land also rose from 31,171 to 33,976 hectares, a 2,805-hectare increase, suggesting inadequate irrigation and reduced agricultural engagement in some areas.

A positive shift is observed in barren and uncultivable land, which decreased from 9,393 to 7,546 hectares, indicating successful reclamation through soil improvement and irrigation schemes, notably in Bhetua, Gauriganj, and Amethi blocks. Non-agricultural land use witnessed a clear increase from 31,805 hectares in 2010 to 35,108 hectares in 2020 reflecting rapid urbanization, industrial development, and infrastructure expansion, particularly in Jamo, Tilo, and Simphur. Grazing land recorded a slight increase of 100 hectares, benefiting livestock-based livelihoods. However, the area under orchards, trees, and shrubs declined from 8,833 to 7,011 hectares, a loss of 1,822 hectares, mainly due to urban encroachment and reduced horticultural activity. Overall, Amethi's land use trends illustrate a gradual shift from a purely agrarian landscape toward a semi-urbanized environment, where agricultural, environmental, and developmental priorities are increasingly intersecting.

**Table 3: Land use Changes in Amethi district (in hectares)**

<i>Block</i>	<b>Fore st</b>	<b>cultiva ble waste Land</b>	<b>Fallo w Land</b>	<b>wasteland and unsuitable for cultivation</b>	<b>land for non- agricultural purposes</b>	<b>pastu res</b>	<b>gardens, area under trees and bushes</b>
<i>Shukul Bazar</i>	70	160	325	-146	-18	4	157
<i>Jagdishpur</i>	14	12	-58	-77	1737	4	-428
<i>Musafirkh ana</i>	53	-108	285	-536	337	-21	84
<i>Simhapur</i>	51	246	354	-75	-61	47	-17
<i>Tilo</i>	87	63	238	-149	505	7	135
<i>Bahadurp ur</i>	65	7	114	-133	247	-3	-97
<i>Gauriganj</i>	63	139	24	-129	14	4	86
<i>Amethi</i>	53	84	-120	-221	-265	-11	72
<i>Bhetua</i>	42	288	139	-85	605	16	150
<i>Bhadar</i>	755	82	278	-56	10	3	77

<b>Sangrampur</b>	39	109	376	-55	2	22	214
<b>Jamon</b>	38	174	331	-203	-33	5	-92
<b>Shahgarh</b>	46	101	273	-47	-15	8	213
<b>Rural Total</b>	<b>1376</b>	<b>1357</b>	<b>2559</b>	<b>-1912</b>	<b>3065</b>	<b>85</b>	<b>554</b>
<b>Urban Total</b>	<b>0</b>	<b>-12</b>	<b>246</b>	<b>65</b>	<b>238</b>	<b>15</b>	<b>37</b>
<b>District Total</b>	<b>1376</b>	<b>1345</b>	<b>2805</b>	<b>-1847</b>	<b>3303</b>	<b>100</b>	<b>-1822</b>

(Source: District Statistical Journal, 2010-2020)

## 6. Conclusion

The study of land use and land cover (LULC) dynamics in Amethi district between 2010 and 2020 highlights significant spatial and temporal transformations influenced by rapid socio-economic development, population growth, and urban expansion. Once primarily agricultural, Amethi is gradually evolving into a semi-urban region where agriculture, environment, and development interact closely. The notable rise in forest cover from 738 hectares in 2010 to 2,114 hectares in 2020 reflects the positive outcomes of afforestation drives and environmental conservation programs, which have contributed to ecological restoration and sustainability. However, the increase in cultivable wasteland and fallow land indicates growing challenges related to declining soil fertility, irrigation limitations, and reduced agricultural utilization in certain blocks. Conversely, the decline in barren and unproductive land demonstrates the success of land reclamation and soil improvement efforts under various government schemes. The expansion of non-agricultural land from 31,805 to 35,108 hectares signifies the growing pressure of urbanization, industrial development, and infrastructural projects. While grazing areas have improved slightly, the reduction in land under orchards, trees, and shrubs signals environmental degradation and the shrinking of green spaces due to human encroachment. Overall, these trends suggest a gradual shift in Amethi's land use pattern from traditional agricultural reliance to diversified land utilization influenced by modern development. The findings emphasize the urgent need for sustainable land management strategies that promote soil fertility restoration, balanced irrigation systems, and controlled urban growth. Integrated planning through GIS-based monitoring, community participation, and environmental awareness can help achieve long-term ecological stability and economic resilience. Ensuring a balanced approach between agricultural productivity and urban development is essential for guiding Amethi district toward sustainable and inclusive growth.

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