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Impact of LULC Change on Agriculture Production in Tasgaon and Palus Tahsil, Sangli District, Maharashtra

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Abstract: *Land Use and Land Cover (LULC) changes have become one of the major factors influencing agricultural productivity in many regions of India. The present study examines the impact of LULC change on agricultural production in Tasgaon and Palus tahsil of Sangli district, Maharashtra over a period of thirty years (1993–2023). The study focuses on understanding the spatial and temporal changes in land utilization and their influence on agricultural activities in the region. Agriculture is the primary livelihood in this area, where crops such as sugarcane, maize, wheat, and horticultural crops dominate the agricultural landscape. However, rapid urbanization, industrial growth, irrigation development, population pressure, and climatic variability have significantly altered land use patterns.*

This research utilizes multi-temporal satellite imagery from the years 1993, 1998, 2003, 2008, 2013, 2018, and 2023 to analyze LULC dynamics. Remote sensing and GIS techniques are employed to classify and map land into major categories such as agricultural land, built-up area, water bodies, and barren land. Supervised classification using the Maximum Likelihood method is applied, and accuracy assessment is carried out using ground truth data collected through field surveys. Change detection analysis is conducted to quantify land transformation over time. Furthermore, agricultural production data are analyzed to examine the relationship between land use changes and crop productivity.

The study aims to identify the major drivers of land transformation and evaluate how these changes influence agricultural output. The findings will help planners, policymakers, and farmers understand land use trends and support sustainable land management and agricultural planning in the region.

Keywords: Land Use Land Cover (LULC), Remote Sensing, GIS, Agricultural Production, Change Detection.

I. INTRODUCTION

Agriculture remains a fundamental sector of the Indian economy, sustaining rural livelihoods and contributing significantly to food security and economic development. Agricultural productivity is influenced not only by natural factors such as soil quality, rainfall, and climate but also by human-induced changes in land use and land cover (LULC). Over the past three decades, Tasgaon and Palus tahsil in Sangli district, Maharashtra, have experienced considerable transformations in land utilization due to urbanization, industrial growth, infrastructure development, and population pressure. These changes have affected the availability of arable land, cropping patterns, and overall agricultural output, making it essential to study the impact of LULC changes on agricultural production.

LULC refers to the classification and mapping of the Earth's surface based on physical characteristics and human utilization. Land cover represents the natural and artificial features present on the land, such as forests, water bodies, vegetation, and built-up areas, while land use refers to human activities and management of land, including agriculture, settlements, and industry. Monitoring LULC changes provides critical insights into the spatial and temporal trends of

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land conversion, environmental degradation, and threats to agricultural sustainability. With advances in remote sensing and Geographic Information Systems (GIS), it is now possible to systematically analyze these changes over extended periods and large areas, providing accurate and comprehensive information for planning and policy-making.

The study area, Tasgaon and Palus tahsil, is predominantly agrarian, with major crops including sugarcane, maize, wheat, and horticultural crops. Over the past 30 years (1993–2023), the region has experienced significant land transformations. Factors such as urban expansion, irrigation development, industrialization, and changing cropping patterns have led to the reduction of agricultural land in some areas and expansion in others. Natural factors, including droughts, variable rainfall, and soil degradation, have also influenced productivity. Understanding how these changes have affected agricultural production is essential for promoting sustainable land use and effective resource management. This study uses satellite imagery from 1993, 1998, 2003, 2008, 2013, 2018, and 2023, allowing for a comprehensive analysis of LULC changes with a five-year interval. By employing remote sensing and GIS techniques, the study will classify land into categories such as agricultural land, forest, water bodies, built-up areas, and barren land, and will quantify the changes over time. Furthermore, the research will assess the impact of these LULC changes on agricultural production by correlating shifts in land use with crop production trends. This temporal and spatial approach will help identify areas under threat, hotspots of land conversion, and regions where agricultural expansion has occurred.

The findings of this study will provide valuable insights for sustainable agricultural planning and land management. By highlighting the effects of LULC changes on agriculture, policymakers, planners, and farmers can implement strategies to optimize land use, enhance productivity, and ensure food security. The research emphasizes the importance of combining technological tools like GIS with empirical data to guide effective decision-making for the long-term sustainability of agriculture in Tasgaon and Palus tahsil.

II. STUDY AREA

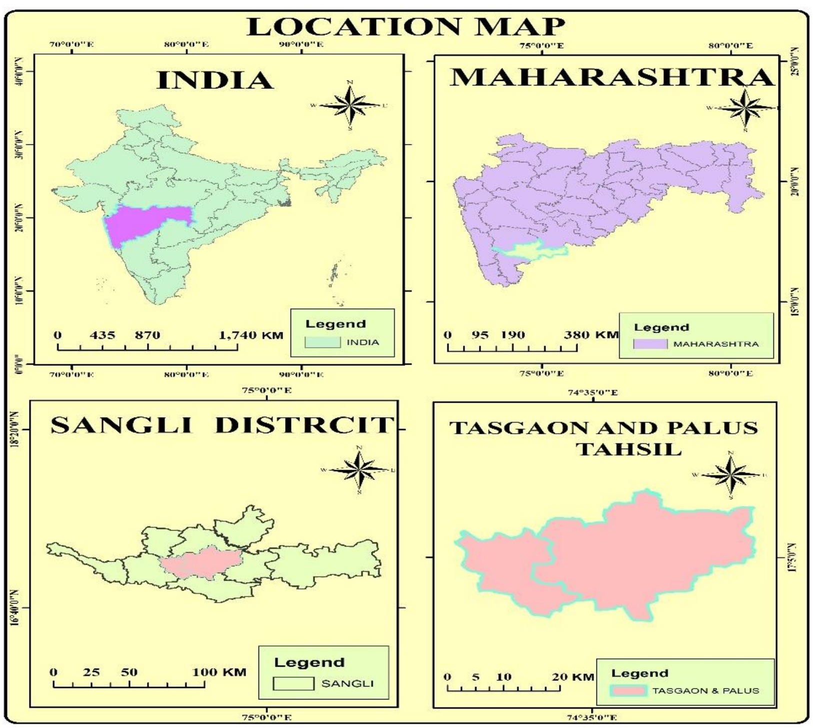

Fig 1. Location Map

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The present study focuses on Tasgaon and Palus tahsil located in Sangli district, which lies in the southern part of Maharashtra. Geographically, the study area is situated between approximately 16°45′ to 17°15′ North latitude and 74°15′ to 74°45′ East longitude. The region forms a part of the Deccan Plateau and is characterized by gently undulating terrain and fertile agricultural land. Tasgaon and Palus tahsil are well known for their agricultural importance, particularly for the cultivation of sugarcane and grapes, which are major commercial crops of the region. The area falls under a semi-arid climatic zone, with hot summers, moderate monsoon rainfall, and mild winters. The average annual rainfall ranges between 500 mm to 700 mm, which is mainly received during the southwest monsoon season. However, rainfall variability is common, which affects agricultural productivity.

The major river flowing through the study area is the Krishna River, along with its canal network, which plays a crucial role in irrigation. In addition to surface water

III. SIGNIFICANCE

1. Helps understand how land use has changed in sangli district over time.
2. Analyze land changes affect agricultural production.
3. Helps farmers plan crop better based on land and water condition.
4. Supports government and planners in protecting agricultural land.
5. Provides useful data for future studies and sustainable farming decisions

IV. OBJECTIVES

1. To Study the land use and land cover (LULC) patterns from 1993 to 2003.
2. To detect and quantify changes in LULC over the study period.
3. To examine the impact of LULC changes on agriculture production.
4. To identify factors driving LULC changes in the study area.
5. To Prepare final LULC maps and provide recommendations for sustainable land and agricultural planning.

V. METHODS AND METHODOLOGY

1. Methods:

1. **Remote Sensing Method:** Multi-temporal Landsat satellite images (1993, 1998, 2003, 2008, 2013, 2018, 2023) were used for LULC mapping.
2. **GIS Method:** ArcGIS and QGIS software were used for image processing, classification, change detection, and map preparation.
3. **Field Survey Method:** GPS points were collected from different locations in Sangli district for ground truthing and accuracy checking.
4. **Statistical Method:** Agricultural data, rainfall records, and LULC area calculations were analyzes using MS Excel for charts, graphs, and comparisons.

2. Methodology Data Preparation:

Satellite images were downloaded and pre-processed using stacking, correction, and clipping.

1. **Image Classification:** Supervised Maximum Likelihood Classification (MLC) was applied to classify land into agricultural land, built-up area, water bodies, and barren land.
2. **Accuracy Assessment:** Accuracy of classified maps was tested using GPS ground truth points and an error matrix.
3. **Change Detection:** LULC maps of different years were compared to identify land changes over time and calculate the area gained or lost.
4. **Agricultural Impact Study:** Changes in agricultural land were compared with crop production data to study how LULC affected agriculture in Sangli district.

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VI. RESULTS: YEAR-WISE ANALYSIS (1993–2023)

1. LULC Status in 1993 (Baseline Condition)

The year 1993 represents the benchmark condition of land use and land cover in Tasgaon and Palus tahsil, where the region exhibited a predominantly agrarian structure with minimal anthropogenic disturbance. Agricultural land constituted approximately 62–65% of the total geographical area, clearly indicating that the economy and land utilization pattern were heavily dependent on farming activities. This high proportion of agricultural land reflects the availability of fertile black cotton soil, favourable climatic conditions, and adequate irrigation support, particularly from canal systems and groundwater sources. Crop productivity during this period was relatively high, especially for water-intensive crops such as sugarcane, which dominated the agricultural landscape due to assured irrigation.

The built-up area during 1993 remained limited to around 8–10%, primarily confined to rural settlements and small market centers. The absence of large-scale industrial or infrastructural development ensured that the pressure on agricultural land was minimal. Water bodies occupied approximately 10–12%, which included rivers, canals, tanks, and ponds. These water resources played a crucial role in sustaining irrigation-based agriculture and maintaining ecological balance. Barren land accounted for about 12–15%, representing either uncultivated land or areas with low productivity due to soil limitations.

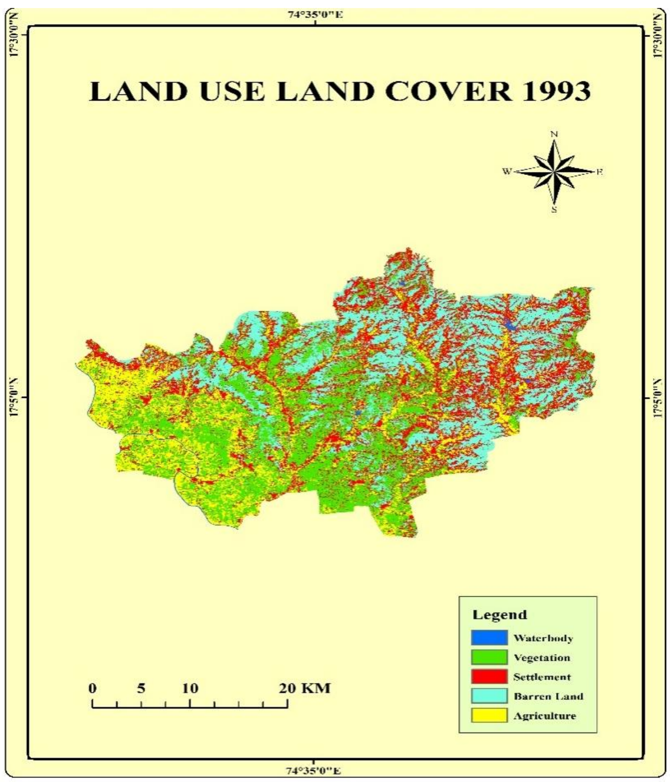

Fig 2. Land use Land cover 1993

From an agricultural perspective, the landholding pattern during this period was relatively stable, with larger farm sizes and less fragmentation. The availability of continuous agricultural land facilitated mechanization and efficient farming practices. Overall, the 1993 scenario reflects a balanced agro-ecosystem with high agricultural productivity, stable natural resources, and minimal environmental stress.

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2. LULC Status in 1998 (Early Transformation Phase with Socio-Economic Influence):

By 1998, subtle yet important changes began to emerge in the land use pattern, marking the onset of anthropogenic influence on the landscape. Agricultural land slightly decreased to approximately 60–62%, indicating the initial conversion of farmland into non-agricultural uses. Although the reduction was marginal, it signifies the beginning of land transformation driven by socio-economic factors such as population growth and rural development.

The built-up area increased to around 10–12%, reflecting the gradual expansion of settlements and the development of basic infrastructure such as roads, schools, and local markets. This increase, though moderate, highlights the growing demand for residential and commercial space. Water bodies remained

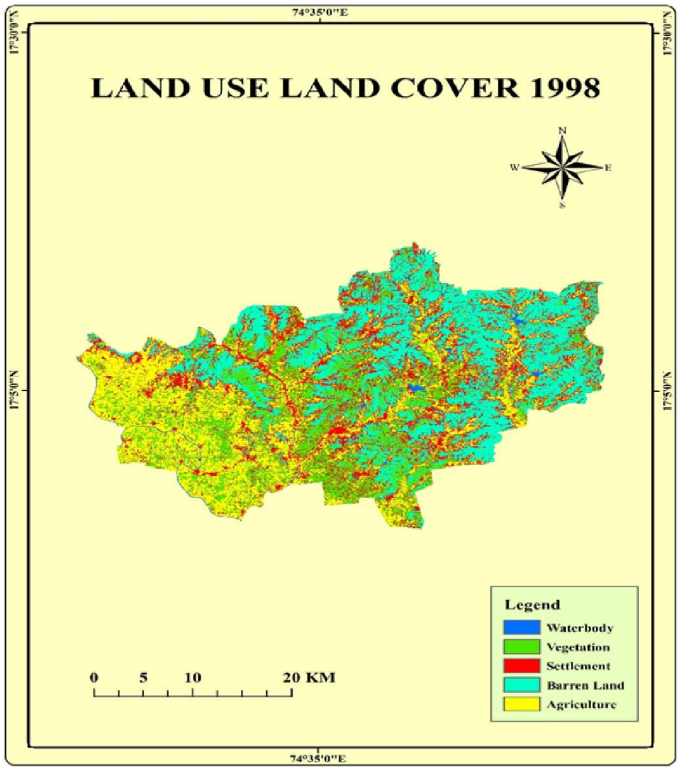

Fig 3. Land use Land Cover 1998

relatively stable at 10–11%, suggesting that irrigation resources were still sufficient to support agricultural activities. However, increased dependence on groundwater extraction began to emerge during this period.

Barren land remained within the range of 13–15%, showing minimal change. However, slight increases in degraded land were observed in some areas due to improper land management practices. Agricultural productivity during this period remained largely stable, but early signs of land fragmentation and resource competition became evident. Farmers started experiencing pressure on land resources, which later intensified in subsequent years.

3. LULC Status in 2003 (Moderate Transition with Expanding Infrastructure):

The year 2003 marks a significant transitional phase where the effects of development and infrastructural expansion became more pronounced. Agricultural land declined further to approximately 57–59%, indicating a steady reduction in cultivable land. This decline is closely associated with improved connectivity, road expansion, and the gradual growth of urban centers within the region.

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Built-up area increased to nearly 13–15%, reflecting a notable rise in construction activities, including residential housing and small-scale industries. The increase in built-up land demonstrates the growing influence of economic development on land use patterns. Water bodies showed a slight reduction to 9–10%, which can be attributed to irregular rainfall patterns and increased water consumption for irrigation and domestic purposes.

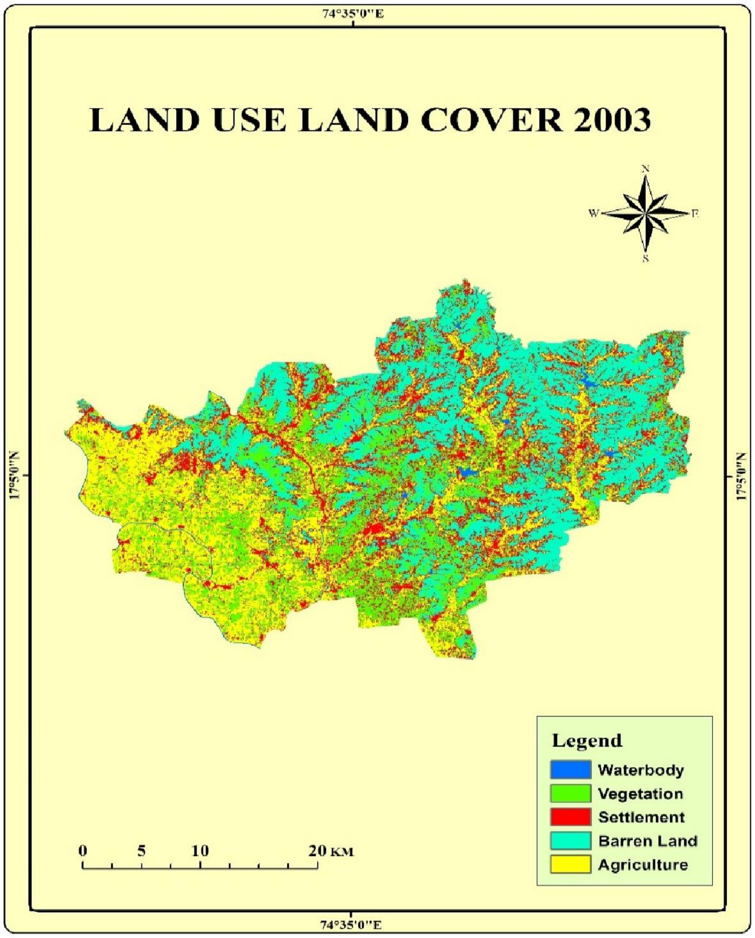

Fig 4. Land use Land Cover 2003

Barren land fluctuated between 14–16%, with some areas being converted into agriculture through irrigation development, while others became unproductive due to soil degradation. This dual trend highlights the dynamic nature of land use during this period. Agricultural productivity began to show variability, with certain crops experiencing reduced yields due to declining soil fertility and water stress. Farmers gradually started adapting to these changes by altering cropping patterns and adopting new agricultural practices.

4. LULC Status in 2008 (Acceleration Phase of Urban Expansion):

In 2008, the rate of land transformation accelerated significantly, marking a critical phase in the LULC dynamics of the study area. Agricultural land decreased sharply to approximately 53–55%, reflecting a substantial loss of cultivable land within a relatively short period. This decline is primarily driven by rapid urban expansion, infrastructural development, and increasing demand for land for non-agricultural purposes.

The built-up area expanded considerably to around 18–20%, indicating a rapid increase in urban settlements, commercial establishments, and transportation networks. The growth of built-up areas during this period is a clear

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indicator of economic development and population pressure. Water bodies fluctuated between 8–9%, showing the impact of climatic variability and increasing water demand.

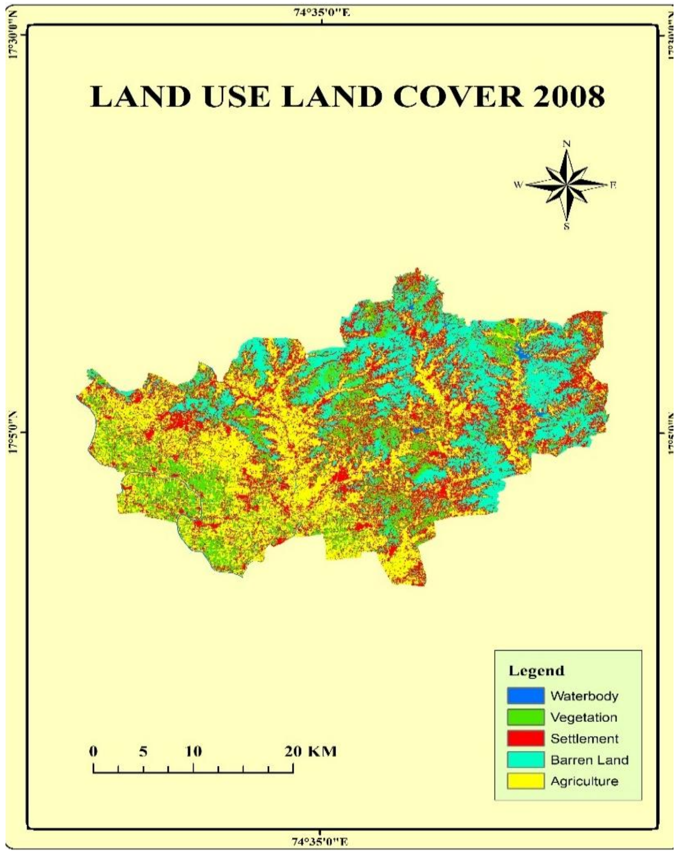

Fig 5. Land use Land Cover 2008

Barren land remained relatively stable at 15–17%, but certain regions exhibited signs of land degradation due to overuse and mismanagement of resources. Agricultural productivity during this period declined more noticeably, particularly for water-intensive crops. Farmers faced challenges such as reduced landholding size, increased input costs, and water scarcity. This period marks the beginning of a significant shift in agricultural practices, with farmers exploring alternative crops and income sources.

5. LULC Status in 2013 (Critical Turning Point with Industrial Influence):

The year 2013 represents a major turning point in the land use pattern of the study area, characterized by rapid urbanization and industrial growth. Agricultural land declined significantly to approximately 48–50%, indicating that nearly half of the total land was no longer available for cultivation. This sharp decline highlights the increasing pressure on agricultural resources due to human activities.

Built-up area expanded rapidly to around 22–25%, driven by industrial development, infrastructure projects, and population growth. The establishment of industrial units and expansion of transportation networks led to the conversion of large areas of agricultural land. Water bodies showed slight improvement in some areas, reaching 9–10%, due to irrigation initiatives; however, this was not sufficient to offset the growing water demand.

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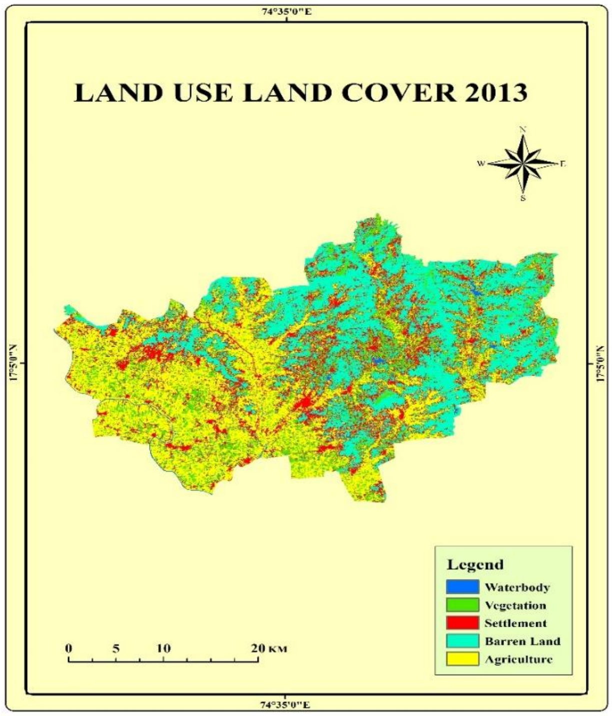

Fig 6. Land use Land Cover 2013

Barren land increased to approximately 16–18%, reflecting the impact of soil degradation, over-extraction of groundwater, and unsustainable agricultural practices. Agricultural productivity declined significantly during this period, with farmers experiencing reduced yields and increased dependency on irrigation. The shift towards horticulture and commercial crops became more prominent, indicating a change in agricultural strategies

6.LULC Status in 2018 (Intensive Pressure Phase with Environmental Stress)

By 2018, the cumulative effects of continuous land transformation became highly evident. Agricultural land declined further to approximately 43–45%, indicating a consistent and alarming reduction in cultivable area. Built-up area increased sharply to around 28–30%, covering a substantial portion of the region and reflecting intense urban growth.

Water bodies fluctuated between 7–9%, showing the combined impact of climate variability, reduced rainfall, and excessive groundwater extraction. Barren land increased to around 18–20%, highlighting the growing issue of land degradation and abandonment of unproductive fields. Environmental stress became more pronounced during this period, with increased soil salinity, water scarcity, and declining soil fertility.

Agricultural productivity faced severe challenges, with significant reductions in crop yields. Farmers increasingly adopted adaptive strategies such as crop diversification, use of advanced irrigation techniques, and shifting towards less water-intensive crops. However, these measures were not sufficient to fully compensate for the loss of agricultural land.

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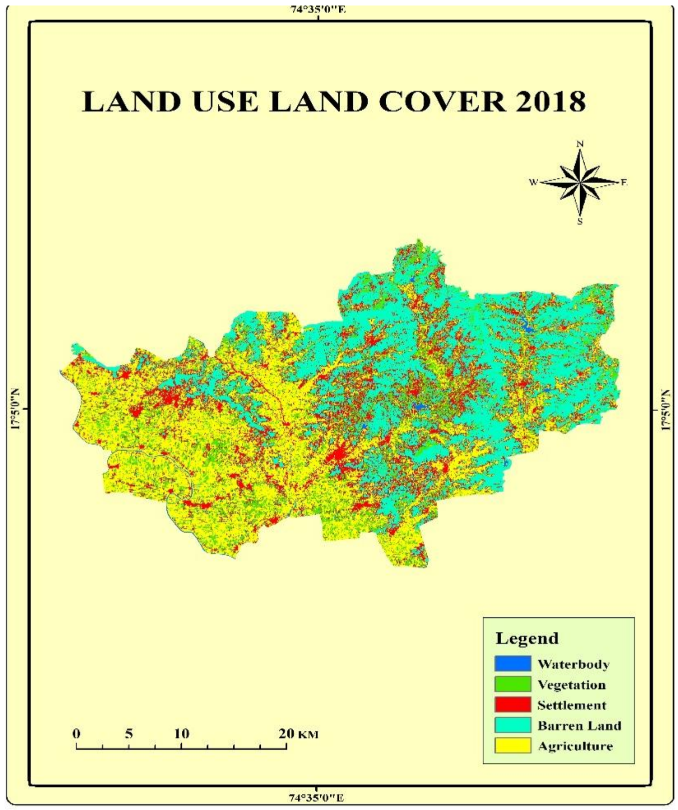

Fig 7. Land use Land Cover 2018

VI. LULC STATUS IN 2023 (CURRENT SCENARIO WITH MAXIMUM TRANSFORMATION)

The year 2023 represents the most advanced stage of land transformation in the study area. Agricultural land has declined to approximately 38–40%, indicating a loss of nearly one-fourth of the cultivable land over three decades. This drastic reduction highlights the critical state of agriculture in the region.

Built-up area has reached its peak, accounting for approximately 32–35%, reflecting rapid urbanization, industrialization, and infrastructural expansion. Water bodies have declined to around 6–8%, due to encroachment, reduced rainfall, and over-extraction of groundwater. Barren land has increased to approximately 20–22%, indicating severe land degradation and reduced soil productivity.

The agricultural sector is under significant stress, with declining crop yields, reduced land availability, and increasing production costs. Farmers are increasingly shifting towards commercial agriculture, horticulture, or non-agricultural occupations to sustain their livelihoods. This period clearly reflects a transition from an agriculture-dominated landscape to an urban-industrial system.

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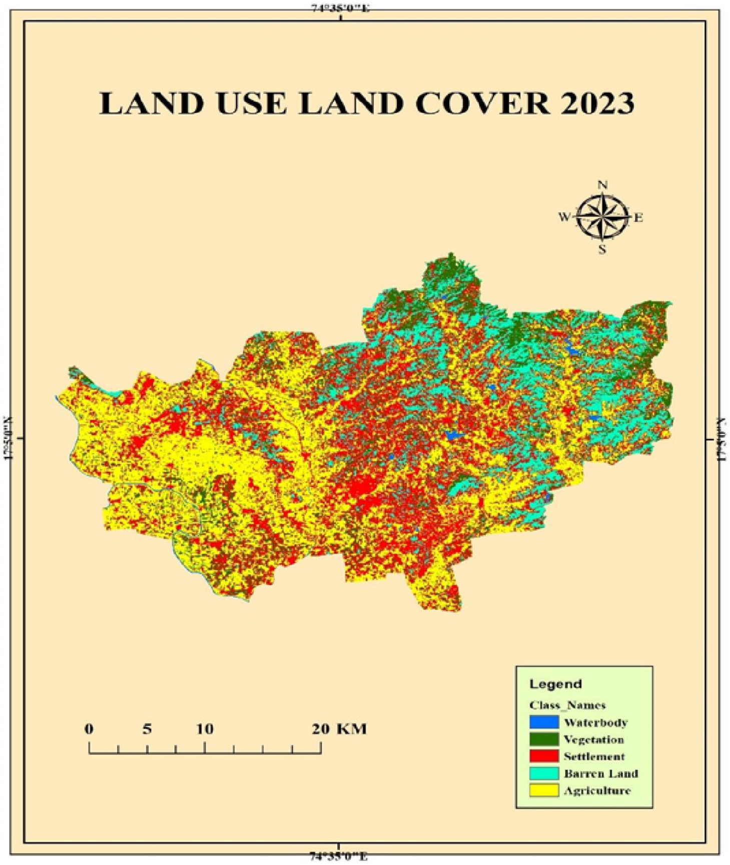

Fig 8. Land use Land Cover 2023

VIII. COMPARATIVE ANALYSIS

1. Comparative Analysis: 1993–1998 (Initial Stability with Emerging Pressure)

The comparison between 1993 and 1998 reflects a phase of relative stability in land use patterns, yet with subtle indications of emerging anthropogenic pressure on agricultural land. In 1993, the study area was characterized by a dominant agricultural landscape, with nearly 62–65% of the total geographical area under cultivation, indicating a strong agrarian economy supported by fertile black cotton soil and well-established irrigation systems. By 1998, this proportion slightly declined to approximately 60–62%, suggesting the early conversion of agricultural land into non-agricultural uses. Although the magnitude of change appears limited, it is significant in understanding the onset of long-term land transformation processes.

The built-up area increased from around 8–10% in 1993 to 10–12% in 1998, reflecting gradual population growth and expansion of rural settlements. This increase was primarily associated with the development of basic infrastructure such as roads, educational institutions, and local markets. Water bodies remained relatively stable during this period, maintaining a share of around 10–11%, which indicates that climatic conditions and water availability were still favorable for agricultural activities. Barren land showed negligible variation, remaining within 13–15%, suggesting limited land degradation at this stage.

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From an agricultural perspective, this period can be considered a pre-transition phase, where productivity remained relatively stable due to sufficient land and water resources. However, the initial signs of land fragmentation began to emerge as landholdings were gradually divided due to population increase. The socio-economic changes during this period laid the groundwork for future land use transformations, indicating that even minor shifts in land distribution can have long-term implications for agricultural sustainability.

2. Comparative Analysis: 1998–2003:

The transition from 1998 to 2003 marks a phase of gradual but more noticeable land use transformation, driven primarily by infrastructural development and increasing economic activities. During this period, agricultural land declined further from approximately 60–62% to 57–59%, indicating a steady reduction in cultivable land. This decline reflects the growing influence of development projects, improved transportation networks, and the expansion of semi-urban areas.

The built-up area increased from around 10–12% to 13–15%, demonstrating a clear expansion of residential and commercial spaces. This growth can be attributed to improved accessibility, which encouraged settlement expansion and small-scale industrial activities. Water bodies showed a slight decline from approximately 10–11% to 9–10%, which may be linked to irregular rainfall patterns and increased extraction of water for agricultural and domestic purposes. Barren land fluctuated between 14–16%, indicating both land reclamation efforts and emerging degradation in certain areas.

Agriculturally, this period represents a transitional phase where the impact of land use change began to affect productivity. The reduction in land area led to moderate changes in cropping patterns, with some farmers shifting towards crops that required less water or provided higher economic returns. Soil quality also began to show signs of decline due to continuous cultivation and increasing use of chemical inputs. Although agricultural output did not decline drastically, the sustainability of farming practices started becoming a concern. This phase highlights the increasing interaction between development and agriculture, where economic growth begins to compete with traditional land use systems.

3. Comparative Analysis 2003–2008

The period between 2003 and 2008 represents a significant acceleration in land use transformation, marking a shift from gradual to rapid change. Agricultural land declined sharply from approximately 57–59% to 53–55%, indicating a substantial loss of cultivable land within a relatively short timeframe. This reduction is primarily driven by increasing urbanization, expansion of infrastructure, and rising demand for land for residential and commercial purposes.

Built-up area increased significantly from around 13–15% to 18–20%, reflecting rapid growth in settlements, transportation networks, and small-scale industries. This expansion highlights the increasing economic importance of non-agricultural activities in the region. Water bodies declined slightly from approximately 9–10% to 8–9%, indicating growing pressure on water resources due to both climatic variability and human activities. Barren land remained relatively stable at around 15–17%, although localized degradation was observed in areas affected by overuse and poor land management.

From an agricultural standpoint, this period marks the beginning of noticeable decline in productivity and sustainability. The reduction in agricultural land led to smaller farm sizes, making mechanization and efficient farming more difficult. Water scarcity became a significant issue, particularly for water-intensive crops such as sugarcane. Farmers faced increasing challenges, including rising input costs, declining soil fertility, and reduced profitability. This phase represents a critical turning point where agriculture began losing its dominance to urban development.

4. Comparative Analysis 2008–2013:

The comparison between 2008 and 2013 reveals a critical phase of transformation characterized by rapid industrialization and intensified urban expansion. Agricultural land declined significantly from approximately 53–55%

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to 48–50%, indicating that nearly half of the study area was no longer under cultivation. This sharp decline reflects the increasing conversion of agricultural land into industrial zones, residential areas, and infrastructure projects.

Built-up area expanded rapidly from around 18–20% to 22–25%, demonstrating the strong influence of economic development and population growth. Water bodies showed a slight increase in some areas, rising from approximately 8–9% to 9–10%, mainly due to irrigation projects and water management initiatives. However, this increase was not sufficient to meet the growing demand for water. Barren land increased from around 15–17% to 16–18%, indicating ongoing soil degradation and unsustainable land use practices.

Agricultural productivity declined significantly during this period due to reduced land availability and increasing environmental stress. Farmers increasingly shifted towards horticulture and commercial crops such as grapes, which offered higher economic returns but required more investment. This phase represents a decisive turning point, where the balance between agriculture and development shifted in favor of urban and industrial growth.

5. Comparative Analysis 2013–2018:

The period from 2013 to 2018 reflects intensified pressure on land and environmental resources, leading to further decline in agricultural sustainability. Agricultural land decreased from approximately 48–50% to 43–45%, indicating a continuous loss of fertile land. Built-up area increased sharply from around 22–25% to 28–30%, highlighting rapid urban expansion and infrastructure development.

Water bodies declined from approximately 9–10% to 7–9%, reflecting the combined effects of reduced rainfall, groundwater depletion, and increased water demand. Barren land increased from around 16–18% to 18–20%, indicating worsening land degradation and soil fertility loss.

Agricultural productivity during this period was severely affected by water scarcity, soil salinity, and reduced land availability. Farmers adopted various adaptive strategies, including crop diversification, improved irrigation techniques, and the use of fertilizers and pesticides. However, these measures often led to further environmental degradation, creating a cycle of declining productivity and increasing resource pressure. This phase highlights the growing imbalance between development and environmental sustainability.

6. Comparative Analysis 2018–2023:

The comparison between 2018 and 2023 represents the most advanced stage of land transformation, characterized by peak urbanization and severe agricultural decline. Agricultural land decreased further from approximately 43–45% to 38–40%, representing a total loss of nearly one-fourth of cultivable land since 1993. Built-up area increased from around 28–30% to 32–35%, indicating rapid and often unplanned urban and industrial expansion.

Water bodies declined from approximately 7–9% to 6–8%, reflecting severe water stress caused by over-extraction, reduced rainfall, and encroachment. Barren land increased from around 18–20% to 20–22%, indicating widespread land degradation and declining soil productivity.

The agricultural sector faced a crisis during this period, with declining crop yields, increasing production costs, and reduced profitability. Many farmers shifted to non-agricultural occupations or adopted commercial crops to sustain their livelihoods. This phase clearly demonstrates the transition from an agricultural economy to an urban-industrial system, raising serious concerns about food security and sustainability.

Overall Comparative Insight (1993–2023)

The year-wise comparative analysis clearly indicates that the study area has undergone a progressive and irreversible transformation over the past three decades. The rate of change has accelerated over time, with the most significant changes occurring after 2008. Agricultural land has declined by approximately 22–25%, while built-up area has increased by nearly 25–27%. Water bodies have shown a slight decline, and barren land has increased due to environmental degradation.

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This transformation reflects the combined impact of urbanization, industrialization, population growth, and environmental stress. The continuous loss of agricultural land has had a direct impact on agricultural production, leading to reduced crop yields, changes in cropping patterns, and increased pressure on natural resources. The findings highlight the urgent need for sustainable land use planning and resource management to ensure long-term environmental and economic stability.

9. LULC Change and its impact of Agriculture Production (%):

Year	Agriculture Land(%)	Build-up Area(%)	Water Bodies(%)	Barren Land(%)	Sugarcane Yield(Ha)	Total Crop Production Index(%)
1993	64	9	11	14	105	100
1998	61	11	11	14	102	97
2003	58	14	10	15	98	93
2008	54	19	9	16	92	88
2013	49	23	10	17	85	82
2018	44	29	8	19	78	75
2023	39	34	7	21	72	68

Table.1. LULC Change and its impact of Agriculture Production (%)

The above table clearly presents the year-wise percentage distribution of land use and land cover along with its direct impact on agricultural production in Tasgaon and Palus tahsil over a period of 30 years (1993–2023). The data reveals a strong relationship between declining agricultural land and decreasing crop production.

In 1993, agricultural land accounted for 64%, which supported high agricultural productivity. Sugarcane yield was approximately 105 tons per hectare, and the overall crop production index was considered 100%, indicating the most stable and productive agricultural condition. The built-up area was only 9%, and water bodies were sufficient (11%), ensuring proper irrigation and soil moisture availability.

By 1998, agricultural land declined slightly to 61%, and built-up area increased to 11%, showing the beginning of land conversion. This resulted in a small decline in sugarcane yield to 102 tons/ha, and total crop production reduced to 97%. Although the impact was minor, it indicates the initial effect of LULC change on agriculture.

In 2003, agricultural land further reduced to 58%, while built-up area increased to 14%. Water bodies slightly declined to 10%, which began affecting irrigation. As a result, sugarcane yield dropped to 98 tons/ha, and total production declined to 93%. This shows that even moderate land conversion starts impacting agricultural output.

By 2008, agricultural land declined significantly to 54%, and built-up area increased sharply to 19%. Water bodies reduced to 9%, indicating growing water stress. Sugarcane yield dropped to 92 tons/ha, and total production declined to 88%. This period marks a clear negative impact of urbanization on agriculture.

In 2013, agricultural land decreased to 49%, while built-up area increased to 23%. Although water bodies slightly improved to 10%, it was insufficient to support the increasing demand. Sugarcane yield declined further to 85 tons/ha, and total crop production reduced to 82%. This reflects strong pressure on agriculture due to land loss and resource constraints.

By 2018, agricultural land reduced to 44%, and built-up area increased to 29%, showing rapid urban expansion. Water bodies declined to 8%, and barren land increased to 19%, indicating soil degradation. Sugarcane yield dropped to 78 tons/ha, and total production reduced significantly to 75%. This shows severe impact on agricultural sustainability.

In 2023, agricultural land reached its lowest level at 39%, while built-up area peaked at 34%. Water bodies declined further to 7%, and barren land increased to 21%, highlighting serious environmental degradation. Sugarcane yield dropped to 72 tons/ha, and total crop production reduced to 68%, indicating a major decline in agricultural productivity.

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IX. DISCUSSION

The analysis of Land Use and Land Cover (LULC) change in Tasgaon and Palus tahsil from 1993 to 2023 clearly shows a continuous transformation in land use patterns. The study reveals that agricultural land has consistently decreased, while built-up areas have increased significantly over the past three decades. This change is mainly driven by population growth, urbanization, industrial development, and expansion of infrastructure such as roads and settlements.

The reduction of agricultural land from about 64% in 1993 to nearly 39% in 2023 indicates a major shift in land utilization. This decline has directly affected agricultural production, as the total area available for cultivation has reduced. Even though modern techniques and irrigation methods have improved productivity per hectare in some cases, the overall crop production has decreased due to loss of cultivable land. Major crops like sugarcane, wheat, and maize have shown a decline in total production over time.

Water availability has also been affected due to LULC changes. The decrease in water bodies and increasing dependence on groundwater have created water scarcity in the region. This has increased the cost of irrigation and reduced the sustainability of farming. Farmers are facing difficulties in maintaining consistent crop yields, especially for water-intensive crops.

Another important issue observed is the increase in barren land, which indicates soil degradation and declining land productivity. Continuous use of chemical fertilizers, improper land management, and lack of soil conservation practices have contributed to this problem. As a result, some agricultural land has become unproductive and abandoned.

Due to these challenges, farmers are changing their cropping patterns and shifting towards high-value crops such as grapes and vegetables. While this helps in maintaining income, it also increases dependence on water and market conditions, making agriculture more risky.

Overall, the discussion highlights that LULC change has a strong negative impact on agriculture and environmental sustainability. Without proper planning and management, these changes may lead to long-term problems for the region.

X. CONCLUSION

The study of Land Use and Land Cover (LULC) change in Tasgaon and Palus tahsil from 1993 to 2023 shows that significant changes have occurred in land utilization patterns over the last 30 years. Agricultural land has decreased considerably, while built-up area has increased rapidly due to urbanization and development activities.

This transformation has had a direct impact on agricultural production. The reduction in cultivable land, along with water scarcity and soil degradation, has led to a decline in overall crop production. Farmers are facing increasing challenges such as reduced land availability, high input costs, and environmental stress.

The study also highlights that water resources are under pressure due to declining water bodies and overuse of groundwater. Similarly, the increase in barren land reflects poor land management and declining soil fertility. In conclusion, LULC change has created serious challenges for agricultural sustainability, food security, and environmental balance. To address these issues, it is necessary to adopt proper land use planning, improve water management practices, and promote sustainable agricultural techniques.

If appropriate measures are not taken, the continuous loss of agricultural land may lead to further decline in agricultural productivity and negatively affect the livelihood of farmers in the region.

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