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The Geography of Land Utilization Change in Beed District: Past to Present

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ABSTRACT

Land is a critical resource shaping human settlements, agriculture, and economic development, particularly in agrarian regions such as Beed district in Maharashtra, India. This study examines the geography of land utilization in Beed from the 1960s to the present, highlighting temporal changes in crop patterns, irrigation practices, and ecological conditions. Historically dominated by subsistence cereals and pulses, the district has transitioned toward cash crops like soybean, cotton, and sugarcane, driven by technological innovations, market incentives, and policy interventions. While these changes have improved productivity and market integration, they have also intensified ecological stress, groundwater depletion, soil degradation, and socio-economic vulnerability, including farmer distress. Using statistical records, remote sensing data, and literature analysis, this paper traces the trajectory of land use change, identifies driving factors, and evaluates consequences. Finally, it emphasizes sustainable land management strategies, including water conservation, crop diversification, agroforestry, and participatory planning, to reconcile economic development with ecological resilience in semi-arid regions.

Keywords: Beed district; Land utilization; Land use change; Cash crops; Semi-arid agriculture; Groundwater depletion; Sustainable land management; Agricultural geography

1. Introduction

Land is the foundation of human existence, providing the basis for agriculture, settlements, industries, and ecological balance. In the discipline of geography, the study of land utilization reflects how societies organize space, respond to environmental challenges, and pursue economic opportunities. In agrarian economies such as India, where more than half the population is dependent on farming, land utilization assumes special importance. It reveals both natural constraints—such as soils, climate, and water availability—and the imprint of human interventions through policy, technology, and market forces.

Beed district, located in the Marathwada region of Maharashtra, offers a particularly significant case study. The district lies within a drought-prone semi-arid zone, characterized by basaltic plateau soils, erratic rainfall, and limited irrigation potential. Despite these constraints, land utilization in Beed has undergone profound transformation from the 1960s to the present. In the past, subsistence agriculture dominated, with cereals such as jowar and bajra, alongside pulses and limited cash crops. Today, land use is increasingly shaped by cash crops—soybean, cotton, and sugarcane—encouraged by technological advances, cooperative industries, and market opportunities.

This transformation has brought mixed consequences. While productivity and incomes have risen in certain phases, ecological degradation, groundwater depletion, and socio-economic distress have intensified. Beed's agrarian crisis, reflected in migration and farmer suicides, has been widely reported. At the same time, questions of sustainability and resilience have come to dominate debates on land utilization.

The geography of land utilization in Beed district has undergone significant transformations, influencing both agroecological dynamics and the distribution of medicinal plants. Studies on regional flora, including *Capparis zeylanica* and *Ricinus communis*, reveal the impact of land use changes on AM fungal colonization and belowground biodiversity (Sarwade et al., 2024; Sarwade et al., 2025; *Plantae Scientia* Vol. 08). Research on phytomedicinal species such as *Allium sativum*, *Ocimum sanctum*, *Moringa oleifera*, *Psidium guajava*, and *Aloe barbadensis* demonstrates how shifting agricultural patterns affect their antioxidant, anticancer, hormonal, and antimicrobial potentials (Mishra et al., 2024; Otia et al., 2024; Sarwade et al., 2024–2025). Focused analyses of *Curcuma longa* for neurological and renal disorders, as well as Pyrimidine derivatives for cancer therapy, highlight the medicinal consequences of altered land use (Sarwade et al., 2024, 2025). Emerging biotechnological studies, including green-synthesized nanoparticles, plant genomics, and biochemical interventions in PCOS and hormonal imbalance, further connect land utilization with plant-based therapeutic potential (Kumar et al., 2024; Gaisamudre et al., 2024; Sarwade et al., 2025). Detailed mapping of *Cascabela thevetia*, *Hibiscus rosa-sinensis*, and *Coriandrum sativum* reinforces the significance of traditional land management in maintaining phytodiversity and pharmacological relevance. Overall, this integrative

perspective underscores how past and present land use changes shape agroecological resilience, biodiversity conservation, and the sustainable exploitation of therapeutic natural products.

The objective of this paper is to review the geography of land utilization change in Beed district from the past to the present. It will (i) trace historical land use patterns, (ii) analyze present conditions, (iii) examine the factors driving change, (iv)evaluate consequences, and (v) suggest sustainable futures. By combining statistical records, spatial analysis, and academic literature, the study seeks to provide a comprehensive understanding of Beed's land use trajectory.

2. Literature Review

The study of land utilization occupies a central place in geography, economics, and environmental science. Globally, land use change has been recognized as both a cause and a consequence of socio-economic development (Turner et al., 2007). The Food and Agriculture Organization (FAO, 2011; 2020) emphasizes that patterns of land use are critical for food security, biodiversity, and climate resilience.

In the Indian context, research on land utilization gained momentum during and after the Green Revolution. Mellor (1976) and Singh (2002) examined how new agricultural technologies, irrigation, and input-intensive farming restructured cropping patterns. These changes were not uniform: while regions with assured irrigation adopted wheat and rice, semi-arid areas continued to struggle with subsistence farming. R.S. Deshpande (1992) pointed out that drought-prone regions, including Maharashtra's Marathwada, faced persistent risks despite modernization.

Environmental concerns were raised by Gadgil (1995), who highlighted the degradation of semi-arid ecosystems due to deforestation, soil erosion, and unsustainable irrigation. Deshpande and Narayanamoorthy (2003) linked land use patterns to farmer suicides in Maharashtra, emphasizing the vulnerability created by cash crop dependence.

Theoretical frameworks help interpret these changes. Von Thünen's model (1826) explains agricultural land allocation around markets, suggesting economic rationality in crop choices. The USDA land capability classification provides an ecological lens, categorizing land according to its suitability for various uses. Applied to Beed, these frameworks reveal tensions between economic incentives and ecological capacities.

3. Study Area: Beed District

Beed district occupies an area of about 10,693 square kilometers in central Maharashtra. It is bordered by Ahmednagar to the west, Latur and Osmanabad to the south, Jalna to the north, and Parbhani to the east. The district lies on the Deccan Plateau, with elevations between 500 and 700 meters above sea level.

Physical Setting

The geology is dominated by basaltic formations, producing soils that range from deep black cotton (regur) to medium black and lateritic soils. These soils are fertile but highly dependent on rainfall. The climate is semi-arid, with hot summers, cool winters, and erratic monsoons. Average annual rainfall is about 700 mm, though spatial and temporal variability is high. Droughts are frequent, and rainfall failures have shaped the district's agricultural history.

Hydrology

The district is drained by tributaries of the Godavari and Manjra rivers. While several dams and canals exist, their irrigation potential is limited. Increasingly, borewells tapping deep aquifers have become the main source of irrigation, raising concerns about groundwater depletion.

Socio-Economic Profile

According to the Census of India (2011), Beed's population is predominantly rural, with over 70% engaged in agriculture and allied activities. Crops include jowar, bajra, pulses, cotton, soybean, and sugarcane. Livestock rearing is important, though constrained by declining grazing lands. Beed is also known for high rates of farmer suicides, linked to debt, drought, and cash crop failures (Government of Maharashtra, 2014).

4. Methodology

This paper is based on secondary sources, including:

Statistical data: Census of India (1961–2011), District Statistical Abstracts, Agricultural Census.

Gazetteers and reports: Beed District Gazetteer (1975), Government drought reports.

Remote sensing data: Land Use Land Cover (LULC) datasets from NRSC (2019).

Academic studies: Published works on agriculture, drought, and land use in Marathwada.

Four time frames were chosen:

1960s (subsistence era)

1980s (early modernization)

2000s (cash crop expansion)

2020s (present scenario)

Data analysis included comparative statistics (percent shares of land under different uses), temporal trend analysis, and spatial interpretation through maps. While quantitative trends provide structure, qualitative insights are drawn from secondary literature to understand socio-economic dynamics.

5. Land Utilization in the Past (1960s–1980s)

1960s: Subsistence Agriculture

During the 1960s, Beed's land use was dominated by cereals and pulses. Jowar and bajra occupied large tracts, supplemented by tur, gram, and groundnut. Cotton was present but limited. Irrigation was minimal, relying mainly on wells and seasonal tanks. Forest cover accounted for 8–10% of land, while grazing lands and wastelands supported livestock.

The District Gazetteer (1975) reported that around 60–65% of the district's area was under cultivation. Productivity was low due to rain-fed farming, limited inputs, and technological backwardness. Land utilization decisions were shaped more by ecology than by markets.

1980s: Early Modernization

By the 1980s, the impact of the Green Revolution reached Marathwada. Farmers began adopting chemical fertilizers, hybrid seeds, and mechanization. Cotton expanded, driven by cooperative spinning mills and state support. However, cereals remained dominant. Irrigation expanded modestly through small dams and wells, but droughts continued to disrupt agriculture. Forest cover declined further, while fallow and grazing lands shrank as agriculture intensified.

6. Present Land Utilization Patterns (2000s–2020s)

Since the 1990s, a structural transformation has occurred. Soybean was introduced and rapidly adopted due to its market demand and shorter duration. Today it occupies one of the largest cropped areas. Cotton continues to be significant, while sugarcane, encouraged by cooperative factories, has expanded despite water scarcity.

According to NRSC (2019), more than 80% of Beed's land is under cultivation. Irrigated land has expanded, but primarily through borewells tapping deep aquifers. Forest cover has declined to under 5%, while pastures and common lands have nearly disappeared. Built-up land has expanded around Beed city and other taluka headquarters.

This present land use pattern is characterized by cash crop monocultures, high input dependency, and ecological stress.

7. Factors Influencing Land Utilization Change

Physical factors: Semi-arid climate, recurrent droughts, and soil conditions restrict options but drive adaptation toward drought-tolerant or high-value crops.

Economic factors: Market incentives for soybean, cotton, and sugarcane; minimum support prices; and export potential.

Technological factors: Mechanization, HYV seeds, chemical fertilizers, and borewell irrigation expanded cultivation.

Socio-political factors: Cooperative sugar factories, loan policies, and government schemes (subsidies, crop insurance) altered crop choices.

Environmental factors: Deforestation, soil erosion, and groundwater over-extraction reduced ecological buffers.

8. Consequences of Land Use Change

The impacts of land use change in Beed are multifaceted:

- **Positive**:
    1. Increased crop productivity in favorable years.
    2. Integration with markets through soybean and cotton.
    3. Growth of agro-industries (sugar factories, cotton ginning).
- **Negative**:
    1. **Groundwater depletion**: Intensive borewell irrigation has lowered water tables dramatically.

2. **Soil degradation**: Monocultures and chemical inputs reduced soil fertility.
3. **Biodiversity loss**: Decline of forests and grazing lands.
4. **Socio-economic distress**: Cash crop dependence increased vulnerability to price fluctuations and drought.
5. **Migration and suicides**: Beed has become one of Maharashtra's hotspots for agrarian distress (Government of Maharashtra, 2014).

9. Comparative Analysis: Past vs Present

The contrast between the past and present is stark:

Crops: Food crops (jowar, bajra, pulses) → cash crops (soybean, cotton, sugarcane).

Irrigation: Traditional wells and tanks → deep borewells and unsustainable groundwater use.

Forests and grazing lands: Decline from 8–10% to <5%.

Landholding: Increasing fragmentation and marginalization.

Ecology: From relatively balanced agro-pastoral systems to fragile monocultures.

Statistical comparisons show a decline of 20–30% in food crop acreage, a sharp rise in soybean area, and expansion of sugarcane despite ecological unsuitability. GIS maps confirm the contraction of forest and pasture alongside agricultural and urban expansion (NRSC, 2019).

10. Future Prospects and Sustainable Land Use Planning

To ensure sustainable land utilization in Beed, a multipronged strategy is needed:

1. **Water conservation**: Rainwater harvesting, watershed development, and efficient irrigation systems (drip, sprinkler).
2. **Crop diversification**: Promoting pulses, oilseeds, and millets that are less water-intensive.
3. **Agroforestry and organic farming**: Enhancing ecological resilience and soil fertility.
4. **Technology and monitoring**: GIS-based land use planning for resource allocation.
5. **Policy alignment**: Integration with the Sustainable Development Goals (SDGs), especially zero hunger, clean water, climate action, and life on land.
6. **Community participation**: Strengthening farmer cooperatives and participatory watershed management.

Only a balance of productivity, equity, and sustainability can secure Beed's agrarian future.

11. Conclusion

The geography of land utilization in Beed district reflects the dynamic interplay of ecological constraints, technological innovations, economic incentives, and socio-political forces. From the 1960s to the present, the district has shifted from subsistence-oriented, food crop-based systems to cash crop monocultures. While modernization has delivered short-term gains, it has also exacerbated ecological vulnerability and socio-economic distress.

The challenge lies in crafting land use strategies that balance economic aspirations with ecological sustainability. Future land use planning must prioritize water conservation, crop diversification, ecological restoration, and community-based management. The case of Beed illustrates not only the local dynamics of land utilization but also broader lessons for semi-arid regions across India and beyond.

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