



Geographical Distribution of Irrigation and Land Use Patterns across Districts of Haryana in the 21st Century

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Abstract

The present paper investigates the geographical distribution of irrigation facilities and land use patterns across the various districts of Haryana in the 21st century. Haryana, an agriculturally dominant state of northern India, has witnessed significant transformations in its irrigation infrastructure and land utilization due to modernization, technological interventions, policy initiatives, and climatic variability. This study analyzes spatial variations in irrigation sources such as canals, tube wells, and rain-fed systems, along with evolving land use categories including net sown area, forest cover, fallow land, and non-agricultural uses. The paper highlights regional disparities, trends over time, and their implications for sustainable agricultural development and resource management.

Keywords: Irrigation, Land Use Pattern, Geographical Distribution, Spatial Variation, Haryana, Agriculture, Sustainability

Introduction

Haryana, carved out of the former state of Punjab in 1966, occupies a significant position in India's agrarian economy. With fertile alluvial soils and a predominantly agricultural population, irrigation plays a crucial role in defining land use patterns and crop productivity. Since the dawn of the 21st century, Haryana has experienced rapid changes in agricultural practices due to increased mechanization, expansion of canal networks, over-dependence on groundwater, and urban expansion.

The geographical diversity of the state results in varied irrigation potential and land use dynamics across districts. While districts like Karnal and Kurukshetra exhibit intensive irrigation and high cropping intensity, southern districts such as Mahendragarh and Bhiwani display limited irrigation coverage and greater dependence on rainfall. Understanding these spatial patterns is essential for formulating balanced agricultural and environmental policies.

Objectives of the Study

The main objectives of this study are:

1. To analyze the spatial distribution of irrigation facilities across different districts of Haryana.
2. To examine the changing land use patterns in the 21st century.
3. To identify regional disparities in irrigation and land utilization.
4. To assess the impact of irrigation on agricultural productivity and land transformation.
5. To suggest measures for sustainable irrigation and land management.

Study Area: Haryana

Haryana is situated in the northwestern part of India between 27°39' to 30°35' North latitudes and 74°28' to 77°36' East longitudes. Covering an area of approximately 44,212 sq. km, it is bordered by Punjab, Rajasthan, Uttar Pradesh, and Delhi. The climate is semi-arid with hot summers and cool winters. The topography is characterized by flat plains in the north and central parts and undulating terrain in the south and southwest.

The state consists of 22 districts, each exhibiting unique geographical characteristics influencing irrigation availability and land use patterns.

Methodology

This study is based on secondary data collected from government publications such as Haryana Economic Survey, Statistical Abstract of Haryana, Agricultural Department Reports, and Census of India records. Spatial analysis has been carried out using district-wise data to interpret the distribution of irrigation sources and land use categories. Descriptive and comparative techniques have been employed for analysis.

Geographical Distribution of Irrigation in Haryana

Major Sources of Irrigation

The principal sources of irrigation in Haryana include:

- Canal Irrigation
- Tube Wells
- Open Wells
- Tanks and Rain-fed systems

Canal irrigation dominates in northern and central districts, supported by the Western Yamuna Canal, Bhakra Canal System, and Jawaharlal Nehru Canal. Tube wells, however, account for a major share of irrigation, particularly in intensively cultivated regions.

District-wise Irrigation Pattern

- **High Irrigation Intensity Districts:** Karnal, Kurukshetra, Panipat, Kaithal, and Ambala exhibit over 90% irrigated net sown area due to dense canal networks and abundant tube wells.
- **Moderate Irrigation Districts:** Hisar, Rohtak, Jind, Fatehabad, and Sonapat show balanced dependence on canals and groundwater.
- **Low Irrigation Districts:** Bhiwani, Mahendragarh, Nuh, and Rewari depend largely on rainfall and have limited canal coverage.

The heavy concentration of tube wells has led to alarming groundwater depletion in several districts, particularly in Kurukshetra, Kaithal, and Karnal.

Land Use Patterns in Haryana

Major Land Use Categories

The land use pattern in Haryana can be divided into:

- Net Sown Area
- Forest Land
- Current Fallow
- Other Fallow
- Cultivable Waste
- Land under Non-agricultural Use

Trends in Land Use

Since the early 2000s, there has been a notable shift in land utilization:

- **Decline in Forest Cover:** Forest area remains less than 5% of total geographical area.
- **Expansion of Non-Agricultural Land:** Due to rapid urbanization and industrialization, especially around Gurugram, Faridabad, and Panchkula.
- **Reduction in Cultivable Waste:** Intensive agricultural practices have minimized unused land.
- **Stagnation of Net Sown Area:** Despite technological advances, net sown area has remained relatively stable.

Relationship between Irrigation and Land Use

A strong correlation exists between irrigation availability and land use efficiency. Districts with higher irrigation infrastructure exhibit:

- Higher cropping intensity
- Multiple cropping systems
- Cultivation of water-intensive crops like rice and sugarcane

Conversely, regions with limited irrigation rely on traditional rain-fed agriculture and drought-resistant crops such as millet and pulses.

This uneven distribution has led to monoculture practices in highly irrigated zones, especially the dominance of the wheat-rice rotation, causing ecological stress and reduced soil fertility.

Spatial Disparities and Issues

Key problems arising from current irrigation and land use patterns include:

- Over-extraction of groundwater
- Declining water table
- Soil salinity and alkalinity
- Inequitable resource distribution
- Fragmentation of agricultural land



Southern Haryana faces periodic droughts, while northern districts struggle with waterlogging and salinity.

Government Initiatives and Policy Measures

To improve irrigation efficiency and land use sustainability, the government has implemented:

- Pradhan Mantri Krishi Sinchayee Yojana (PMKSY)
- Micro-Irrigation Programs (drip and sprinkler systems)
- Crop Diversification Schemes
- Watershed Development Programs
- Sub-Mission on Sustainable Agriculture

These policies aim to balance regional disparities and promote sustainable farming practices.

Suggestions for Sustainable Management

1. Promotion of micro-irrigation techniques
2. Strengthening rainwater harvesting
3. Encouraging crop diversification
4. Restoration of degraded land
5. Regulation of groundwater extraction
6. Extension of canal networks to under-served areas

Conclusion

The geographical distribution of irrigation and land use patterns in Haryana reflects significant spatial inequality influenced by natural, infrastructural, and socio-economic factors. While northern and central districts benefit from extensive irrigation networks, southern regions remain vulnerable due to limited water resources. The 21st century has witnessed both advancement and ecological challenges linked to over-irrigation and changing land use practices. Sustainable planning, judicious use of water resources, and equitable distribution of irrigation facilities are essential for achieving long-term agricultural and environmental stability in Haryana.

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