



# Trends And Patterns Of Water Availability In Karnataka: An Economic Analysis

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**Abstract:** Trends and patterns of water availability in Karnataka through an economic lens, focusing on spatiotemporal variations and their implications for agriculture, livelihoods, and sustainable development. Karnataka, a semi-arid state in southern India, faces significant water stress due to erratic rainfall, over-extraction of groundwater, and uneven distribution of water resources. analyzing using secondary data from government and academic sources, the paper investigates changes in water availability over the past two decades, evaluates their economic impact, and offers policy recommendations to enhance water sustainability and equity.

**Keywords:** Water Availability, Karnataka, Economic Analysis, Groundwater, Rainfall, Irrigation.

## Introduction

Karnataka, located in the southern part of India, is a state characterized by significant geographical and climatic diversity. While the state is home to lush agricultural lands in certain regions, it also faces severe water scarcity in others, particularly in the northern and central parts. This disparity in water availability is influenced by a combination of factors, including erratic rainfall patterns, over-exploitation of groundwater, and inefficient water management practices. Agriculture, the backbone of Karnataka's rural economy, is heavily reliant on water resources, with many crops such as sugarcane, paddy, and cotton being water-intensive. However, the ongoing stress on water resources poses a serious threat to agricultural productivity and food security, making it an urgent issue for the state's development.

Over the last few decades, the situation has worsened due to fluctuating rainfall patterns, depleting groundwater levels, and rising water demand from both domestic and industrial sectors. The state has been grappling with recurring droughts and floods, which further exacerbate the unpredictability of water availability. This paper aims to explore the trends and patterns of water availability in Karnataka, focusing on its economic implications for agriculture and livelihoods. Through an economic analysis, this study evaluates the current status of water resources, the regional disparities in water distribution, and the impact on agricultural productivity, offering recommendations for sustainable water management practices to ensure long-term water security for the state.

## Objectives:

1. To analyze the trends in water availability in Karnataka.
2. To identify the spatial and seasonal patterns of water distribution in Karnataka.
3. To evaluate the economic impacts of water scarcity on agriculture and rural livelihoods.

## Methodology:

This study is based on secondary data collected from reliable government and academic sources such as the Central Water Commission (CWC), India Meteorological Department (IMD), Ministry of Jal Shakti, and Karnataka State Natural Disaster Monitoring Centre (KSNDMC), and policy reports. The analysis involves quantitative techniques including trend analysis, district-wise comparison, and spatial mapping using GIS tools. The data is used to assess temporal changes in water availability and its economic impact, with an emphasis on identifying regional disparities and policy implications.

## Literature Review:

Kulkarni et al. (2005) were among the first to highlight emerging water stress in northern Karnataka, particularly due to erratic monsoons affecting rain-fed agriculture. Narayana and Vani (2010) provided an economic perspective by assessing the burden of water scarcity on smallholder farmers, showing how inconsistent water supply reduces crop productivity and increases vulnerability. Reddy and Mishra (2013) emphasized the unsustainable exploitation of groundwater resources and the inefficiency of traditional irrigation systems, urging policy shifts toward more efficient water management practices. Deshpande (2017) critically evaluated Karnataka's water policy framework, exposing gaps in implementation and institutional coordination. More recently, Iyer et al. (2021) investigated the impacts of climate change on Karnataka's hydrology, linking shifts in precipitation and temperature patterns to agricultural distress and water security concerns. Collectively, these studies underscore the urgent need for integrated and region-specific water management strategies.

## Discussion and Analysis:

Data from 2000–2023 shows a declining trend in surface water availability, especially in northern districts like Vijayapura and Bagalkot. Rainfall patterns have become erratic, with shorter but more intense monsoon periods. Groundwater extraction has increased significantly, surpassing recharge rates in several districts. Irrigation-dependent crops such as sugarcane have further strained water resources.

Economic impacts are evident in reduced crop yields, increased input costs, and migration in drought-prone regions. The Mahadayi and Krishna river disputes have also influenced water sharing dynamics. GIS mapping reveals that southern districts like Mandya and Mysuru fare better due to better irrigation infrastructure.

**Table 1: Water Availability and Agricultural Impact by Region in Karnataka State**

Region	Avg. Annual Rainfall (mm)	Groundwater Status	Crop Yield Change (%)	Key Crops
Vijayapura	567	Over-exploited	-15%	Sugarcane, Jowar
Bagalkot	578	Over-exploited	-13%	Cotton, Bajra
Mandya	845	Safe	+2%	Paddy, Sugarcane
Mysuru	812	Safe	+3%	Paddy, Ragi
Tumakuru	689	Semi-critical	-5%	Groundnut, Maize

Source: Government of India Reports and Statistical Compilations (2023)

Above table shows comparison of water availability and agricultural outcomes in Karnataka, highlighting key indicators. Average Annual Rainfall (mm) shows that southern districts like Mandya and Mysuru receive significantly more rainfall (845 mm and 812 mm, respectively) compared to northern districts like Vijayapura (567 mm) and Bagalkot (578 mm), which experience water scarcity. Groundwater Status indicates that northern regions are over-exploiting their groundwater resources, while southern regions have safer groundwater conditions, contributing to better agricultural outcomes. Crop Yield Change (%) demonstrates the direct impact of water availability, with northern regions like Vijayapura and Bagalkot showing significant declines in crop yields (up to -15%) due to water stress, while southern regions exhibit slight increases (2–3%) in productivity. Key Crops highlight the dependency on water-intensive crops like sugarcane and cotton in the north, whereas crops like paddy and groundnut are more prevalent in the south, where water conditions are relatively better.

**Results:**

- 12 out of 30 districts in Karnataka are classified as over-exploited in terms of groundwater usage.
- Rainfall variability has increased by 18% over the last two decades.
- Agricultural productivity has declined by 10–15% in water-scarce districts.

**Findings:**

- Water availability is closely linked to economic stability in rural Karnataka.
- Regional disparities are widening due to infrastructural and policy shortcomings.
- Current water management strategies are insufficient to address the dual challenge of scarcity and variability.

**Suggestions:**

1. Promote water-efficient crops and cropping patterns.
2. Strengthen watershed development and rainwater harvesting schemes.
3. Implement stricter groundwater regulation and monitoring.
4. Enhance inter-district coordination for equitable water distribution.
5. Increase investments in irrigation technology and canal maintenance.

**Conclusion:**

Water availability in Karnataka presents a significant challenge, with distinct regional disparities impacting agriculture and livelihoods. Northern districts like Vijayapura and Bagalkot face severe water stress due to erratic rainfall and over-exploited groundwater, resulting in declines in crop yields, particularly for water-intensive crops. In contrast, southern districts like Mandya and Mysuru benefit from better rainfall and safer groundwater levels, leading to more stable agricultural productivity. However, even these regions face pressures from inefficient irrigation systems and increasing demand on water resources. The current water management policies in the state are insufficient to address the challenges of water scarcity and variability. To ensure long-term water security and agricultural resilience, Karnataka must adopt integrated water resource management strategies that emphasize water-efficient practices, improved irrigation infrastructure, and stronger groundwater regulation, while fostering community participation and policy reforms.

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