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WATER PLANNING FOR AGRICULTURE IN THE MARATHWADA REGION: A STUDY

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Abstract

The Marathwada region of Maharashtra faces chronic water scarcity, affecting agricultural productivity and rural livelihoods. This research examines the current state of water resources, irrigation methods, and conservation efforts in the region. Using secondary data from government reports, satellite imagery, and field surveys, the study analyzes groundwater depletion, rainfall variability, and farmer adaptation strategies. It highlights the effectiveness of water conservation programs and recommends sustainable agricultural water management practices. The findings suggest that a combination of modern irrigation techniques, watershed development, and policy reforms can enhance water security in the region.

Keywords: - Water Planning, Agriculture, Marathwada, Irrigation, Groundwater Depletion, Rainwater Harvesting, Watershed Management, Climate Change

Introduction

The Marathwada region of Maharashtra, India is located between 17°37' to 20°39' north latitude and 74°33' to 78°22' east longitude. The Marathwada region of Maharashtra is 64,590 square kilometres in area. It is made up of eight districts: Aurangabad, Beed, Hingoli, Jalna, Latur, Nanded, Osmanabad, and Parbhani. The Marathwada region is located in central Maharashtra. It is bordered by the Nashik region to the west, the Pune region to the south, and the Amarawati region to the north. The region is also bordered by Karnataka and Andhra Pradesh to the southeast and south.

Water is a critical resource for agriculture, particularly in semi-arid regions like Marathwada, where erratic rainfall and frequent droughts pose severe challenges. Marathwada's agriculture is heavily dependent on groundwater, which is overexploited due to the cultivation of water-intensive crops like sugarcane. In recent years, several government initiatives and NGO-led projects have aimed at improving water management. However, sustainable water planning remains a significant challenge. This study seeks to assess the current status of agricultural water management in Marathwada and propose solutions to ensure long-term water security for farmers.

Objectives

The study aims to:

1. Analyse the existing water resources and their usage in Marathwada's agriculture.
2. Examine the impact of rainfall variability and groundwater depletion on farming.

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3. Assess the effectiveness of government schemes and community-driven water conservation initiatives.
4. Propose sustainable water management strategies for improving agricultural productivity.

Data and Methodology

Data Sources

Secondary Data: Reports from the Maharashtra Water Resources Department, India Meteorological Department (IMD), and Agricultural Census.

Primary Data: Surveys conducted in selected villages to gather farmer insights on water usage and conservation methods.

Remote Sensing Data: Satellite imagery to analyze groundwater levels and land use patterns.

Methodology

Rainfall and Groundwater Analysis: Historical rainfall data and groundwater level trends are analysed.

Case Study Approach: Successful water management projects in Marathwada are documented.

Comparative Analysis: The impact of water conservation measures on crop yield and water availability is compared across different villages.

Subject rendering

Location of Marathwada region with map

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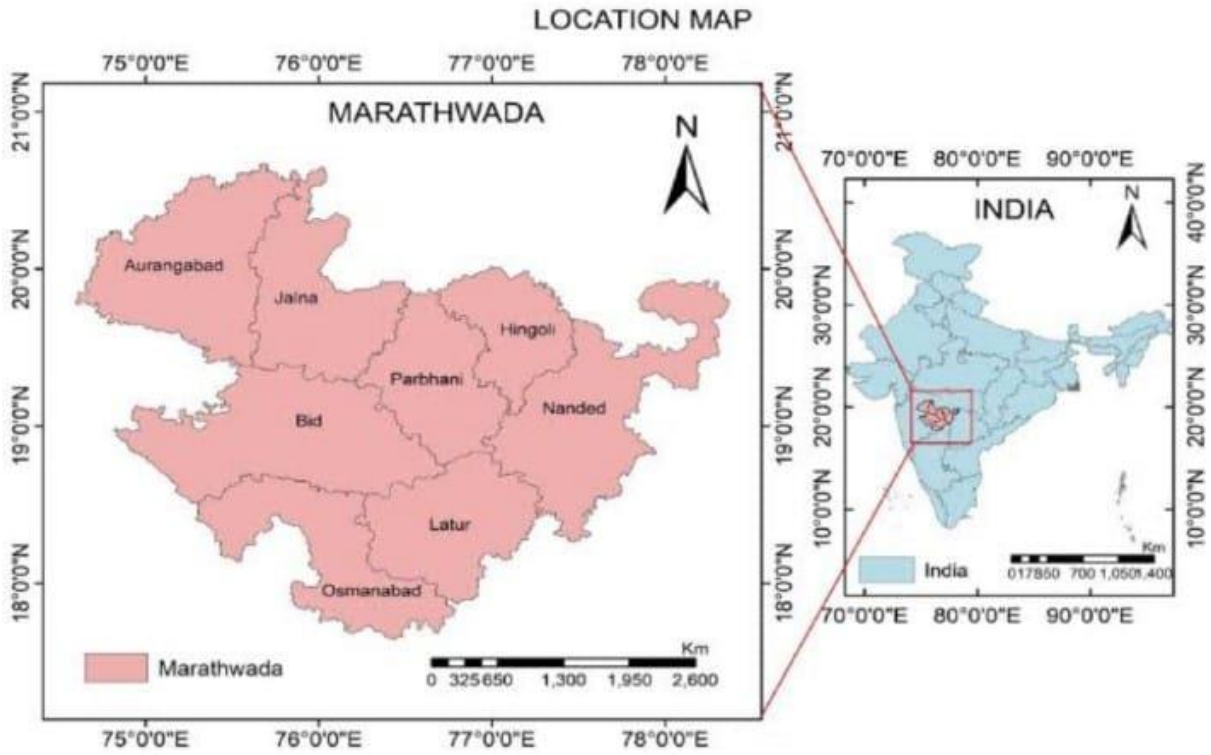
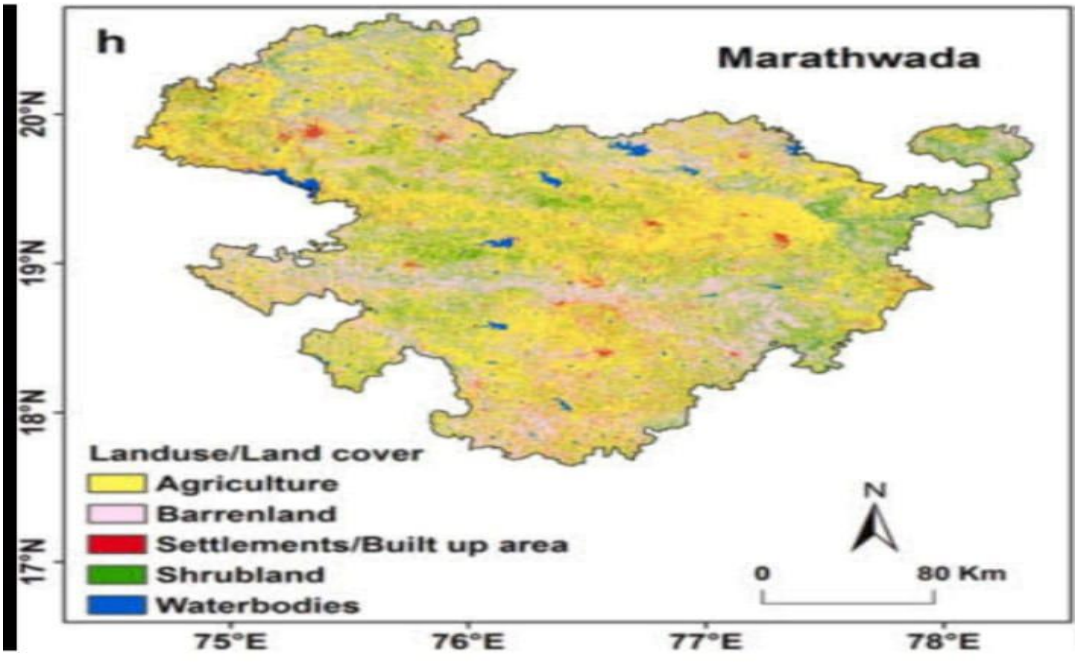


Land use of Marathwada region



Soil structure of Marathwada region

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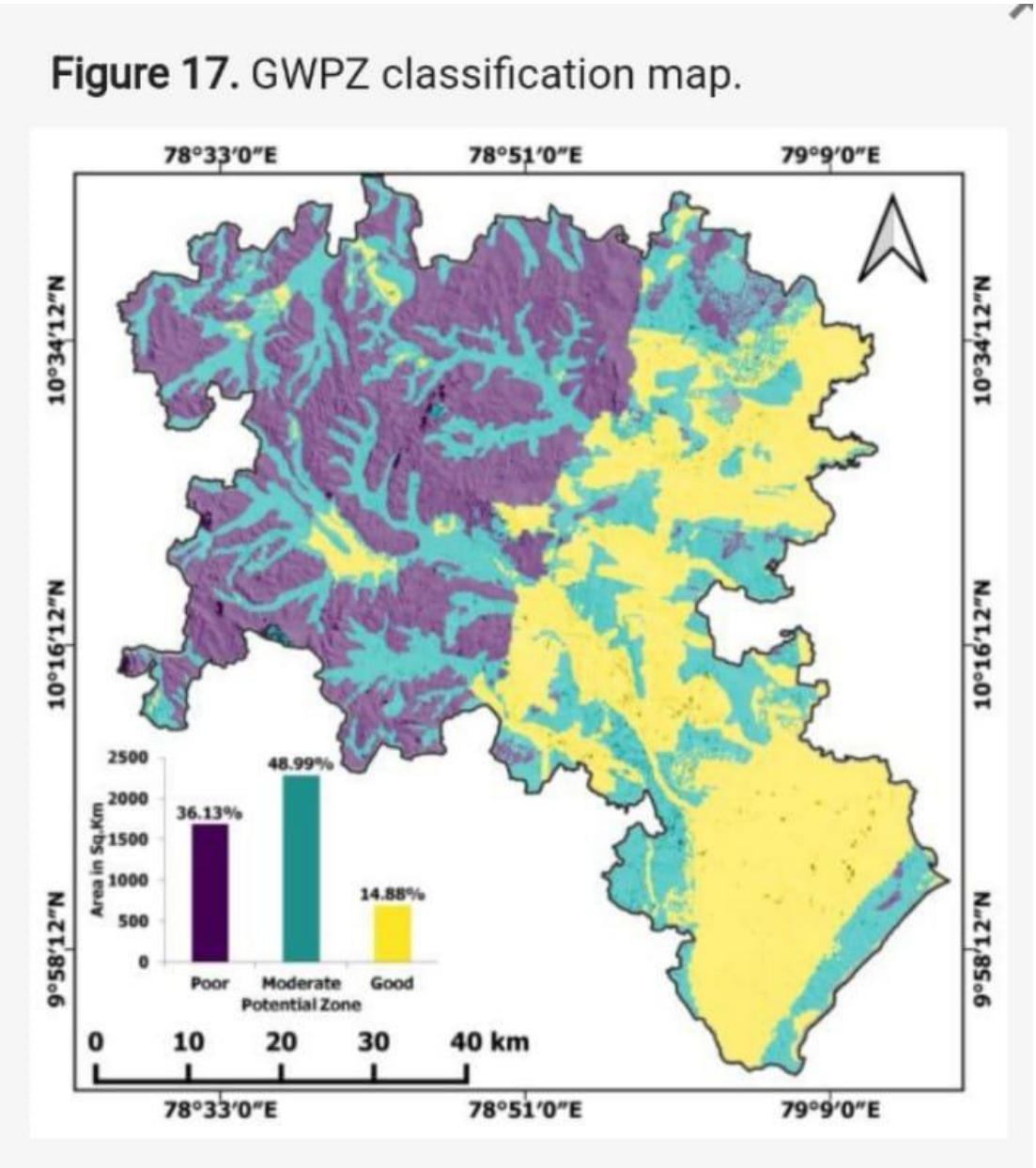

Figure 17. GWPZ classification map.

India's arable land area of 1,597,000km^2 (394.6 million acres) is the second largest in the world after the United States. Its gross irrigated crop area of 826,000 km^2 (215.6 million acres) is the largest in the world. The Maharashtra state has an area of 10.91 lakh hectares under various fruit crops like mango, banana, orange, grape and cashew nut etc. Marathwada region comprises eight districts viz. Aurangabad, Jalna, Parbhani, Nanded, Hingoli, Latur, Osmanabad and Beed with cultivated area of 5.6 M ha which is traditionally a drought prone.

Data Structure and Analysis

Rainfall Trends: Time series analysis of annual rainfall variability.
Groundwater Depletion: GIS mapping of groundwater levels over the last decade.
Water Use Efficiency: Analysis of irrigation methods (drip, flood, and sprinkler).

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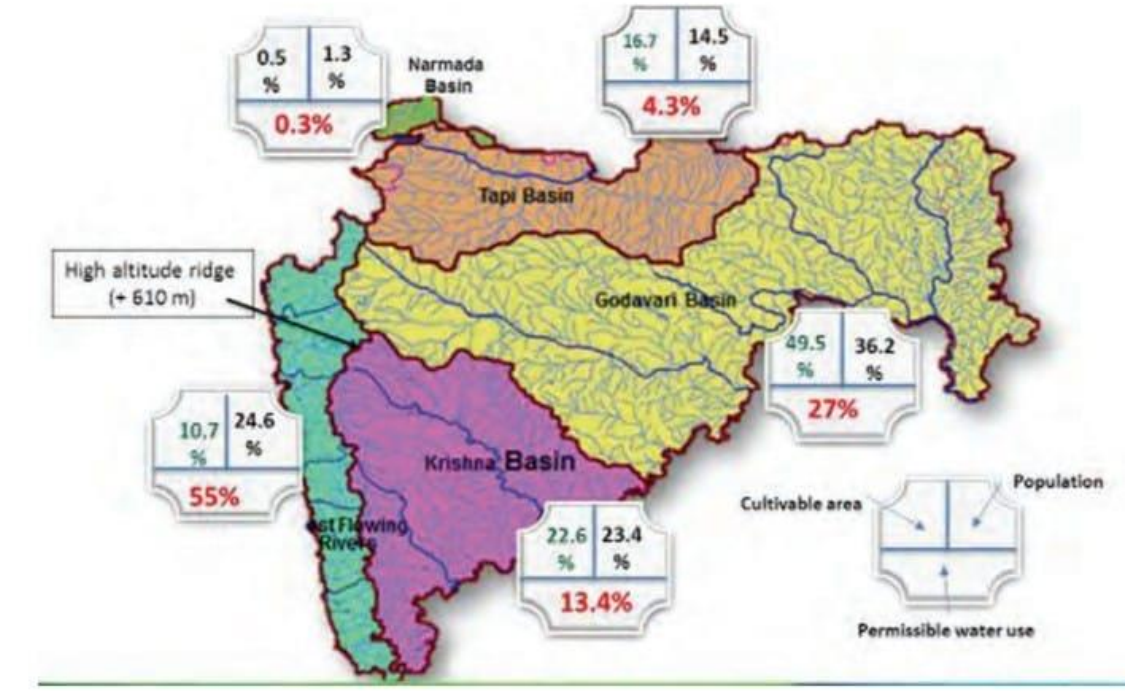
Impact of Watershed Development: Comparison of agricultural productivity in watershed-treated and non-treated areas.

Statistical Methods: Regression analysis to determine the relationship between water availability and crop yield.

Classification of permissible water use, cultivation area and population



The Marathwada region in Maharashtra, India, faces significant challenges regarding rainwater distribution. Here's a breakdown of the key factors:

1. Rain Shadow Region: Marathwada lies in the rain shadow of the Western Ghats. The mountains intercept moisture-laden winds from the Arabian Sea, resulting in less rainfall compared to the Konkan region on the other side of the Ghats.
2. Erratic Rainfall: The region experiences highly variable rainfall, with unpredictable timing and amounts. This uncertainty makes it difficult for farmers to plan their crops and manage water resources effectively.
3. Uneven Distribution: Even when it does rain, the distribution is often uneven across the region. Some areas may receive adequate rainfall, while others may remain dry, leading to localized droughts.
4. Climate Change: Increasing temperatures due to climate change are exacerbating the problem. Higher temperatures lead to greater evaporation of surface water, further depleting water resources.
5. Water-Intensive Crops: The cultivation of water-intensive crops like sugarcane has put a strain on the region's limited water resources. This has led to depletion of groundwater levels and increased competition for water.

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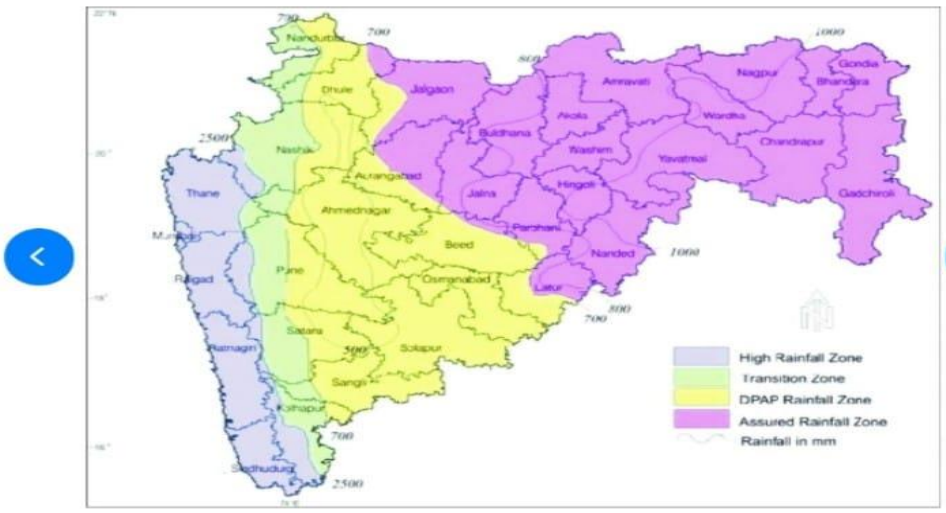
6. Deforestation: Decreasing forest cover has reduced the region's capacity to retain rainwater and replenish groundwater reserves.
7. Water Management Issues: Inefficient water management practices, including inadequate irrigation infrastructure and lack of water conservation measures, have contributed to the crisis.

Consequences of Uneven Rainwater Distribution:

* Droughts: The region frequently experiences droughts, leading to crop failures, livestock losses, and water scarcity for both domestic and agricultural use.
* Economic Hardship: Farmers face significant economic hardship due to crop losses and reduced yields, leading to debt and poverty.
* Social Issues: Water scarcity can lead to social tensions and conflicts over access to resources.
* Migration: People may be forced to migrate from the region in search of water and livelihood opportunities.

Rainwater distribution map of Maharashtra



Rainfall distribution map of Maharashtra.

Efforts to Address the Issue:

* Marathwada Water Grid Project: This ambitious project aims to link major dams in the region through a network of pipelines to ensure more equitable distribution of water.
* Rainwater Harvesting: Promoting rainwater harvesting techniques at the individual and community levels can help augment water supplies.

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* Micro-irrigation: Encouraging the adoption of micro-irrigation methods like drip and sprinkler irrigation can significantly reduce water consumption in agriculture.

* Crop Diversification: Shifting away from water-intensive crops towards more drought-resistant varieties can help reduce the strain on water resources.

* Afforestation: Increasing forest cover can improve water retention and groundwater recharge.

Addressing the rainwater distribution challenges in Marathwada requires a multi-faceted approach involving government initiatives, community participation, and individual efforts to conserve and manage water resources effectively.

Detailed Solutions for Water Management in Agriculture in Marathwada

To tackle the water crisis in agriculture, a multi-pronged approach is needed, focusing on conservation, efficiency, and sustainable farming. Here are key solutions:

1. Efficient Irrigation Practices

A. Promotion of Drip and Sprinkler Irrigation

Drip irrigation can save up to 50% of water compared to flood irrigation. The Maharashtra government provides subsidies under the Micro Irrigation Scheme (PMKSY – Per Drop More Crop). Farmers can be trained on installation and maintenance through workshops.

B. Adoption of Mulching

Covering soil with organic or plastic mulch reduces water evaporation. It maintains soil moisture and improves crop yield. C. Alternate Wetting and Drying (AWD) for Paddy Cultivation Instead of continuous flooding, farmers can alternate wet and dry periods to reduce water usage. This practice is useful where rice farming is practiced in parts of Marathwada.

2. Rainwater Harvesting and Watershed Management

A. Revival of Traditional Water Bodies Repair and desilting of old ponds, check dams, and lakes can improve water storage. Jalyukt Shivar Abhiyan, a Maharashtra government initiative, has helped in rejuvenating water bodies.

B. Construction of Farm Ponds (Tanks on Farms)

Farmers should be encouraged to build Jal Kunds (small water storage pits) to store rainwater. The government provides financial assistance under schemes like Magel Tyala Shet Tale Yojana.

C. Contour Bunding and Trenches

Contour bunding slows down water runoff, allowing more infiltration. Continuous Contour Trenches (CCTs) in hilly areas help in water retention.

D. Large-Scale Watershed Development

NGOs like WOTR and Paani Foundation have been working on community-led watershed development in Marathwada. More participation from local farmers and panchayats can expand these initiatives.

3. Crop Diversification and Drought-Resistant Crops

A. Shift from Water-Intensive to Climate-Resilient Crops

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Sugarcane and banana consume excessive water; shifting to pulses (tur, moong), oilseeds (soybean), millets (jowar, bajra), and drought-resistant fruits (pomegranate, custard apple, drumstick) can reduce water demand.

B. Agroforestry and Multi-Cropping

Planting trees alongside crops enhances soil moisture. Intercropping with legumes helps in water retention and soil fertility improvement.

4. Groundwater Recharge Techniques

A. Borewell and Well Recharge Systems

Farmers should install percolation pits near borewells to recharge groundwater. Check dams and nala bunding (small embankments) can increase groundwater levels.

B. Artificial Recharge through Injection Wells

Injection wells can be used to directly recharge depleted aquifers, a method already tested in some parts of Maharashtra.

5. Policy Interventions and Government Schemes

A. Strict Regulations on Borewell Drilling

The government should regulate new borewells in overexploited regions to prevent further depletion. Promoting community borewells instead of individual ones ensures equitable water use.

B. Farmer Incentives for Water Conservation

Water-saving farmers can be rewarded through financial incentives. Maharashtra has introduced 'Water Budgeting' in some villages, where farmers plan their water use efficiently.

C. Strengthening Water User Associations (WUAs)

Community-based water-sharing agreements should be encouraged for fair distribution.

6. Capacity Building and Awareness Programs

A. Farmer Training on Water Management NGOs and Krishi Vigyan Kendras (KVKs) should conduct workshops on smart irrigation and sustainable farming.

B. Digital Tools for Water Conservation

Use of satellite imagery and mobile apps to provide real-time data on soil moisture, rainfall predictions, and irrigation scheduling.

7. Wastewater Recycling and Reuse

A. Use of Treated Water for Agriculture

Cities like Aurangabad can set up sewage treatment plants (STPs) to recycle water for irrigation.

B. Greywater Recycling at the Farm Level

Greywater (from households) can be filtered and used for trees and fodder crops.

8. Community Participation and NGO Involvement

Several organizations are already working in Marathwada: Paani Foundation (Satyamev Jayate Water Cup) – Organizing village-level competitions for watershed management. WOTR (Watershed Organisation Trust) – Working on large-scale water

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conservation and climate resilience. SSP (Swayam Shikshan Prayog) – Helping women farmers adopt sustainable water use practices. Encouraging Farmers' Cooperatives Farmers can form groups to invest in shared water-saving technology (e.g., community drip irrigation).

Results and Discussion

Water Scarcity in Marathwada

Rainfall has shown a declining trend over the past two decades.
Over 60% of borewells in the region have dried up due to over-extraction.

Inefficiency in Water Use

Only 20% of farmers have adopted drip or sprinkler irrigation.
Sugarcane cultivation, covering only 4% of the land, consumes over 70% of available water.

Effectiveness of Water Conservation Programs

Villages participating in the Jalyukt Shivar Abhiyan have reported a 25-30% increase in water storage capacity. Community-driven watershed projects have led to an improvement in groundwater recharge.

Policy Gaps and Challenges

Poor enforcement of groundwater regulation policies. Limited financial support for small farmers to adopt water-efficient techniques.

Conclusion

Solving Marathwada's agricultural water crisis requires a combination of traditional wisdom and modern techniques. By adopting water-efficient irrigation, rainwater harvesting, crop diversification, and government-supported policies, the region can move towards sustainable water management.

Water planning in Marathwada requires an integrated approach, combining efficient irrigation, watershed management, and policy interventions. While several successful initiatives exist, their implementation needs scaling up. Farmers should be encouraged to shift from water-intensive crops to sustainable alternatives. Strengthening community participation and improving financial support for water conservation projects will be crucial for long-term agricultural sustainability in the region.

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