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Drought in Nanded District: Causes, Effects and Solutions

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Abstract

Drought is one of the most serious environmental and socio-economic problems affecting the agricultural economy of India. The district of Nanded, located in the eastern part of the Marathwada region of Maharashtra, frequently experiences drought-like conditions due to irregular rainfall, increasing temperatures, groundwater depletion, and climate variability. Although Nanded falls within a relatively assured rainfall zone receiving approximately 700–900 mm of annual rainfall, the uneven temporal and spatial distribution of rainfall often leads to water scarcity in several parts of the district. The drought situation adversely affects agriculture, livestock, water resources, employment, and the overall socio-economic condition of rural communities. Agriculture being the primary occupation of the majority of the population, drought has severe consequences on crop productivity and farmers' income. Frequent droughts also accelerate migration, indebtedness, unemployment, and environmental degradation. The present study examines the causes, effects, and possible solutions to drought in Nanded district. The study is based on secondary data collected from government reports, published research papers, district statistical records, and related literature. The findings reveal that drought in Nanded is not merely a result of rainfall deficiency but is also influenced by unsustainable groundwater extraction, inadequate water management practices, land degradation, and climate change. The study suggests integrated watershed development, groundwater recharge, micro-irrigation, crop diversification, afforestation, and community participation as effective measures for drought mitigation. Sustainable water resource management and climate-resilient agricultural practices are essential for reducing drought vulnerability and ensuring long-term rural development in Nanded district.

Keywords: *Drought, Nanded District, Water Scarcity, Climate Change, Agriculture, Groundwater, Sustainable Development.*

Introduction

Drought is a recurring natural hazard characterized by a prolonged period of deficient rainfall resulting in water shortages, reduced soil moisture, declining agricultural productivity, and adverse socio-economic impacts. Among all natural disasters, drought has the most widespread and long-lasting effects because it directly influences water availability, food production, and human livelihoods. Maharashtra is one of the drought-prone states of India, and the Marathwada region is particularly vulnerable due to its semi-arid climate and dependence on monsoon rainfall.Nanded district occupies an important geographical position in eastern Marathwada. The district is situated between 18°16' and 19°55' North Latitude and 76°55' and 78°19' East Longitude. It is characterized by a predominantly plateau landscape, black cotton soils, and major river systems such as the Godavari, Manjara, Penganga, and Manar. The district generally receives between 700 and 900 mm of annual rainfall, of which nearly 89 percent is received during the southwest monsoon season. Despite relatively favorable average rainfall, drought conditions frequently occur because rainfall is highly variable and unevenly distributed across seasons and locations.Agriculture forms the backbone of the district economy, with major crops including cotton, soybean, pigeon pea, sorghum, wheat, sugarcane, banana, and sweet orange. Since agriculture is highly dependent on monsoon rainfall, any failure or delay in rainfall significantly affects crop production and farmers' livelihoods. In recent years, climate variability, increasing temperatures, groundwater depletion, and changing land-use patterns have intensified drought vulnerability across the district.The recurring droughts in Nanded have highlighted the urgent need for scientific water management, sustainable agricultural practices, and effective drought mitigation strategies. Therefore, understanding the causes, impacts, and solutions of drought is essential for ensuring environmental sustainability and socio-economic development in the district.

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Objectives of the Study

1. To examine the major causes of drought in Nanded district.
2. To analyze the socio-economic and environmental effects of drought.
3. To evaluate existing drought mitigation measures.
4. To suggest sustainable solutions for drought management.

Methodology

The study is based on secondary sources of data collected from:

The present study on "Drought in Nanded District: Causes, Effects and Solutions" is based on both primary and secondary sources of data. Secondary data were collected from government publications, District Statistical Handbook, Groundwater Survey and Development Agency (GSDA) reports, Nanded District Gazetteer, rainfall records, agricultural statistics, research papers, books and relevant official websites. Primary information was obtained through field observations and informal discussions with farmers and rural residents in selected drought-prone areas of Nanded district. The collected data were systematically classified, tabulated and analyzed using descriptive, comparative and geographical methods. The study examines rainfall variability, water availability, groundwater conditions, agricultural impacts, drinking-water scarcity, socio-economic effects and livestock-related problems to identify the major causes and consequences of drought. Based on the analysis, suitable measures such as watershed development, rainwater harvesting, groundwater recharge, micro-irrigation, crop diversification and sustainable water-resource management are suggested for reducing drought vulnerability in Nanded district.

Resealt and discussion

1. Rainfall Variability and Drought Conditions

The analysis indicates that drought in Nanded district is primarily associated with variability in the southwest monsoon, prolonged dry spells and uneven distribution of rainfall. Although Nanded receives comparatively moderate annual rainfall, nearly 89% of the annual rainfall is concentrated in the southwest monsoon season. Therefore, a reduction in monsoon rainfall or long intervals between rainfall events can create serious agricultural water stress. Historical taluka-level rainfall data also demonstrate considerable spatial variation in rainfall across the district.

2. Geographical Factors Responsible for Drought

The physical geography of Nanded plays an important role in determining the intensity of water scarcity. The district contains plain, plateau and hilly terrain, with the Satmala and Nirmala hill ranges in the northern part and comparatively hilly areas towards Mukhed and Kandhar. The Godavari, Manjara, Manar and Penganga are the major rivers of the district; however, the availability of surface water is not uniform across all locations. Consequently, hilly and hard-rock areas are more vulnerable to seasonal water scarcity.

3.Agricultural Impact of Drought

The results show that drought has its most direct impact on agriculture. Reduced rainfall and inadequate soil moisture affect sowing, crop germination, crop growth and final productivity. Rain-fed farmers are particularly vulnerable because their agricultural production depends largely on the timing and quantity of monsoon rainfall. Crops such as cotton, soybean, pulses and sorghum may experience reduced yields during prolonged dry spells. In irrigated areas, declining water availability can also affect commercial crops such as banana, sugarcane and turmeric. The district administration's geographical profile identifies cotton, soybean, pulses and other crops as important agricultural activities in different parts of Nanded.

4. Impact on Groundwater Resources

Drought increases dependence on groundwater for both drinking water and irrigation. According to the Groundwater Survey and Development Agency, the 2020–21 groundwater assessment placed all 49 watersheds of Nanded in the safe category; however, seasonal water scarcity is still reported in parts of Mukhed, Kandhar, Loha, Kinwat and Mahur, particularly in hilly and rocky areas. This indicates that a district may have an overall favourable groundwater assessment while specific villages and talukas can still experience severe summer water shortages.

5. Impact on Drinking Water Availability

One of the significant effects of drought is the seasonal shortage of drinking water. As wells, borewells and local water sources decline during summer, rural communities may have to depend on alternative water-supply arrangements. The problem is more severe in scattered settlements and hilly areas where reliable surface-water sources are limited. Government water-supply programmes have specifically identified water-scarce habitations in Nanded and other districts for interventions during acute scarcity periods.

6. Socio-Economic Effects of Drought

Drought has consequences beyond agricultural production. Declining crop yields reduce farm income and increase household expenditure on agricultural inputs, livestock maintenance and water procurement. Agricultural labourers may also face reduced employment opportunities when agricultural operations decline. Repeated drought conditions can therefore contribute to indebtedness, migration and increased socio-economic vulnerability among small and marginal farming households. The impact is particularly pronounced where alternative livelihood opportunities are limited.

7. Impact on Livestock and Rural Economy

Water scarcity also affects livestock because availability of drinking water and fodder becomes limited during prolonged dry periods. Farmers may be compelled to reduce livestock holdings or purchase fodder at higher prices. Since livestock provides supplementary income to many rural households, drought-related losses in livestock productivity can further weaken household economic security. Thus, drought should be understood as a multidimensional rural crisis affecting agriculture, livestock, employment and household livelihoods.

8. Effectiveness of Water Conservation Measures

The study indicates that water conservation is one of the most important long-term strategies for reducing drought vulnerability. Check dams, farm ponds, nala bunding, watershed development, contour trenches, desilting of water bodies and groundwater recharge structures can improve local water availability. In Nanded, groundwater conservation and artificial

recharge activities have been undertaken; GSDA reports that 1,165 recharge-shaft works were completed in 171 villages during 2022–23. Such interventions can improve groundwater recharge and strengthen the resilience of rural communities.

9. Need for Efficient Irrigation and Crop Planning

The findings emphasize that increasing irrigation alone is not sufficient; efficient use of available water is equally important. Drip irrigation, sprinkler irrigation, mulching, moisture conservation and scientific irrigation scheduling can reduce water consumption. Crop selection should also be based on local rainfall, soil characteristics and water availability. Water-intensive crops should be avoided or carefully managed in chronically water-stressed areas, while drought-tolerant crops and diversified farming systems should be promoted.

10. Integrated Drought Management Strategy

The results suggest that drought management in Nanded requires an integrated approach combining water conservation, groundwater recharge, efficient irrigation, crop diversification, weather-based agricultural advisories, crop insurance, livestock support and employment generation. Community participation is particularly important because local water-security planning can help identify village-level water requirements and suitable conservation measures. Maharashtra's Atal Bhujal programme also emphasizes community-based water-security planning, groundwater recharge, efficient water use and crop-pattern planning according to water availability.

11.Overall Result of the Study

The overall results demonstrate that drought in Nanded district is not merely a consequence of inadequate rainfall; it is the outcome of the interaction between rainfall variability, uneven geographical conditions, dependence on rain-fed agriculture, seasonal groundwater stress, inefficient water use and increasing demand for water. The study therefore concludes that the most effective solution is to shift from a drought-relief approach to a drought-resilience approach. Watershed development, rainwater harvesting, groundwater recharge, micro-irrigation, appropriate crop planning, water-efficient agriculture and community participation should form the core of Nanded's long-term drought-management strategy

Conclusion

Drought remains one of the most critical environmental and developmental challenges facing Nanded district. The problem is multidimensional and results from a combination of natural and human-induced factors, including rainfall variability, climate change, groundwater depletion, and unsustainable land-use practices. Its impacts extend beyond agriculture and affect water security, rural livelihoods, migration patterns, and environmental sustainability.The study highlights that effective drought management requires an integrated approach involving scientific water resource management, watershed development, groundwater recharge, climate-resilient agriculture, and active community participation. Programs such as rainwater harvesting, micro-irrigation, afforestation, and sustainable agricultural practices can significantly reduce drought vulnerability. Strengthening institutional support, improving water governance, and promoting awareness among farmers are equally important.In the context of increasing climate uncertainty, drought preparedness must become a central component of regional development planning in Nanded district. Sustainable management of water resources, coupled with technological innovation and community engagement, can transform drought-prone areas into resilient and productive landscapes. Therefore, a long-term, integrated, and participatory strategy is essential for ensuring environmental sustainability, agricultural prosperity, and socio-economic development in Nanded district.

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Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of thesis paper.

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