International Journal of Research Studies on Environment, Earth, and Allied Sciences (IJRSEAS)
| *Volume-3 Issue-1* | *February-2026* | *ISSN: 3066-0637* | *Website:* https://eesrd.us

Manuscript ID:
IJRSEAS-2026-030121

OPEN ACCESS

Quick Response Code:

Website: https://eesrd.us

DOI: 10.5281/zenodo.21554395

DOI Link:
https://doi.org/10.5281/zenodo.21554395

Volume: 3

Issue: 1

Pp. 104-106

Month: February

Year: 2026

E-ISSN: 3066-0637

Submitted: 16 Jan. 2026

Revised: 27 Jan. 2026

Accepted: 10 Feb. 2026

Published: 28 Feb. 2026

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How to cite this article:
Dhokate, S. M. & Shinde, D. G. (2026). Role of Farm Ponds under Climatic Variability: Evidence from Sangola Taluka of Solapur District. International Journal of Research Studies on Environment, Earth, and Allied Sciences, 3(1), 104–106. https://doi.org/10.5281/zenodo.21554395

Role of Farm Ponds under Climatic Variability: Evidence from Sangola Taluka of Solapur District

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Abstract

Sangola Taluka of Solapur District is a semi-arid and drought-prone region characterized by low and highly variable rainfall, which poses serious challenges to agricultural sustainability. This study examines the pattern of climatic variability and evaluates the role of farm ponds in supporting agriculture under such conditions during the period 2000–01 to 2020–21. The study is based on secondary data related to rainfall variability and the growth of farm ponds collected from district statistical records and agricultural department reports. Descriptive statistical techniques and trend analysis are used for interpretation. The findings reveal significant inter-annual rainfall variability and a steady increase in the number of farm ponds as an adaptive response to climatic stress. The study concludes that farm ponds play an important supportive role in enhancing agricultural stability under variable climatic conditions.

Keywords: *Farm Ponds; Climatic Variability; Drought-Prone Agriculture; Sangola Taluka*

Introduction

Agricultural sustainability in semi-arid regions is increasingly challenged by fluctuations in climatic conditions, especially irregular rainfall patterns. Variations in the amount, timing, and spatial distribution of rainfall create uncertainty in crop production and increase the vulnerability of rainfed farming systems. In India, these challenges are particularly evident in drought-prone regions, where agriculture continues to depend largely on monsoon rainfall. Solapur District of Maharashtra frequently experiences such climatic stress, resulting in recurring drought conditions and water scarcity. Sangola Taluka, situated in the western part of Solapur District, represents one of the most water-deficient areas of the region. The taluka receives relatively low annual rainfall, generally around 400–500 mm, with noticeable year-to-year variability. Farming activities in the area are predominantly rainfed, and even short interruptions in rainfall during the cropping season often lead to yield instability. Limited access to assured irrigation further intensifies agricultural risk. Under these conditions, farm ponds have gained prominence as small-scale water harvesting structures at the farm level. These structures are designed to collect and store rainwater during periods of excess rainfall and supply supplementary irrigation during dry spells. Encouraged by government initiatives and farmers' adaptive efforts, the number of farm ponds has increased in drought-prone areas such as Sangola. The present study focuses on examining climatic variability in Sangola Taluka and evaluating the role of farm ponds in supporting agriculture under variable climatic conditions.

Objectives

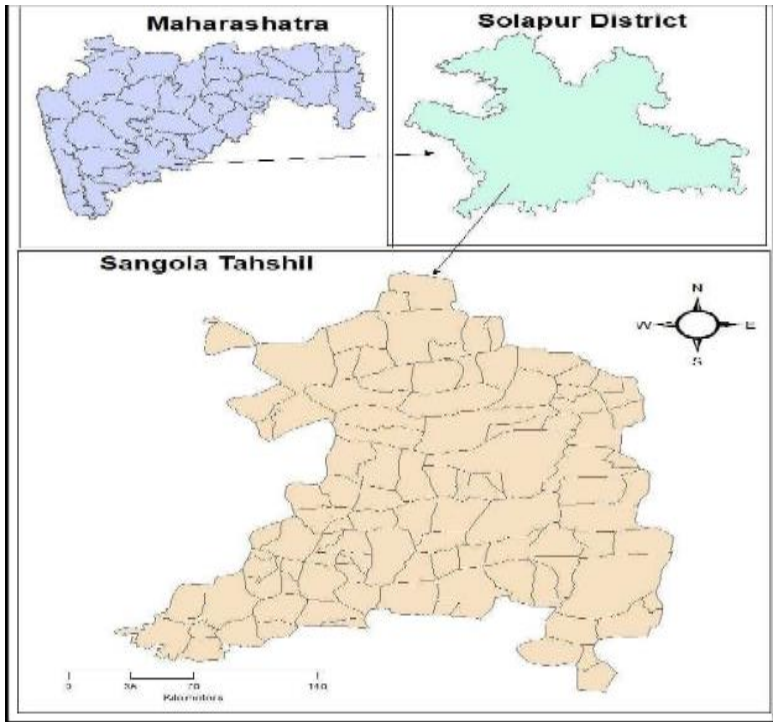
The main goals of this study are:

1. To examine the pattern of climatic variability in Sangola Taluka of Solapur District.
2. To assess the impact of climatic variability and farm ponds on agriculture in the study area.

Study Area

Sangola Taluka of Solapur District, Maharashtra, forms the focus of the present study. Located in the western part of the district, the taluka is characterized by a semi-arid climate, low average annual rainfall of about 400–500 mm, and high inter-annual variability. Agriculture in the region is predominantly rainfed and highly vulnerable to frequent dry spells and recurrent droughts. These climatic and agricultural characteristics make Sangola Taluka an appropriate area for examining climatic variability and evaluating the role of farm ponds in supporting agriculture.

Location Map of the Study Region



Data and Methodology

This study is based on secondary data covering the period from 2000–01 to 2020–21. Rainfall-related information for Sangola Taluka was collected from the District Statistical Abstract and the Socio-Economic Review of Solapur District. Data on the construction and growth of farm ponds were obtained from records maintained by the Agricultural Department, Government of Maharashtra. These official sources provide consistent and reliable information for analyzing climatic trends and water conservation practices in the study area.

Rainfall variability was assessed using basic statistical measures such as average rainfall values and indicators of variability to understand fluctuations over time. Trend analysis was employed to examine long-term changes in rainfall patterns as well as the growth of farm ponds. The role of farm ponds in agriculture was interpreted by examining their expansion in relation to climatic stress and rainfall uncertainty.

The results are presented in a summarized form through tables to highlight major trends without excessive detail. This approach allows for a clear and concise interpretation of climatic variability and the adaptive role of farm ponds, while maintaining suitability for a short research paper.

Results and Discussion

The results of the study reveal that agriculture in Sangola Taluka is significantly influenced by climatic variability, particularly fluctuations in rainfall. The analysis shows that rainfall in the study area is not only low but also highly variable, increasing the vulnerability of rainfed agriculture. In response to such climatic uncertainty, farm ponds have emerged as an important on-farm water management intervention. The combined assessment of rainfall variability and the distribution of farm ponds highlights their role in supporting agriculture under variable climatic conditions.

Rainfall Variability in Sangola Taluka

Rainfall data for Sangola Taluka indicate considerable inter-annual variability during the study period from 2000–01 to 2020–21. As shown in Table 1, the average annual rainfall of Sangola Taluka ranged between 561.4 mm and 575 mm across different benchmark periods. Despite receiving comparatively higher rainfall than some eastern talukas of Solapur District, Sangola experiences frequent fluctuations and deficit rainfall years. Such variability affects sowing schedules, crop growth, and agricultural productivity, particularly in a predominantly rainfed farming system.

Table 1: Average Annual Rainfall in Sangola Taluka (2000–01 to 2020–21)

Period	Average Annual Rainfall (mm)
2000–05	561.4
2006–10	565.0
2011–15	570.0
2016–21	575.0

Source: Socio-Economic Review and District Statistical Abstract of Solapur District

The data clearly demonstrate that rainfall variability is a persistent characteristic of the study area. Recurrent dry spells and uneven rainfall distribution increase agricultural risk and highlight the need for supplemental water sources at the farm level.

Growth of Farm Ponds in Sangola Taluka

To cope with increasing climatic stress and water scarcity, the adoption of farm ponds in Sangola Taluka has increased significantly. As presented in **Table 2**, Sangola Taluka recorded a total of 4,100 farm ponds by 2020–21, with a density of 33.06 farm ponds per 1,000 hectares. This reflects a growing reliance on decentralized water storage structures promoted under various government schemes.

Table 2: Farm Pond Distribution in Sangola Taluka (2020–21)

Indicator	Value
Number of Farm Ponds	4,100
Geographical Area (Ha)	124,000
Number of Villages	125
Farm Pond Density per 1,000 Ha	33.06
Farm Ponds per Village	32.80

Source: Agricultural Department, Zilla Parishad Solapur

The increasing number of farm ponds indicates their importance as a local-level adaptation strategy. Farm ponds enable the storage of rainwater during monsoon periods and provide supplementary irrigation during dry spells. Although they do not ensure full irrigation, they play a crucial role in providing protective irrigation during critical crop growth stages, thereby reducing moisture stress and enhancing agricultural stability in the drought-prone Sangola Taluka.

Conclusion

The study concludes that Sangola Taluka of Solapur District is characterized by significant climatic variability, particularly in terms of rainfall, which poses persistent challenges to agricultural sustainability. The analysis confirms that irregular and uncertain rainfall patterns increase the vulnerability of predominantly rainfed agriculture in the study area. In response to these climatic constraints, farm ponds have emerged as an important local-level adaptation measure.

The growth and distribution of farm ponds reflect farmers' efforts, supported by government initiatives, to secure supplementary water resources under variable climatic conditions. Farm ponds play a supportive role by providing protective irrigation during critical crop growth stages, thereby reducing moisture stress and contributing to greater agricultural stability. Although farm ponds alone cannot ensure complete irrigation security, their role in enhancing resilience to climatic variability is significant. The study emphasizes the need to strengthen farm pond-based water management through proper construction, maintenance, and integration with broader water conservation strategies to improve agricultural sustainability in drought-prone regions.

Acknowledgement

The authors express their sincere gratitude to Punyashlok Ahilyadevi Holkar Solapur University for providing academic guidance and institutional support for this research work. The authors are also thankful to the Department of Geography, Deshbhakta Sambhajirao Garad Mahavidyalaya for extending valuable assistance during the course of the study.

Financial support and sponsorship

Nil.

Conflicts of interest

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

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