

GEOGRAPHICAL ANALYSIS OF FARM POND DISTRIBUTION AND INFLUENCING FACTORS IN MALGAON VILLAGE OF MIRAJ TEHSIL

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Article Info	ABSTRACT
Article History: Received: 15th Dec 2025 Accepted: 19th Dec 2025 Published: 20th Dec 2025	Water scarcity is a critical challenge to global food security, particularly in rainfed agricultural systems. This paper presents a comprehensive review and analysis of the spatial distribution of farm ponds and various irrigation sources, and their collective impact on agricultural productivity and water resource management. The study synthesizes findings from diverse geographical regions, leveraging geospatial technologies (GIS and remote sensing) and field-based surveys to understand the factors influencing the placement of farm ponds and the distribution of other irrigation methods (canals, wells, and tanks). We examine how the spatial arrangement of these water sources affects crop intensity, yield, and resilience to climate change-induced droughts. The paper concludes by highlighting the importance of strategic spatial planning for water harvesting structures and irrigation infrastructure to optimize agricultural outcomes and ensure sustainable water resource utilization.
Keywords: Irrigation, Farm ponds, Water scarcity	

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1. INTRODUCTION

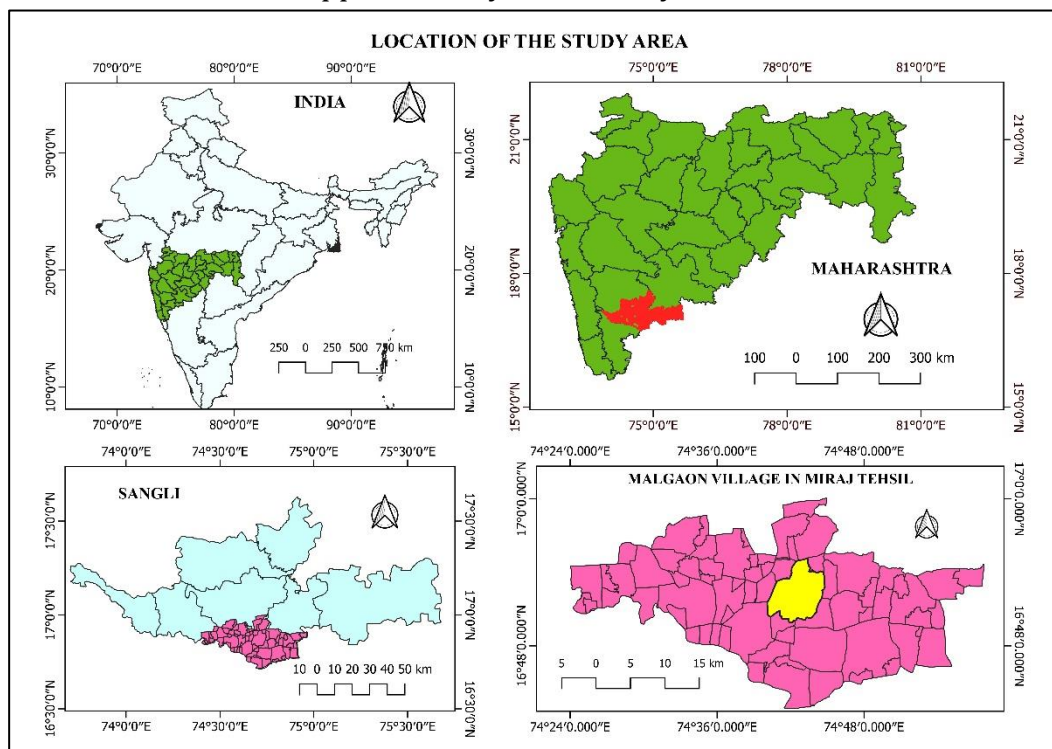
Sustainable agriculture is highly dependent on reliable water resources. In many parts of the world, especially in developing countries, agriculture remains predominantly rainfed, making it vulnerable to erratic rainfall patterns and prolonged dry spells. To mitigate this risk, farmers and governments have implemented various water harvesting and irrigation strategies. Among these, farm ponds have emerged as a cost-effective solution for on-farm rainwater conservation and supplementary irrigation.

Farm ponds are small-scale water bodies created by excavating a dugout or building an embankment to collect and store surface runoff. They provide a crucial source of protective or life-saving irrigation during critical crop growth stages, particularly in semi-arid and drought-prone regions. However, the effectiveness of farm ponds is not solely dependent on their existence, but also on their strategic location and integration with other irrigation sources.

The spatial distribution of farm ponds and other irrigation sources (e.g., canals, wells, and tanks) is a complex and under-researched topic.

LOCATION:

Malgaon is a village in the Miraj Tehsil in Sangli District of Maharashtra. Malgaon village is situated between 16° 49' 52.45" North to 16° 55' 09.38" North and 74° 44' 05.82" East to 74° 44' 20.31" East. It is situated 10 km away from sub-district headquarter Miraj (tehsildar office) and 10km away from district headquarter Sangli. According to Census 2011, the location code or village code of Malgaon is 568728. The village spans a total geographical area of 5625 hectares, and the pincode of the locality is 406407. Sangli - Miraj - Kupwad is nearest town to Malgaon village for all major economic activities, which is approximately 10 km away.



OBJECTIVES OF THE STUDY:

1. To understand the spatial distribution of farm ponds in Malgaon Village.

2. To study the factors affecting on the establishment of farm ponds.
3. To study the major irrigation sources in study area.

DATA COLLECTION AND RESEARCH METHODOLOGY:

The Primary and Secondary data are used for this present research. The data has been collected from many sources, like

Primary data: Researcher had randomly visited to the farm ponds and collected information through questionnaire and schedules.

Secondary data: Secondary data collected from the socio-economics abstracts of Sangli Districts, Books, magazines, Research paper etc.

The collected information is finally classified and by applying various cartographic techniques presented in the form of table and maps.

SPATIAL DISTRIBUTION OF FARM PONDS IN MALGAON VILLAGE:

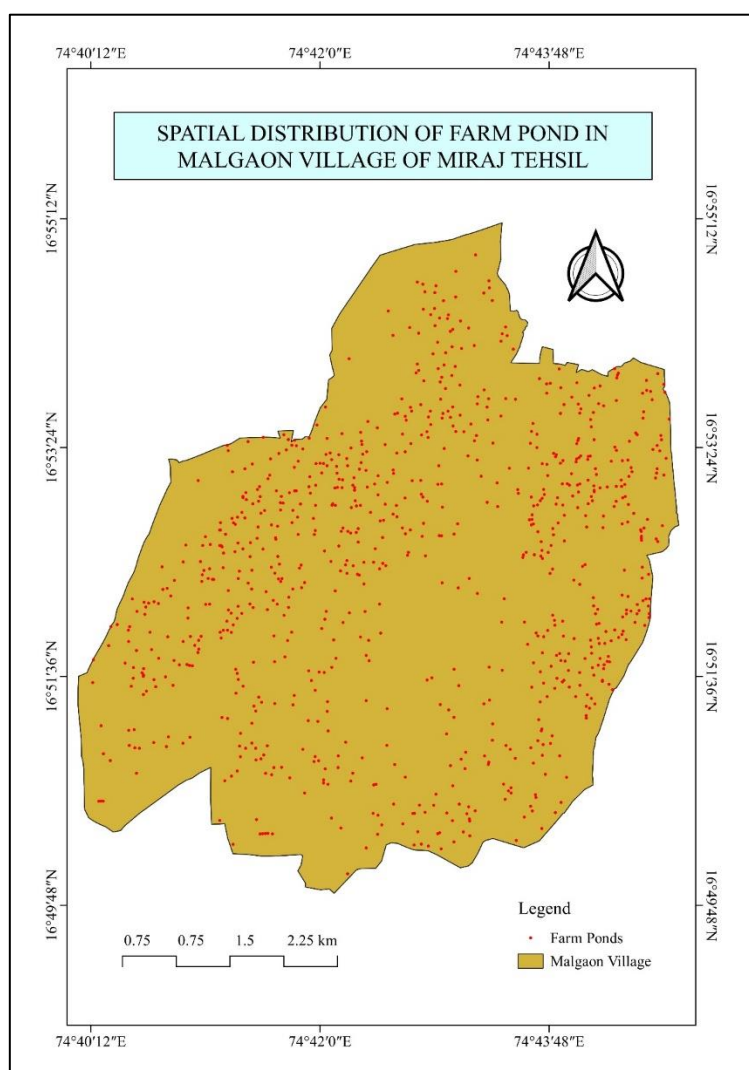


Fig. 1 Spatial Distribution of the farm ponds

This map shows the Spatial Distribution across Malgaon village in Miraj Tehsil. The village boundary is marked with a yellow outline, and each red dot marks a single farm pond. The map is showing that farm ponds are not equally distributed in the Malgaon Village. They are spread out and Clustered in some places.

The pattern shows that while farm ponds are found throughout the village, certain areas have a higher concentration. In particular, the northern and northeastern sections feature a dense cluster, indicating that farmers there may depend heavily on these ponds for irrigation and water storage. Northern area of the village having good groundwater resources. While the western and central parts have a moderate number of ponds, while the southern area has fewer ponds, which could be due to differences in land use, landscape features, or lower farming activity. There are 619 farm ponds in Malgaon Village in the year 2022 while 248 farm Ponds in the year 2011. The growth of the farm ponds is 371 in a decade.

FACTORS INFLUENCING SPATIAL DISTRIBUTION OF FARM PONDS:

The location of farm ponds is not random; it is influenced by a combination of physical, environmental, and socio-economic factors.

1. Topography:

The most suitable locations for farm ponds are typically in areas with specific topographic features that facilitate water accumulation. Low-lying areas, natural depressions, and locations with favorable drainage density are ideal for runoff harvesting. Studies using GIS and Analytical Hierarchy Process (AHP) have shown that factors like slope, soil type, and drainage density are critical in identifying potential farm pond sites. The land's slope and overall morphology are crucial. A site with a suitable slope can naturally channel water into the pond, and the topography determines the type of construction possible.

Topography of the Miraj tehsil as well as Malgaon village is mostly in the plain region. But in the north east side of the village there is Dandoba Hills. So the flow of water generally from north east to south west. Actually the Malgaon Village is situated in the central Part of Miraj Tehsil and the area of this village is generally plain and the most suitable for the cultivation. Malgaon village is situated in the border of the waterline of the Miraj Tehsil. So this area generally suitable and fulfill the requirement of the Farm Pond construction.

2. Soil Type:

The soil should have good water-holding capacity, ideally with a high percentage of clay (around 35%), to prevent seepage. The soil type is crucial for the water retention capacity of a pond. Impermeable soils, such as clay, are preferred to minimize seepage losses. Conversely, constructing ponds on lineaments (faults in the Earth's crust) can lead to poor water retention due to increased infiltration into deeper aquifers.

Miraj soil ranges from loamy to clayey textures, encompassing various types such as black soils, brown soils, and some laterite. These soils support diverse crops including sugarcane, grapes, turmeric, and cotton. The soil exhibits variations in texture, organic matter content, and contains lime nodules in places, influencing fertility and drainage. Being situated in a rain shadow zone, the district experiences differences in soil moisture and health across locations, making soil testing essential for optimizing agricultural productivity. Localized understanding of soil characteristics is therefore crucial for effective crop cultivation in Sangli.

3. Land Use and Land Cover:

The surrounding land use and land cover (LULC) also play an important role. Farm

ponds are more prevalent in agricultural zones, where they directly serve irrigation needs. However, in urbanizing areas, ponds often face loss and conversion to other land uses, leading to a complex mosaic of urban and agricultural landscapes.

Sangli District's as well as Miraj Tehsil's land is mainly used for farming, particularly growing sugarcane, grapes, and bananas, which make up the "Sangli sugar belt." Besides agriculture, large parts of the land consist of barren or scrub areas, with built-up land increasing over time. The main types of land cover include farmland, natural vegetation, unused fallow land, water bodies, and settlements. Changes in land use often result from irrigation initiatives, such as the Krishna canal system, and the growth of urban areas, which causes built-up spaces to expand, often reducing vegetation and other land types.

4. Government Policies and Schemes:

Government initiatives and schemes, such as the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) in India, have played a significant role in promoting the construction of farm ponds. 'Jalyukt Shivar Scheme' have also played an important role in a rural and drought prone area in Maharashtra. These schemes often provide subsidies and labor support, leading to a concentrated spatial distribution of ponds in targeted regions.

Maharashtra's main farm pond initiative is called the Chief Minister Sustainable Agriculture Irrigation Scheme (CMSAIS), popularly known as "Magel Tyala Shettale" (Farm Pond on Demand). This scheme offers subsidies ranging from ₹14,000 to ₹75,000 through the MahaDBT portal to help farmers build farm ponds. These ponds aid in water conservation and improve irrigation efficiency.

In addition, the Dr. Babasaheb Ambedkar Krushi Swavalamban Yojana supports activities like pond lining and micro-irrigation, especially targeting SC/ST and BPL farmers to enhance their farming capabilities. On the central government level, the Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) includes a "Per Drop More Crop" component that provides extra financial assistance for installing drip and sprinkler irrigation systems connected to these farm ponds, promoting efficient water use in agriculture.

MAJOR IRRIGATION SOURCES:

The spatial distribution of farm ponds needs to be understood within the broader context of other major irrigation sources.

Table No. 1 Irrigation Sources

Year	2012	2022	Change
Percolation Tank	49	61	+12
KT Weirs (Kolhapur type Bandh)	7	22	+15
Wells	9294	20016	+10722
Bore wells	48	148	+100

Source: Socio-economic abstract 2012 & 2022

1. Canal Irrigation:

Canal irrigation is a significant source of water in flat, plain areas with deep, fertile soils and a perennial water source. In India, for example, canal irrigation is concentrated in the northern plains (e.g., Uttar Pradesh, Punjab, Haryana). However, a major challenge is the unequal spatial distribution of water within canal systems, with farmers located at the tail-end often receiving less water than those near the source.

In Miraj Tehsil of Sangli District, canal irrigation primarily depends on large-scale projects like the Krishna Koyna Lift Irrigation system, which is complemented by smaller local works such as dams and tanks managed by the Minor Irrigation Project Sub-Division. These smaller reservoirs, including Kuchi tank and Balavadi bandhara, help distribute water through smaller canals vital for local irrigation. Additionally, micro-irrigation methods like drip and sprinkler systems are increasingly popular, supported by government subsidies and local suppliers such as Jain Irrigation and Pallavi Drip. Despite these efforts, Miraj receives less irrigated area compared to neighboring tehsils like Walwa and Tasgaon, highlighting the ongoing need for improved water management in this drought-prone area.

2. Well and Tube Well Irrigation:

Wells and tubewells are a dominant source of irrigation, particularly in areas with sufficient groundwater availability. Their spatial distribution is influenced by the depth of the water table and the permeability of the underlying rock structure. Well irrigation is popular in the northern plains of India and in the deltaic plains of major rivers, where groundwater is easily accessible.

In Miraj Tehsil, irrigation depends heavily on groundwater accessed through wells and tubewells. A thriving local market offers services including borewell drilling and pump installation. Government programs like the Pradhan Mantri Krishi Sinchayee Yojana further encourage the adoption of micro-irrigation by providing subsidies, while the Zilla Parishad oversees smaller irrigation projects to enhance sustainable water use in agriculture.

Wells, which more than doubled from 9,294 in 2012 to 20,016 in 2022 increase of 10,722 indicating growing dependence on groundwater for agriculture. Similarly, **Tube wells** increased from 48 to 148 (+100), showing a shift toward deeper groundwater extraction, likely due to rising water demand or declining water tables.

3. Tank Irrigation:

Tank irrigation, which involves storing rainwater in natural or artificial depressions, is a traditional and widespread practice, especially in peninsular India. The spatial distribution of tanks is often linked to the region's topography, characterized by hard rocks and undulating terrain that are not suitable for digging canals.

In Miraj Tehsil, irrigation mainly depends on water from the Krishna River canal system (Krishna Khore Project), along with private wells and advanced methods like drip and sprinkler irrigation. While there are some older, smaller tanks, they are not the main source. The area emphasizes recharging groundwater to maintain water sustainability, supported by many local suppliers offering modern irrigation equipment. **Percolation tanks** increased from 49 to 61, a rise of 12, which suggests enhanced groundwater recharge efforts. **KT Weirs (Kolhapur-type Bandhs)** show a significant jump from 7 to

22 and increase of 15 reflecting focused investment in small check-dam-like structures that help store water and maintain river flow in dry periods.

4. Farm Pond Irrigation:

Farm pond irrigation in Miraj tehsil involves water harvesting and storage, primarily through private farm ponds and government initiatives like the MGNREGA scheme, to provide water for drip irrigation, sprinkler systems, and other methods, supplying farmers in the region's dry areas with essential water for crops. The Sangli district, which includes Miraj, benefits from these systems to mitigate the impacts of rainfall variability and groundwater issues.

CONCLUSION:

Farm ponds have truly become a lifeline for farmers in Malgaon village. Not long ago, folks mainly relied on wells, canals, and small tanks to water their crops. But over the past decade, these handy little ponds have nearly tripled—from just 248 in 2011 to 619 by 2022. This growth tells a story of farmers realizing how valuable it is to capture and store rainwater right on their own land, especially since water shortages are a regular challenge here.

Interestingly, the farm ponds aren't scattered randomly. They cluster mostly in the village's northern and northeastern areas, where the land's shape, soil quality, and slope naturally suit holding water. Down south, you'll see fewer ponds, probably because farming patterns, soil, or land use differ there. Plus, government programs like MGNREGA, Jalyukt Shivar, and Magel Tyala Shettale have helped a lot by giving farmers financial support to create these ponds. Compared to other water sources like wells, borewells, percolation tanks, or KT weirs, farm ponds stand out because they're simple and effective. They catch and store rainwater, support modern irrigation like drip and sprinkler systems, help recharge the groundwater, and deliver water right when crops need it most. In many ways, these ponds are a small but mighty answer to farming's tough water questions in Malgaon.

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