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Supply and Scarcity of Water in Rural Areas of Jamner Taluka, Jalgaon District, Maharashtra: A Geographical Study

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Abstract

Water is one of the most essential natural resources for sustaining human life, agriculture, and economic development. The rural areas of Jamner Taluka in Jalgaon District frequently experience water scarcity due to irregular rainfall, excessive groundwater extraction, climate variability, and increasing agricultural demand. This study examines the geographical distribution of water resources, the factors influencing water scarcity, and the socio-economic impacts on rural communities. The study adopts a geographical approach by analysing physiographic conditions, rainfall patterns, water resources, irrigation facilities and problems, and water availability in the taluka. Both primary and secondary data have been used for the study. Primary data were collected through a questionnaire-based survey using the random sampling method, while secondary data were obtained from government reports, published literature, and other relevant sources. The study also suggests sustainable water management strategies to improve water security in the study area. Jamner Taluka covers an area of approximately 1,349.68 sq. km and receives an average annual rainfall of about 600 mm. Despite this, the region continues to face significant water scarcity due to uneven rainfall distribution, declining groundwater levels, and increasing pressure on available water resources.

Keywords: *Water Supply, Water Scarcity, Rural Geography, Groundwater,*

Introduction

Water is one of the most vital natural resources and plays a fundamental role in sustaining life, agriculture, industry, and overall socio-economic development. It is indispensable for domestic use, food production, ecosystem stability, and rural livelihoods. Although water covers nearly 71% of the Earth's surface, only a small proportion is available as freshwater suitable for human consumption and agricultural use. Rapid population growth, urbanization, climate change, and increasing demand for water have intensified pressure on available freshwater resources, resulting in water scarcity in many parts of the world. India is predominantly an agrarian country where agriculture is highly dependent on the availability of water. However, the uneven spatial and temporal distribution of rainfall, overexploitation of groundwater, inadequate water conservation practices, and recurrent droughts have created serious water-related challenges, particularly in rural areas. Maharashtra is one of the states frequently affected by water scarcity due to erratic monsoon rainfall, semi-arid climatic conditions, and increasing dependence on groundwater for irrigation and domestic purposes. The problem is more severe in regions where agriculture forms the primary source of livelihood. Jamner Taluka, located in Jalgaon District of Maharashtra, is characterized by semi-arid climatic conditions and receives an average annual rainfall of about 600 mm. Despite the presence of rivers, wells, borewells, and irrigation projects, many rural villages experience seasonal water shortages. Increasing groundwater extraction for agricultural activities, declining groundwater levels, irregular rainfall, and inadequate water resource management have further aggravated the problem. Water scarcity has adversely affected agricultural productivity, drinking water availability, livestock, and the socio-economic conditions of rural households. From a geographical perspective, the availability and distribution of water resources are influenced by physical factors such as relief, geology, drainage pattern, soil characteristics, and rainfall, as well as by human factors including population growth, agricultural practices, irrigation development, and water management policies. Therefore, a geographical analysis of water supply and scarcity provides a comprehensive understanding of the spatial variation in water availability and its impact on rural communities. The present study focuses on the supply and scarcity of water in the rural areas of Jamner Taluka. It examines the geographical distribution of water resources, identifies the major factors responsible for water scarcity, evaluates the existing sources of water and irrigation, and assesses their socio-economic implications for rural households. The study is based on both primary and secondary data. Primary data were collected through a questionnaire-based household survey using the random sampling method, while secondary data were obtained from government publications, census reports, meteorological records, and relevant literature.

The findings of this study are expected to contribute to a better understanding of rural water resource management and provide useful recommendations for sustainable water conservation, groundwater recharge, efficient irrigation practices, and equitable water distribution. Such measures are essential for ensuring long-term water security and promoting sustainable rural development in Jamner Taluka and other semi-arid regions of Maharashtra.

Concept of Water Scarcity

Water scarcity is the condition in which the available water resources are insufficient to meet the demand for domestic, agricultural, industrial, and environmental needs. It is caused by both natural factors, such as low rainfall and drought, and human factors, including excessive groundwater extraction, population growth, pollution, and poor water management.

Types of Water Scarcity

Physical Water Scarcity:

It occurs when natural water resources are insufficient to meet demand due to low rainfall, drought, climate variability, and overexploitation of water resources.

Economic Water Scarcity:

It occurs when water resources are available but cannot be accessed because of inadequate infrastructure, poor management, lack of investment, or weak governance.

Rural areas are more vulnerable to water scarcity because agriculture is the main source of livelihood and largely depends on rainfall and groundwater. Irregular rainfall, declining groundwater levels, and limited irrigation facilities often result in seasonal shortages of water for both domestic and agricultural purposes.

Review of Literature:

1. Challenges and Solutions for Global Water Scarcity. (Hilla Shemer, Shlomo Wald and Raphael Semiat. 20 Jume 2023)
1. Emerging Challenges of water Scarcity in India: The Way Ahead (Dr. Rajesh Kumar. April 2019)
2. Evaluating the economic impact of water scarcity in a changing world. (Flannery Dolan, Jonathan Lamontagne, Robert Link, Mohamad Hejazi, Patrick Reed and Jae Edmonds,2021)
3. Water scarcity and climatic change in India: the need for water demand and supply management, Hydrological Sciences Journal. Rathinasamy Maria Saleth (2011).
4. Emerging Challenges of Water Scarcity in India: The Way Ahead (Dr. Rajesh Kumar. April 2019)

Objectives of the Study

The major objectives are:

1. To study the availability of water resources and water supply in rural areas of Jamner Taluka.
2. To identify geographical factors responsible for water scarcity.
3. To study water scarcity in rural areas of Jamner tahsil.
4. To assess the impact of water scarcity on rural livelihoods.
5. To suggest suitable measures for sustainable water management.

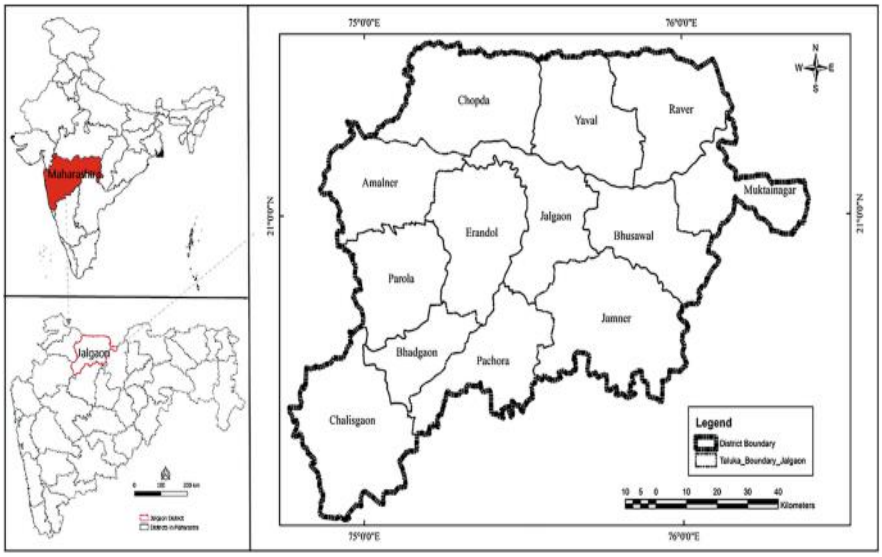
Data Collection and Research Methodology:

The present study is based on both primary and secondary data sources. Primary data were collected through a structured household questionnaire using the simple random sampling method. Household surveys were conducted across the entire tehsil, with particular emphasis on rural areas, to obtain representative information on the socio-economic characteristics of the study population. Secondary data were obtained from various government departments, official websites, the Census of India, socio-economic abstracts, published reports, books, and other relevant literature. The collected data were compiled, coded, classified, and processed using Microsoft Excel. Descriptive statistical techniques, such as frequency distributions, percentages, tables, charts, and graphs, were used to analyse the data. Thematic maps and spatial representations were prepared to illustrate the geographical distribution and patterns of the selected variables. The analysed data were interpreted in accordance with the objectives of the study to draw meaningful conclusions.

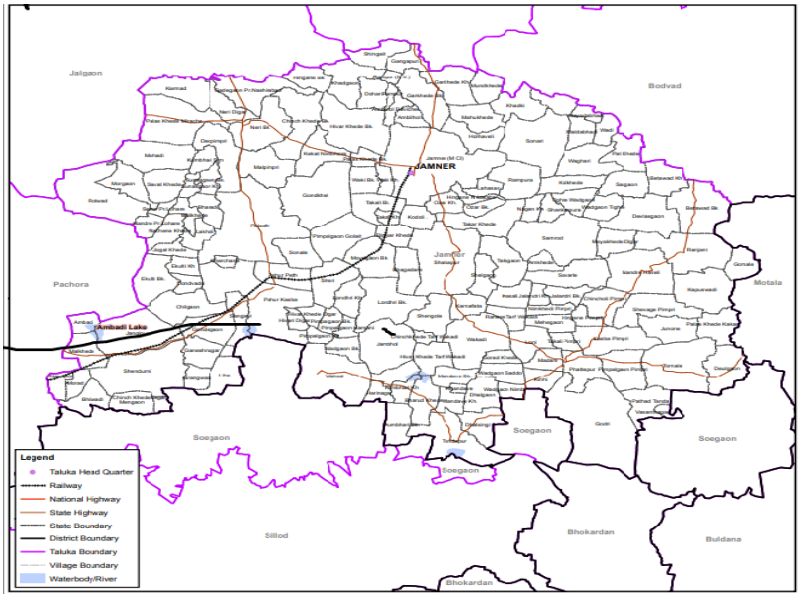
Study Area:

Jamner Tahsil is located in the eastern part of Jalgaon District in northern Maharashtra, India. Geographically, it lies between 20°50′ and 21°15′ North latitude and 75°15′ and 75°45′ East longitude. The tahsil comprises 155 revenue villages and is predominantly rural in character. It is situated between the foothills of the Satpuda Ranges to the north and the Tapi River basin to the south. The climate of Jamner Tahsil is tropical semi-arid, with an average annual rainfall ranging from 650 mm to 750 mm, most of which is received during the southwest monsoon season (June to September). Rainfall is highly variable in both spatial and temporal distribution, often resulting in recurrent droughts and seasonal water scarcity. Geologically, the study area is dominated by Deccan Trap basalt, a hard rock formation with limited groundwater storage capacity. Groundwater occurs mainly in weathered and fractured basaltic formations, making its availability highly dependent on local hydrogeological conditions. Consequently, many wells and borewells experience declining water levels or dry up during the summer season, forcing several villages to depend on tanker-supplied drinking water. Surface water resources are limited, as most streams and nalas are seasonal and dry up soon after the monsoon. Agriculture is the primary occupation of the population, and groundwater is extensively exploited for irrigation. The absence of perennial surface water bodies, coupled with inadequate artificial groundwater recharge structures, has increased pressure on groundwater resources and intensified drinking water scarcity, particularly during the summer months. The hydrogeological, climatic, and socio-economic characteristics of Jamner Tahsil make it an appropriate study area for investigating groundwater availability, rural drinking water security, and sustainable water resource management.

Location Map:



Source: Maharashtra Remote Sensing Application Centre



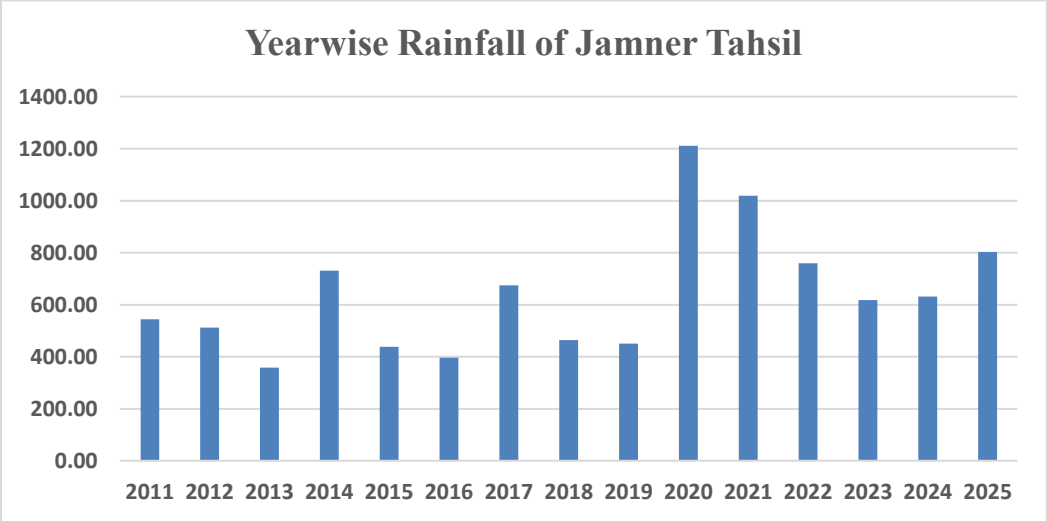
Source: Maharashtra Remote Sensing Application Centre

Subject of Study:
A) Year wise Rainfall Variation of Jamner Tahsil

Sr. No	Year	Rainfall
1	2011	543.70
2	2012	511.60
3	2013	358.20
4	2014	731.30
5	2015	438.60
6	2016	396.30
7	2017	674.00
8	2018	464.10
9	2019	451.00
10	2020	1211.00
11	2021	1018.80
12	2022	759.00
13	2023	617.4
14	2024	631.50
15	2025	802.00

The rainfall data presented in the study indicate significant fluctuations in annual rainfall over the 15-year period in Jamner Tahsil. According to the table and graph shown rainfall varied widely from 358.20 mm in 2013 to 1211.00 mm in 2020, demonstrating a high degree of interannual variability. During the initial phase (2011–2013), rainfall showed a declining trend, decreasing from 543.70 mm in 2011 to 358.20 mm in 2013, which represents the lowest rainfall recorded in the study period. This period reflects relatively dry conditions and may have contributed to water scarcity and reduced groundwater recharge. A significant increase in rainfall was observed in 2014 (731.30 mm), followed by fluctuations in subsequent years. Rainfall again declined during 2015 (438.60 mm) and 2016 (396.30 mm), indicating the continuation of irregular monsoon patterns. However, rainfall improved in 2017 (674.00 mm) before declining again in 2018 (464.10 mm) and 2019 (451.00 mm). These alternating increases and decreases highlight the unstable nature of rainfall distribution in the region. A remarkable shift occurred in 2020 and 2021, when rainfall increased sharply to 1211.00 mm and 1018.80 mm, respectively. These years represent exceptionally high rainfall and significantly influenced the overall trend. As noted in the graph on page 6, this period marks the peak of rainfall in the study area. Following this peak, rainfall decreased to 759.00 mm in 2022, and further stabilized at 617.40 mm in 2023 and 631.50 mm in 2024, before increasing again to 802.00 mm in 2025. Although rainfall declined after 2021, it remained higher than many earlier years, indicating relatively improved rainfall conditions in the later phase of the study. Overall, the rainfall graph illustrates an irregular but slightly increasing trend over the study period. The data clearly show that rainfall in Jamner Tahsil is highly variable and dependent on monsoon performance. Such variability has a direct impact on groundwater recharge, agricultural productivity, and water availability in rural

Source by socio-economic abstract



B) Water Scares and Tanker supplied data of Jamner Tahsil

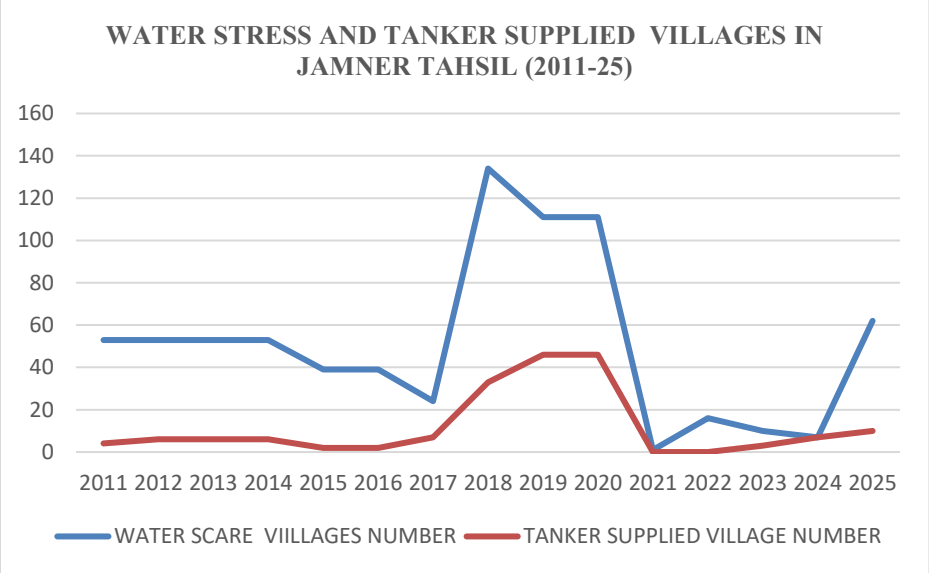
Table

Sr. No	Year	Total Village	Water Scare Villages Number	Tanker Supplied Villages Number
1	2011	155	53	4
2	2012	155	53	6
3	2013	155	53	6
4	2014	155	53	6
5	2015	155	39	2
6	2016	155	39	2
7	2017	155	24	7
8	2018	155	134	33
9	2019	155	111	46
10	2020	155	111	46
11	2021	155	1	0
12	2022	155	16	0
13	2023	155	10	3
14	2024	155	7	7
15	2025	155	62	10

Source by socio-economic abstract

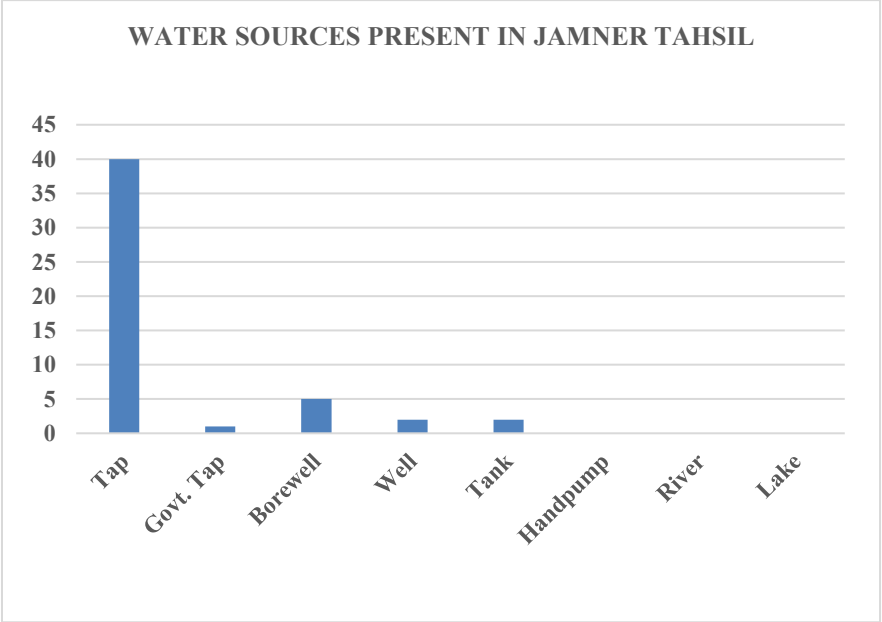
The table and graph show that the number of water-scarce villages varied significantly over the years. Water scarcity was highest in 2018 (134 villages) and remained high during 2019 and 2020 (111 villages each). Correspondingly, tanker water supply also increased, reaching 46 villages in both 2019 and 2020. In contrast, only one village experienced water scarcity in 2021, and no villages required tanker supply, indicating a considerable improvement in water availability

after the high rainfall years. These findings demonstrate a close relationship between rainfall variability and drinking water availability in rural areas.



C) Questionaries Analysis by Researcher:

To study water supply and water scarcity problems from a geographical perspective in Jamner Tahsil of Jalgaon District, the researcher developed a structured questionnaire. This structured questionnaire was examining water supply and water scarcity problems from a geographical perspective in Jamner Tahsil of Jalgaon District. The questionnaire included questions related to water sources, the availability and supply of water, the nature and extent of water scarcity, and its impact on the livelihoods and socio-economic conditions of rural households in the study area.

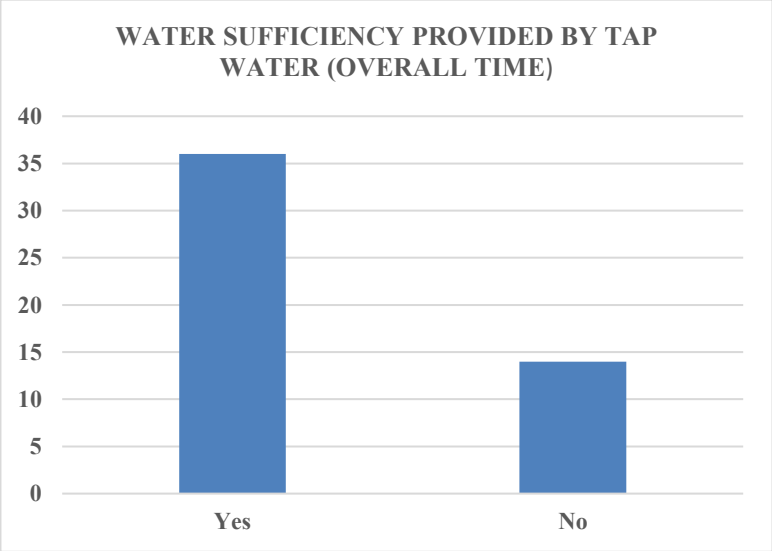


		Sources
Sr. No	**Water Sources**	**Numbers**
1	Tap	40
2	Govt. Tap	1
3	Borewell	5
4	Well	2
5	Tank	2
6	Handpump	0
7	River	0
8	Lake	0
9	**Total**	**50**

D) **Water Sources present in Jamner taluka in rural area to fulfil daily needs**

Data collected by researcher The survey reveals that tap water is the primary source of drinking water, available in 40 out of 50 villages, whereas government tap schemes, borewells, wells, and tanks contribute only a small share. Hand pumps, rivers, and lakes are absent as regular water sources. This indicates heavy dependence on piped water supply for meeting daily domestic water requirements.

E) Sufficient water provided by Tap water overall time:

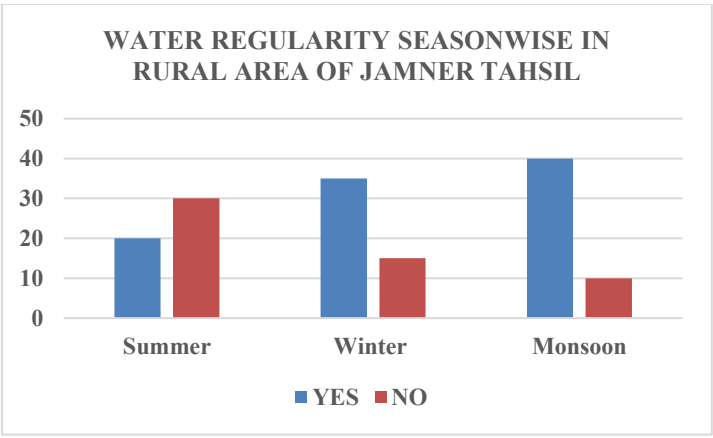


Sr No	Response	Respondent
1	Yes	36
2	No	14
3	**Total**	**50**

Data collected by researcher

The graph indicates that a majority of respondents reported receiving sufficient tap water throughout the year, while a smaller proportion expressed dissatisfaction with water availability. This suggests that although tap water is available in most villages, its adequacy varies depending on seasonal conditions and local infrastructure.

F) Water regularity seasons wise in rural area of Jamner tahsil:

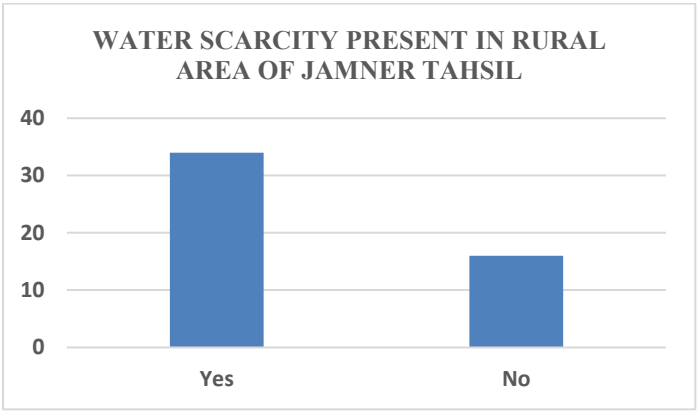


Sr No	Seasons	Yes	No
1	Summer	20	30
2	Winter	35	15
3	Monsoon	40	10

Data collected by researcher

Water availability differs across seasons. The survey shows that water supply is most regular during the monsoon season, followed by winter, while summer experiences the greatest irregularity in water supply. This seasonal variation reflects the dependence of rural water resources on monsoon rainfall and declining groundwater levels during summer.

G) Water Scarcity Present in rural area of Jamner tahsil:

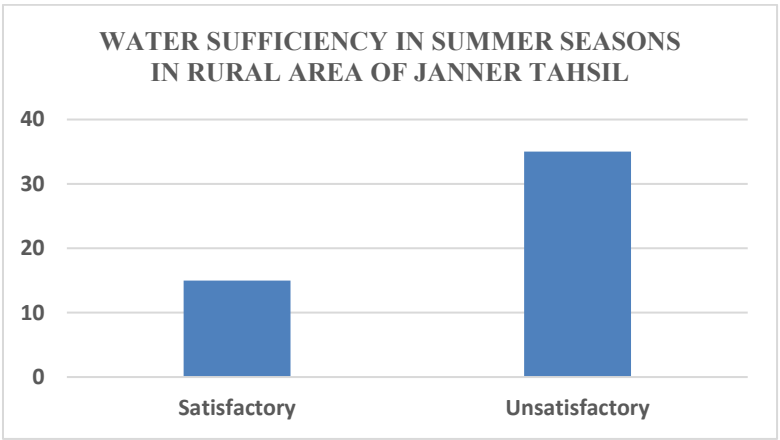


Sr. No	Response	Respondent
1	Yes	34
2	No	16
3	**Total**	**50**

Data collected by researcher

The survey data show that 34 out of 50 respondents (68%) reported the presence of water scarcity in their villages, while 16 respondents (32%) stated that they did not experience water scarcity. This indicates that more than two-thirds of the surveyed population are affected by drinking water shortages, making water scarcity a significant issue in the rural areas of Jamner Tahsil. The findings suggest that inadequate rainfall, declining groundwater levels, and increasing dependence on limited water resources continue to affect the availability of safe drinking water.

H) Water Sufficiency in Summer Season:

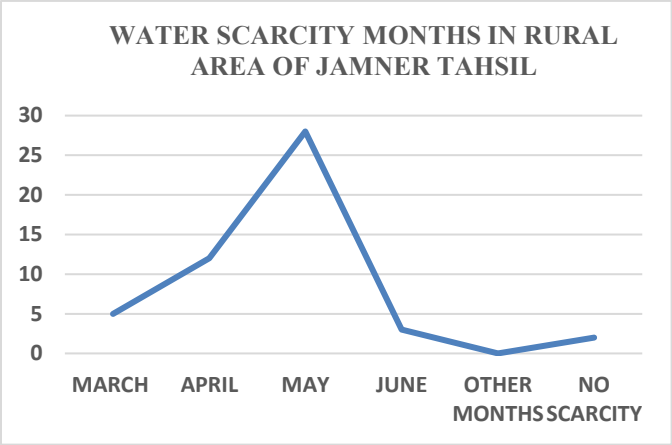


Sr. No.	Response	Respondent
1	Satisfactory	15
2	Unsatisfactory	35
3	**Total**	**50**

Data collected by researcher

The survey results reveal that 35 out of 50 respondents considered the summer water supply unsatisfactory, whereas only 15 respondents reported satisfactory water availability. This clearly indicates that summer remains the most challenging season for drinking water supply in Jamner Tahsil because of increased demand and declining groundwater levels. The findings emphasize the need for additional water conservation measures, rainwater harvesting, and groundwater recharge before the onset of summer.

I) Which months faces scarcity in rural area of Jamner tahsil

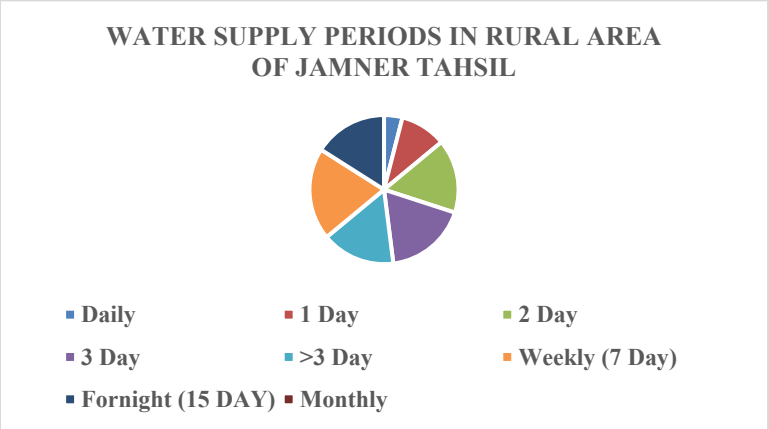


Sr. No.	Months	Responses
1	March	5
2	April	12
3	May	28
4	June	3
5	Other Months	0
6	No Scarcity	2
7	**Total**	**50**

Data collected by researcher

The survey indicates that regular daily water supply is available in only a few villages. Most respondents reported receiving water at intervals of three days, more than three days, weekly, or fortnightly. This demonstrates that intermittent water supply remains a major challenge in rural areas of Jamner Tahsil and affects household water security.

J) Water Supply Periods in rural area of Jamner Tahsil:

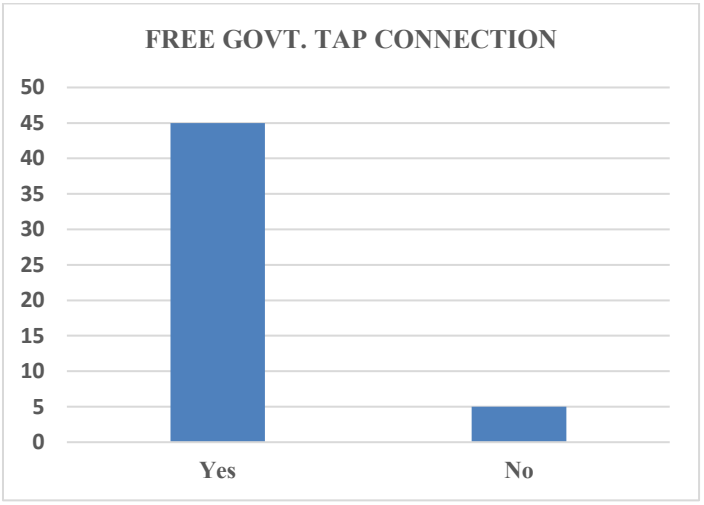


Sr. No	Water Regularity	Responses
1	Daily	2
2	1 Day	5
3	2 Day	8
4	3 Day	9
5	>3 Day	8
6	Weekly (7 Day)	10
7	Fortnight (15 DAY)	8
8	Monthly	0
9	**Total**	50

Data collected by researcher

The survey indicates that regular daily water supply is available in only a few villages. Most respondents reported receiving water at intervals of three days, more than three days, weekly, or fortnightly. This demonstrates that intermittent water supply remains a major challenge in rural areas of Jamner Tahsil and affects household water security.

K) Free Government Tap Connection:

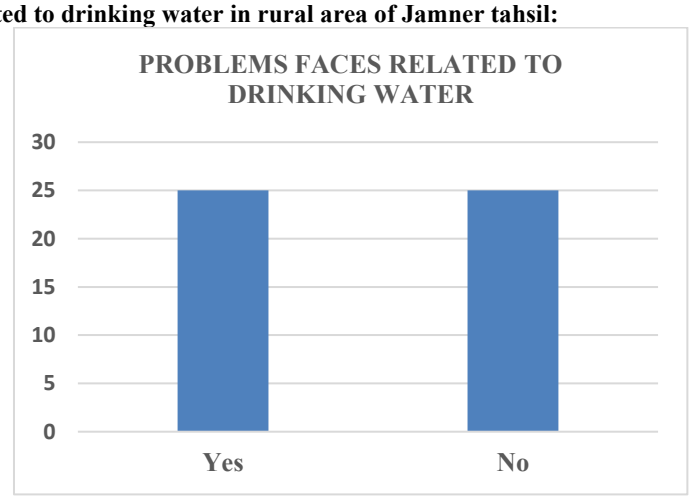


Sr. No.	Responses	Respondent
1	Yes	45
2	No	5
3	Total	50

Data collected by researcher

The graph shows that the majority of respondents have received free government tap connections, indicating effective implementation of rural drinking water supply schemes. However, a small proportion of households still remain outside the coverage of these programmes.

L) Problems present related to drinking water in rural area of Jamner tahsil:

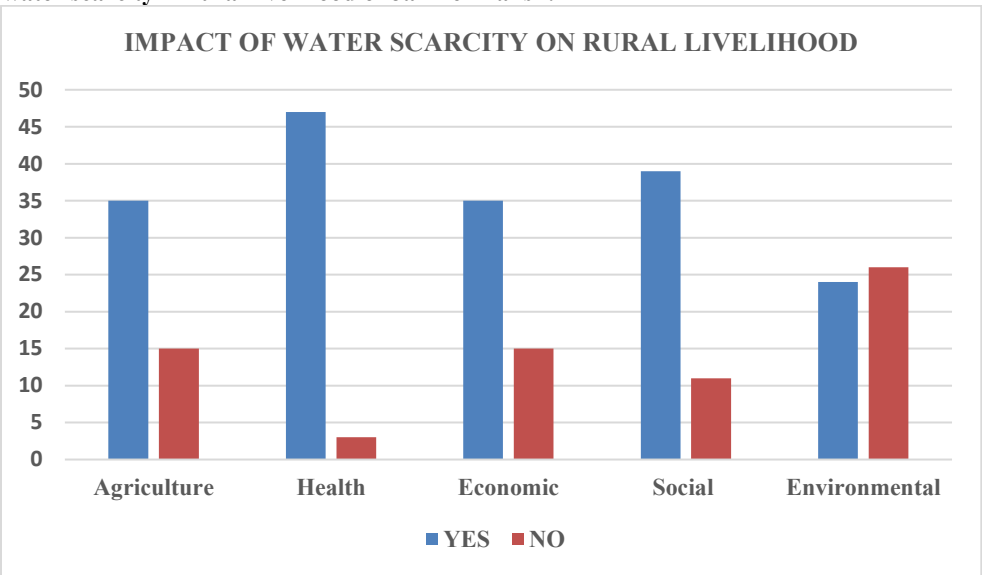


Sr. No.	Responses	Respondent
1	Yes	45
2	No	5
3	**Total**	**50**

Data collected by researcher

The survey findings reveal that 45 out of 50 respondents reported facing problems related to drinking water, while only five respondents did not experience significant issues. This indicates that drinking water remains a major concern despite improvements in water supply infrastructure.

M) Impact of water scarcity in rural livelihood of Jamner Tahsil:



Sr No	Impact	Yes	No	Total
1	Agriculture	35	15	50
2	Health	47	3	50
3	Economic	35	15	50
4	Social	39	11	50
5	Environmental	24	26	50

Data collected by researcher

The analysis shows that water scarcity has significant impacts on rural livelihoods. The highest impact is observed on health (47 respondents), followed by social conditions (39 respondents) and agriculture and the economy (35 respondents each). Environmental impacts were comparatively lower but still affected nearly half of the respondents. Overall, the findings indicate that water scarcity influences not only agriculture but also public health, economic activities, and social well-being in Jamner Tahsil.

Measures for Sustainable Water Management

1. Rainwater Harvesting

1. Construction of rooftop rainwater harvesting systems in rural households and public buildings such as schools and gram panchayat offices.
2. Development of farm ponds, check dams, and percolation tanks to store monsoon runoff.
3. This will help in increasing groundwater recharge and reducing dependency on tanker water supply.

2. Groundwater Recharge and Conservation

1. Promotion of artificial recharge techniques such as recharge wells, soak pits, and recharge trenches.
2. Regulation of excessive borewell drilling to prevent groundwater depletion.
3. Encouraging farmers to adopt water-saving irrigation methods.

3. Watershed Development Programmes

1. Implementation of watershed management projects in drought-prone villages.
2. Soil and water conservation measures such as contour bunding, terracing, and afforestation should be adopted.
3. These practices will reduce surface runoff and increase infiltration.

4. Improvement in Water Supply Infrastructure

1. Strengthening and maintenance of piped water supply systems to ensure regular water availability.
2. Expansion of government tap water schemes to cover all households.
3. Proper monitoring of water distribution to avoid leakage and wastage.

5. Efficient Irrigation Practices

1. Promotion of drip and sprinkler irrigation systems to reduce water consumption in agriculture.
2. Encouraging cultivation of less water-intensive crops suitable for semi-arid conditions.
3. Adoption of crop diversification and improved farming techniques.

6. Seasonal Water Management

1. Special focus on summer water management, as it is the most critical period of water scarcity.
2. Planning of water storage before summer through tanks and reservoirs.
3. Proper scheduling of water supply during scarcity periods.

7. Community Participation and Awareness
1. Involvement of local communities in water management decisions.
2. Conducting awareness programmes on water conservation and efficient usage.
3. Formation of village water committees for sustainable management.

8. Policy and Government Support
1. Effective implementation of schemes such as Jal Jeevan Mission and other rural water supply programmes.
2. Providing subsidies for rainwater harvesting and micro-irrigation systems.
3. Strengthening policies for equitable distribution of water resources.

9. Use of Modern Technology
1. Use of GIS and remote sensing for monitoring water resources and planning.
2. Installation of smart water meters to reduce wastage.
3. Adoption of data-based water management systems.

10. Alternative Water Sources
1. Utilization of treated wastewater for irrigation purposes.
2. Development of small-scale storage structures for non-drinking purposes.
3. Encouraging reuse and recycling of water at the household level.

Conclusion:
1. The present study on *"*Supply and Scarcity of Water in Rural Areas of Jamner Tahsil" reveals that water availability in the region is highly influenced by rainfall variability, groundwater conditions, and management practices. The rainfall analysis (2011–2025) shows significant fluctuations, with extremely low rainfall in 2013 and very high rainfall in 2020 and 2021, indicating an irregular monsoon pattern. This variability has a direct impact on water availability and groundwater recharge in the study area.
2. The analysis of water-scarce villages clearly demonstrates that years of low rainfall correspond with an increase in water scarcity and tanker dependency. For example, the highest number of water-scarce villages was recorded in 2018 (134 villages), while water scarcity drastically reduced after high rainfall years such as 2020 and 2021 (only 1 village in 2021). This confirms a strong relationship between rainfall and rural water supply.
3. The questionnaire survey highlights that tap water is the main source of drinking water in rural areas, but its availability is often irregular. Most households receive water intermittently rather than daily, which creates difficulties in meeting basic needs. Seasonal analysis shows that water supply is most reliable during the monsoon and least reliable during summer. A majority of respondents reported water scarcity, and summer months, especially May, were identified as the most critical period for water shortage.
4. Despite the expansion of government water supply schemes, the study found that 45 out of 50 respondents face drinking water-related problems, indicating that infrastructure alone is insufficient to ensure reliable water supply. Water scarcity has significant impacts on rural livelihoods, particularly on health, agriculture, and socio-economic conditions, with health being the most affected sector.
5. Overall, the study concludes that water scarcity in Jamner Tahsil is the result of both natural factors (irregular rainfall, semi-arid climate, limited surface water) and human factors (over-extraction of groundwater, inadequate water management, increasing demand). To address these challenges, there is an urgent need for sustainable water management practices, including rainwater harvesting, groundwater recharge, watershed development, efficient irrigation techniques, and equitable distribution of water resources.

Acknowledgment
I would like to express my sincere gratitude to all those who contributed directly or indirectly to the successful completion of this research study entitled "Supply and Scarcity of Water in Rural Areas of Jamner Taluka, Jalgaon District, Maharashtra: A Geographical Study."

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Nil.

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

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