



Comparative Analysis of the Impact of Climate Variability on the Chemical Properties of Agricultural Well Water in Sohar (2018–2025)

Done by the students: Mira Omar Al-Yhyai \ Sultanah Ibrahim Al-Balushi

Supervised by: Ms. Asmaa Al-Alawi, Telbrahimacher

Academic year (2025-2026)

Abstract

This study examines the relationship between climate variability and the chemical properties of agricultural well water in the Wilayat of Sohar during the period from 2018 to 2025, in light of the increasing challenges posed by climate change to water resources in arid and semi-arid regions. The study relied on official data obtained from relevant authorities and specialized platforms, including measurements of salinity (EC) and acidity/alkalinity (pH) for three agricultural wells, in addition to reliable climatic data comprising rainfall amounts and average annual temperatures for the same period.

Research questions

The study focuses on addressing a set of key research questions, most notably:

- (1) To what extent do changes in rainfall amounts affect the salinity and pH of agricultural well water?
- (2) What is the nature of the relationship between average temperature and changes in the chemical properties of this water?
- (3) Do salinity and pH differ in their degree of sensitivity to climatic factors during the study period?

Research Methods

Data Collection and Analysis:

Climatic data (rainfall and average temperatures) for 2018–2025 were obtained from accredited sources, while salinity (EC) and pH data were collected from the Agricultural Research Center in Sohar. The data were organized chronologically and analyzed comparatively to assess the relationship between climate variability and well-water quality.

B. Interview:

A personal interview was conducted with farmer Yusuf bin Mohammed Al-Maqbali to document observed changes in agricultural well-water quality and the effects of climate variability on salinity and irrigation.

C. Field Study

Water samples were collected from selected wells, and salinity and pH were measured using specialized instruments to verify official data and reflect field conditions.

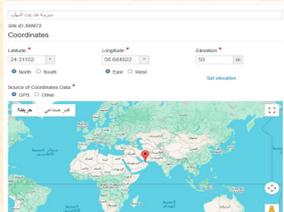
Research Procedures

1. Collecting rainfall and temperature data for Sohar (2018–2025) from accredited sources.
2. Collecting salinity (EC) and pH data for three agricultural wells from the Agricultural Research Center in Sohar.
3. Developing a research plan defining objectives, questions, timeframe, and methodology.
4. Conducting a personal interview with a local farmer to document changes in well-water quality.
5. Collecting water samples and measuring salinity and pH to verify official data.
6. Organizing data chronologically and standardizing measurement units.
7. Calculating annual averages of salinity and pH.
8. Comparing climatic variables with water quality indicators.
9. Presenting results using tables and graphs.
10. Analyzing results and drawing conclusions on climate impacts on groundwater quality.

Study Location

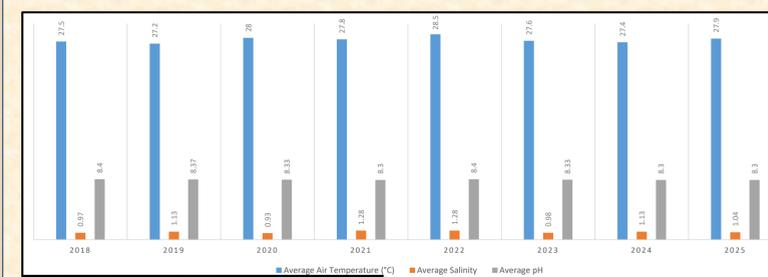
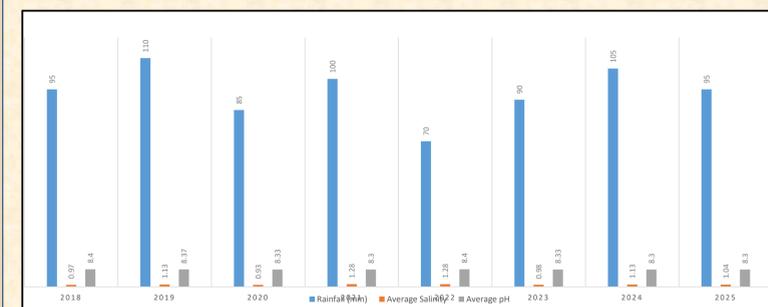
The study was conducted in the Wilayat of Sohar, North Al Batinah Governorate, Sultanate of Oman. Water quality data were collected from three agricultural wells located on different farms representing local groundwater conditions. The geographic coordinates of the farms were recorded to ensure accurate site identification and support spatial analysis. Sohar's arid to semi-arid climate, characterized by variable rainfall and high temperatures, makes its groundwater resources highly vulnerable to climate variability and salinization, justifying its selection as the study area.

| m No. | Wilayat / Area | Latitude (N) | Longitude (E) |
|-------|-------------------------|--------------|---------------|
| 1 | Sohar – Majlis Al-Kubra | 24.23058 | 56.81361 |
| 2 | Sohar – Al-Fateq | 24.24744 | 56.81135 |
| 3 | Sohar – Al-Tareef | 24.354 | 56.69326 |



Data Collection and Analysis

Climatic data on annual rainfall amounts and average temperatures for the period 2018–2025 were obtained from accredited meteorological sources. Data on the chemical properties of agricultural well water, including salinity (EC) and pH values, were collected from the Agricultural Research Center in the Wilayat of Sohar and supported by field measurements. All data were organized into chronological tables and classified by year and by well. Annual averages of salinity and pH were calculated to identify overall trends during the study period. A comparative analytical approach was then applied to examine the relationship between climatic variables and changes in well-water quality. The results were presented using tables and graphical representations to support interpretation and highlight the effects of climate variability on groundwater quality.



Discussion of Results

The comparative analysis revealed a clear impact of climate variability on the chemical properties of agricultural well water in the Wilayat of Sohar during 2018–2025. An inverse relationship was observed between rainfall and well-water salinity, with lower salinity during wetter years and higher salinity during periods of relative drought, reflecting the role of rainfall in groundwater recharge and salt dilution. Higher average temperatures were also associated with increased salinity due to enhanced evaporation rates. In contrast, pH values remained relatively stable within a slightly alkaline range, indicating that salinity is more sensitive to climatic changes than pH and highlighting the importance of salinity management in agricultural groundwater strategies.

Conclusion

This study concluded that climate variability significantly affects agricultural well-water quality in the Wilayat of Sohar, particularly salinity. Higher rainfall reduced salinity, while drought and rising temperatures increased salt concentrations due to enhanced evaporation. In contrast, pH values remained relatively stable, indicating that salinity is more sensitive to climatic changes and should be a key focus in sustainable groundwater management.

References

1. Abdulrahman, A. (2015). Use of Moringa in Water Purification. Journal of Environmental Sciences.
2. Al-Sayed, M. (2018). Study on the Effect of Moringa on Greywater Quality Improvement. Arab Journal of Water Sciences.
3. Al-Otaibi, K. (2020). Water Purification Techniques Using Natural Plants. Arab Academic Publishing House.
4. Arab Journal of Water Sciences. (2018). Article on Greywater.
5. World Health Organization (2015). Water Quality Guidelines and Turbidity Assessment.

GLOBE Badges

