

Author response

Reviewer 4

We would like to extend our sincere appreciation to the reviewer for their careful reading, constructive feedback, and valuable insights into our manuscript. Your thoughtful comments have highlighted areas for improvement and provided us with an opportunity to strengthen the clarity, accuracy, and scientific rigor of our work. We are grateful for the time and effort you have dedicated to reviewing our study, and we have made careful revisions to address each of your concerns.

1. the classification of the precipitation - how does the presented author's classification relate to that of Prinz?

Answer: Prinz's research has been instrumental in defining mean annual rainfall ranges suitable for various RWH systems, with thresholds of 150 mm for macro-catchment and 200 mm for micro-catchment systems within regions with summer rainfall patterns. This foundational work indicates that RWH systems can function effectively with specific rainfall minimums.

Building on Prinz's insights, our study considers that in regions with winter-dominated rainfall, even lower rainfall depths may be sufficient for RWH, given the seasonal variations and storage needs. Accordingly, we developed a new rainfall classification for macro-catchment areas, tailored to reflect these local conditions and variations. Our classification scheme, as presented in Table 3, categorizes rainfall suitability into five ranks, ranging from "Below 125 mm" (low suitability) to "Above 426 mm" (high suitability).

2. I know that there is no better soil data for this region, but a higher accuracy of this layer would be desirable, certainly for such a small area it is insufficient.

Answer: The soil data used in this study has a resolution of 250m by 250m, which we believe is sufficient given the study area spans over 2700 km². This resolution strikes a balance between detail and coverage, capturing the essential variability across the region. To further validate the soil classification and ensure its relevance, we incorporated visual observations and consulted with local geotechnical experts, whose judgment has confirmed the reliability of the maps for this scale.

3. precipitation remains at this point the only parameter of assessment whose classification is to be zoned regardless of the obsar on which the survey will be conducted. What about the other parameters, shouldn't they also have unified values so that the assessments are comparable? There are not even class ranges given for them.

Answer: In this study, all criteria, including soil texture, land use-land cover, slope, and drainage density, have been consistently classified into five suitability classes to maintain comparability across parameters.

Our focus on rainfall was intended to highlight our proposed new classification approach, which differs from traditional methods in the literature. Given its importance, we provided a more detailed discussion of the rainfall classification.

detailed comments below:

line 47 and 51 - reference needed

Answer: Done

line 88 - DMSS - what is data availability? https source maybe?

Answer: The data is obtained by hard copy from the directory.

fig.1- add rain station locations and comment why Darbandikhan station has such high precipitation in relation to the other, what is their location at DEM

Answer: We have added the locations of the rain stations to Figures 5 and 6 for clearer reference. The Darbandikhan station shows relatively high precipitation compared to other stations due to its unique topographic setting. Positioned within a valley and surrounded by elevated terrain, Darbandikhan benefits from orographic effects, where moist air is lifted over the surrounding hills, leading to higher rainfall accumulation. In the Digital Elevation Model (DEM), Darbandikhan's location is visible as an area at the upper most of the study area, which contributes to its distinctive precipitation pattern.

fig.2 - water year - explain please in the text

Answer: In Iraq, the water year, also known as the hydrological year, is defined by hydrologists as the period starting on October 1 of one year and ending on May 30 of the following year. For example, the 2022 water year extends from October 1, 2022, to May 30, 2023. This period captures the main rainy season and is crucial for assessing annual water availability and hydrological patterns. We removed the word water from (water year) and just kept year.

line 121 and 129 - add http data source

Answer: Done

line 131 - there is only one reference to these criteria, You should add more reliable information, and give directly reference to FAO recommendation

Answer: Done

line 176 - The question arises as to how much of this is the author's classification and how much is the slightly modified Prinz's classification by the authors

Answer: To clarify, Prinz did not provide a classification system; rather, his work in the 1990s focused on studying rainwater harvesting (RWH) and determining the minimum annual rainfall depths required for effective RWH systems. Building on his findings regarding these minimum requirements, we developed our own classification scheme specifically tailored to suit our study area. This new classification framework is based on Prinz's minimum criteria but was independently structured to better address the rainfall variability and RWH suitability in our region.

table 2 - add reference to "traditional"

Answer: To clarify, Table 2 is the authors' work and does not have an external reference. This table was created by adopting the traditional classification approach commonly followed in the literature, where rainfall is categorized into five suitability classes. In this classification, the lowest rainfall values within the study area are assigned a grade 1 suitability, and the highest values are assigned a grade 5 suitability.

table 3 and 4 - justify use of equal intervals

Answer: in Tables 3 and 4. To maintain consistency with standard statistical classification methods and to simplify interpretation, we used equal intervals to divide the data into five classes. This approach not only aligns with common practices in the field but also provides a straightforward framework for assessing and comparing RWH suitability across different parameters.

fig.3 - 5 - add rainfall stations and comment in the text the method of the interpolation, which is also important for the final results.

Answer: Done

line 206 - what is the basis for slope classification? there are no slope values corresponding to the class boundary

Answer: Studies have shown that slopes around 3-5% are effective for maximizing runoff efficiency without excessive erosion. Steeper slopes generally promote higher runoff but are also associated with increased erosion, which can undermine long-term RWH viability. Based on these findings, we adopted a slope threshold that balances runoff efficiency and erosion risk, aligning with common practices in RWH suitability studies.

This classification is intended to enhance the RWH site selection process by incorporating these slope considerations, as supported by literature. In addition; Table 5 has added to present the slope classes.

fig.7 - mistake in legend

Answer: Corrected

line 217 - no information which class correspond to type of the LULC

Answer: We have added Table 5 to the manuscript to provide a detailed classification of land use-land cover (LULC) types, including the specific suitability classes assigned to each type.

line 235 - this is next layer where there are no enough information about transition from raw parameter values and estimated classes. Does drainage density take into account the possibility that values smaller or larger than those found in the study area and their classification under other conditions may occur, just as the distribution of precipitation has been justified?

Answer: To address your concern, we have added Table 5 that outlines the classification details for drainage density, showing the transition from raw parameter values to estimated suitability classes. The drainage density classes were selected based on both the specific values observed locally and recommendations from relevant literature. While we focused on local data to ensure relevance to the study area, the classification approach is also aligned with literature-supported guidelines.

line 365 - standardized - yes but only for the rainfall, the rest of the assessment parameters remains not very well described...

Answer: Table 5 has been added to describe all the parameters used.

line 375 - really don't know how it was measured - accurate and realistic

Answer: The measurement you referenced was conducted using GIS tools, which allowed us to obtain accurate and realistic spatial data. By leveraging GIS analysis, we ensured precise measurements that align with the spatial resolution and requirements of our study.