Dear reviewer:

Thank you for providing many constructive suggestions concerning our manuscript (EGUSPHERE-2022-1390). Here are our specific responses to your comments.

If any questions, please let us know, and we would like to have more discussions with you!

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Question 1: The paper is of interest for the area of saline water management. The methods are generally satisfactory and the paper is generally well organized. -Fig.1: The legend must be completed (figures must be self-explanatory).

Response: Thank you for your suggestion, we will add relevant legends to the diagram for a more visual presentation.

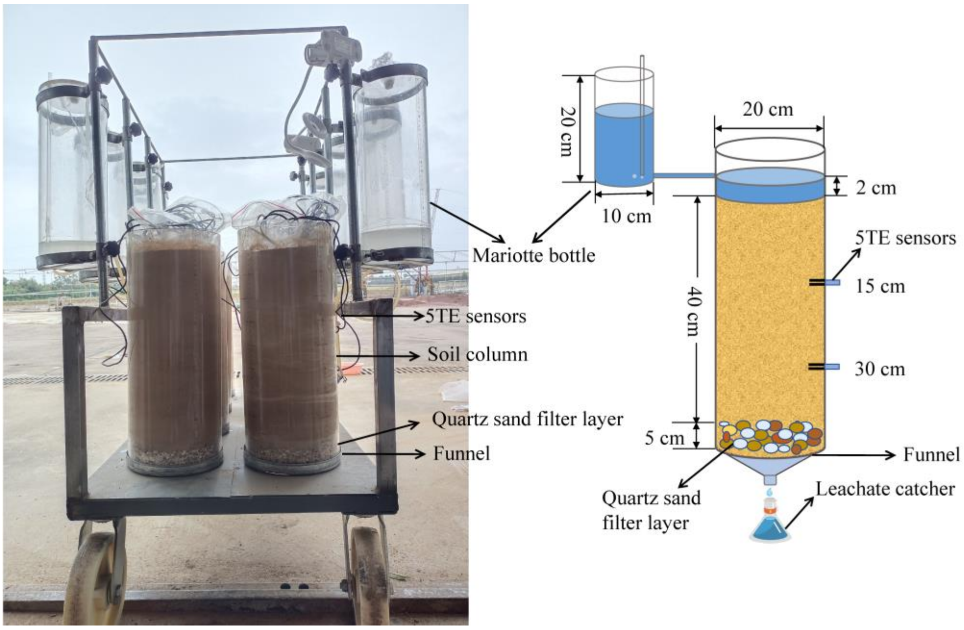

Fig. 1. Illustration of the experiment apparatus (a) and schematic diagram (b).

Question 2: What about the statistical analysis in Figures 3 and 5?

Response: The amount of data for soil moisture and bulk electrical conductivity is very large, and if we do a significance analysis, we can only use the average value, or the value at a point in time after the end of the irrigation cycle, and this does not accurately represent the process of soil moisture or bulk electrical conductivity, so we did not do a significance analysis for soil moisture or bulk electrical conductivity in Fig.3 and 5.

Question 3: Fig. 3: What is the explanation for soil moisture at 15 cm being lower than at 30 cm after an irrigation event? (it is supposed to be higher at 15 cm immediately after an irrigation event)

Response: The data analyzed in Fig. 3 and Fig. 5 were started at the time after a certain period of water supply, soil moisture was redistributed at different depths of soil column. Soil water moved further down during the phase of water redistribution soon after each irrigation, reducing the water content in the upper soil layers. As the upper soil layers drained, the lower soil layers still had water inflow (Kargas et al., 2021), increasing the water content in the lower soil layers. (Lines 328-332). And after each irrigation, soil moisture rose rapidly in both 15 cm and 30 cm soil layers.

Question 4: Did not started the irrigation events in parallel for the different treatments?

Response: The starting point of irrigation was the same for all treatments.

Question 5: L226: "Water content increased immediately after each infiltration for all treatments, and then gradually declined to a constant level…" -It does not seem that soil water content has become constant (Fig. 3).

Response: We can rephrase this sentence to more accurately describe: 'Water content increased immediately after each infiltration for all treatments, then gradually decreases and the degree of variation tends to stabilize'.

Question 6: L260: "At both 15 and 30 cm soil layers, the bulk electrical conductivity of K0Na1 was considerably greater than K1Na1, and K1Na1 was quite higher than K1Na0." -I do not took this information from Fig. 5, particularly at 15 cm.

Response: We can revise the sentence to: Overall, K0Na1 had the highest bulk electrical conductivity among all treatments at both 15 and 30 cm, and K1Na1 was quite higher than K1Na0.

Question 7: L267: “At 15 cm soil depth, K0Na1 reached the soil desalination prerequisite…” -What could be the reason for the increase in bulk electrical conductivity at 15 cm in K0Na1 after 4th irrigation?

Response: The decrease in the soil macro-porosity, soil water retention, and weaker hydraulic conductivity all contribute to the increase in bulk electrical conductivity of K0Na1. A greater reduction in Na^+ concentration was associated with a higher rate of cation exchange rate, and the slow rate of solute leaching from aggregates reduced the total leaching efficiency (Shaygan et al., 2017). During the leaching process, water flow preferentially passed through the macropores rather than aggregates. The slow water transportation through aggregates induced the slow removal of solutes from the aggregates, leading to a reduced leaching efficiency. In our study, the alternate leaching was implemented to improve solute leaching. The soil solutes diffused into the aggregates surface during the rest period, improving salt leaching due to the water flow in macropores (Al-Sibai et al., 1997). Increasing the relative ratio of K^+ to Na^+ could increase the magnitude of cation exchange due to the substitution of Na^+ on exchange sites by K^+ with lower dispersive potential (Shaygan et al., 2017), the intensive release of cations from the soil further improved salt’s leaching efficiency. In addition, the integrity of soil aggregates created by combining clay particles and the other soil components enhanced by K^+ can benefit solute transportation (Marchuk and Rengasamy 2011) (Lines 355-368).

Question 8: L326: “Therefore, in our study, the high K^+/Na^+ ratio promoted the flocculation and stabilization of soil clay particles, resulting in an increased infiltration rate.” -What about infiltration rate data? There is no information in the manuscript.

Response: This sentence illustrates the data in Fig. 2 (Saturated hydraulic conductivity under different treatments), and to avoid misleading, we change this sentence to: Therefore, in our study, the high relative concentration of K^+ to Na^+ promoted the flocculation and stabilization of soil clay particles, resulting in an increased water hydraulic conductivity.

Question 9: I suggest indicating the number of figure/table throughout the discussion (e.g. L332 “The results also implicated…”).

Response: We will indicate the figure and table number in the discussion so that it can be more clearly represented.