LEACHING POTENTIAL OF FRESH AND SEA WATER

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ABSTRACT
This paper reports the findings from leaching experiments conducted on some Omani soils. The purpose of this laboratory experiments was to estimate the amount of water required for adequate leaching of salts with continuous and intermittent ponding from the soil profile. Results show that most of the salt (50-90%) is removed from the soil profile by the application of water equal in amount to the depth of soil to be leached. The results also show that intermittent ponding method of leaching is more efficient than the continuous ponding method of leaching if initial salinity level is high. Leaching with sea water also reduced soil salinity between 90.4 to 17.8% depending on the depth of sampling.
Key words: continuous, intermittent, ponding, water depth, soil depth.

INTRODUCTION
There is no doubt that the soil salinity is a very serious problem. The accumulated salts need to be leached by the application of extra water on the surface; otherwise, crop production will suffer. One possible solution to this problem is the leaching of saline soil with the available water. Very little information is available regarding the optimum water requirement for different types of soils in Oman for leaching purposes. This paper presents findings from a research that had the objective of estimating the amount of water required for adequate leaching with fresh and sea water.

MATERIALS AND ETHODS
Soils for leaching experiments were collected from agricultural locations. Soils from seven soil profiles to depths of 30 cm were sampled. The collected soil samples were air dried and sieved. Sampled soils were re-packed as found in the field into plastic cylinders of 10 cm diameter. The soils in the columns were leached (D_w) either continuously (continuous ponding) or in different intervals (intermittent ponding). Once drainage stopped completely, soil samples were collected from different depths (D_s) of the column. Electrical Conductivity of saturated extract of the soil samples was measured before (EC_{eb}) and after (EC_{ea}) leaching. Same experiment design was repeated with sea water and saline soil from the coastal area.

RESULTS AND DISCUSSIONS
Figure 1 shows that in most of the samples, for both continuous ponding and intermittent ponding, lowering of soil salinity (as expressed by the ratio EC_{ea}/EC_{eb}) is moderate beyond $D_w/D_s=1$. It shows that addition of more water beyond D_w/D_s would be a wastage. Table 1 also shows that intermittent ponding will be a more efficient method especially if the initial salinity is high. There is no difference between the continuous and intermittent ponding methods if the initial soil salinity is low. Average salt concentration coefficient, K, is dependent both on the ratio D_w to D_s and initial EC. Presence of large particles, pebbles, cracks and macropores all will affect the leaching process. Water is likely to move faster bypassing smaller pores, which will decrease leaching efficiency.

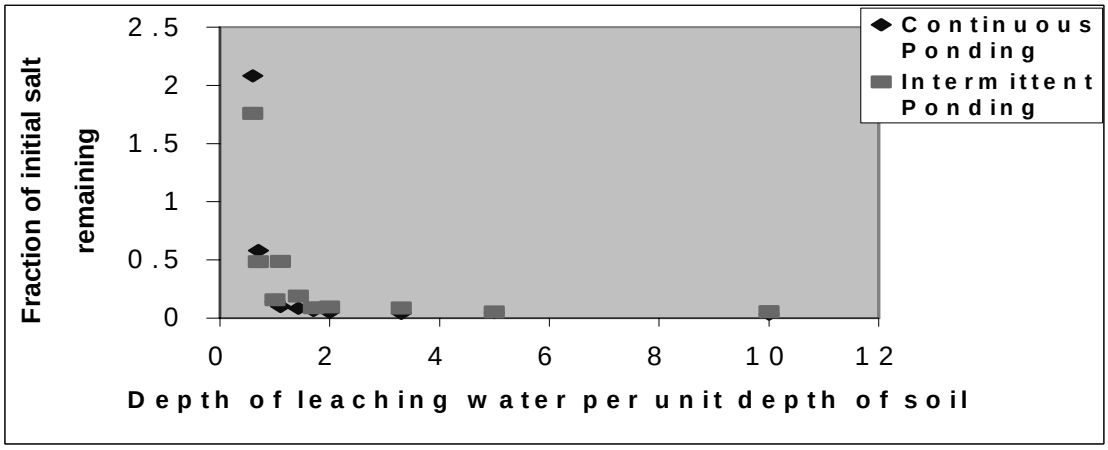

Figure 1: Salts remaining with continuous and intermittent ponding.

Table 1: Fraction of salt remaining at $D_w/D_s=1$ and average salt transport efficiency coefficient

Soil No.	Mean initial EC of profile (dS/m)	Fraction of salt remaining, at $D_w = Ds$		Average salt transport efficiency coefficient $K = (D_w/D_s)(EC_{ea}/EC_{eb})$	
		Continuous ponding	Intermittent ponding	Continuous ponding	Intermittent ponding
1	85.2	0.18	0.09	0.24	0.15
2	17.97	0.14	0.16	0.27	0.34
3	3.04	0.38	0.38	0.96	0.63
4	1.98	0.51	0.47	1.21	1.47
5	3.71	0.2	0.15	0.45	0.32
6	8.99	0.09	0.08	0.22	0.12
7	5.0	0.29	0.29	0.40	0.40

Figure 2 shows high efficiency of sea water in leaching highly saline soils. The efficiency of leaching would be improved if better quality water can be used. This result is supporting the finding of fresh water leaching study.

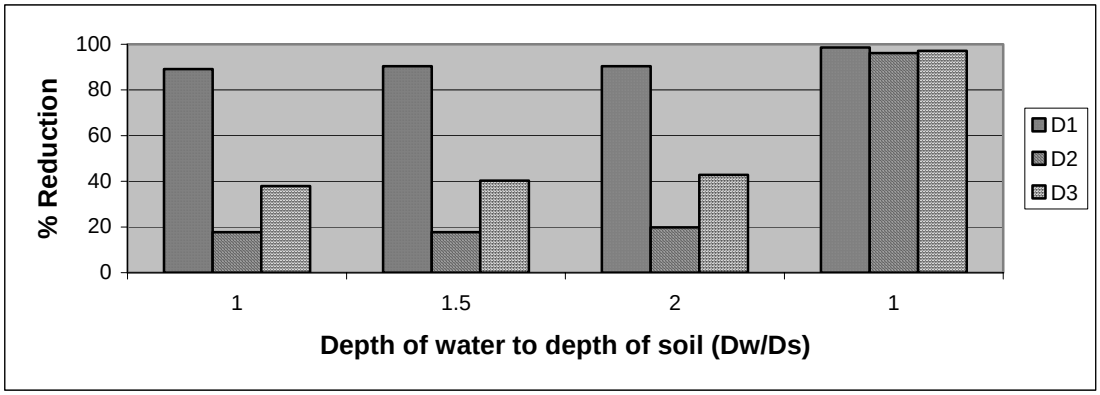

Figure 2: Percentage reduction in soil salinity under different leaching treatments.

It is important to note that leaching with sea water was more effective in soil with initially higher than lower salinity. Sea water leaching appeared to leave soil with some salts so it is recommended that plant species selected for this soils can survive under those conditions.

CONCLUSIONS

The results from this study show that 70-80 percent of salts can be removed if the depth of water applied equal to the depth of leached soil. The results also show that intermittent ponding method of leaching is more efficient compared to continuous ponding method of leaching if initial salinity level is high.

it is feasible to leach salts from a sandy soil by using sea water if a good drainage system is present. Sea water was most effective at reducing soil salinity when applied at an amount equal to the depth of soil to be leached.

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