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Estimation the soil Salinity of Sugarcane Root Zone in Different Management of Irrigation and Drainage Using SaltMod in the Imam Khomeini Agro- Industry

Arash Mahjoobi
Hamidreza Khodabakhshi
Arashmahjoobi@Gmail.com

Khoozestan, The Birth Place of Subsurface Drainage in Iran

In very near future in Khouzestan subsurface drainage have to develop in around 700000 ha

Drainage Challenges in Khoozestan

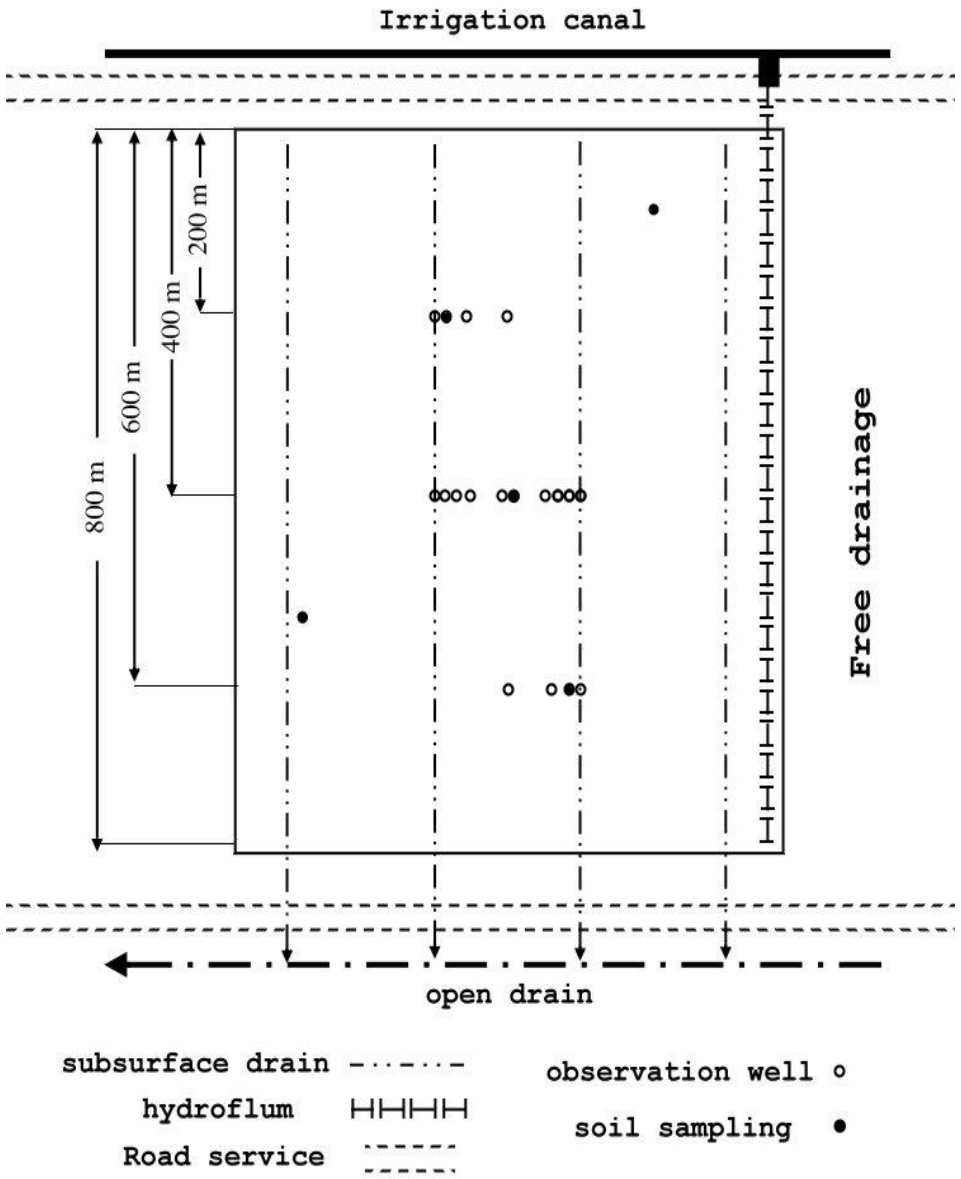
- Extraordinary high volume of drainage water
- Very poor quality drainage water
- Lack of suitable outlet
- High usage of chemicals i.e. fertilizer, pesticides and herbicides

Sugarcane Irrigation & Drainage system

Agronomy

Sugarcane (CP-48-103 variety) was planted at the two fields on August 2011. The length of furrows and their width were 250 and 1.85 m respectively. After the sugarcane plantation, irrigation started and until the beginning of the rainy season 8 times irrigation was done.

Water table control device and Observation wells



SALTMOD

A computer program for the prediction of the salinity of soil moisture, ground water and drainage water,

the depth of the water table, and the drain discharge in irrigated agricultural lands,

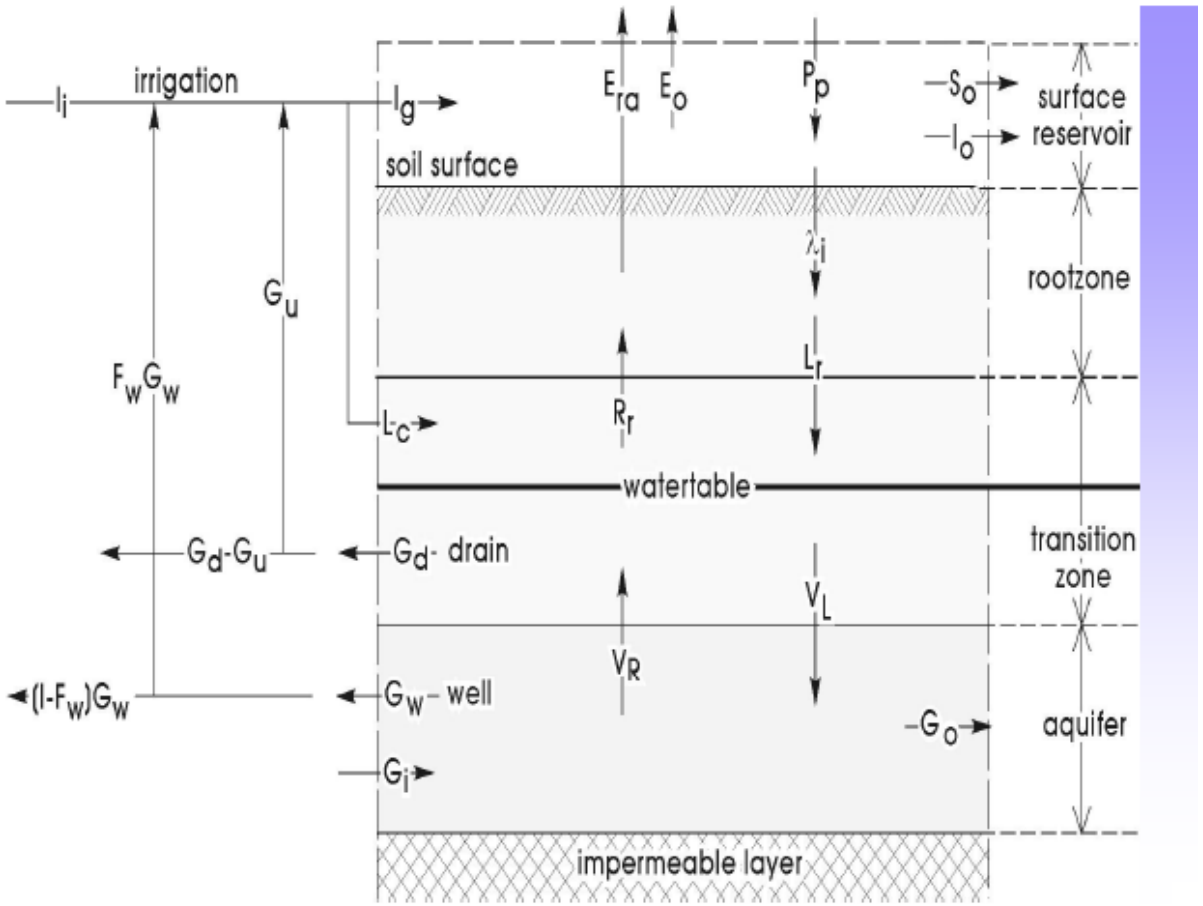
using different (geo)hydrologic conditions, varying water management options, including the use of ground water for irrigation,

and several cropping rotation schedules.

In the soil profile we recognise 4 reservoirs:

- 1 On top of soil surface
- 2 Root zone/Evapotranspiration zone
- 3 Transition zone
- 4 Aquifer

- Salt and water balances are made for each reservoir:
  - Inflow = outflow + change in storage


irrigation
I_i
I_g
E_{ra}
E_o
P_p
S_o
I_o
surface reservoir
soil surface
λ_i
rootzone
G_u
$F_w G_w$
L_r
L_c
R_r
watertable
G_d-G_u
G_d- drain
transition zone
V_L
V_R
$(I-F_w)G_w$
G_w- well
G_o
aquifer
G_i
impermeable layer

Crop rotations

- Together with previous cropping data, the crop rotations must be specified.
- Rotation code Kr = 0, 1, 2, 3, 4

  0 = no crop rotation (fixed areas e.g. Sugarcane, orchards)

  4 = full rotation (no fixed areas)

  1 = fallow area is fixed, permanent, other crops have full rotation
- Etcetera

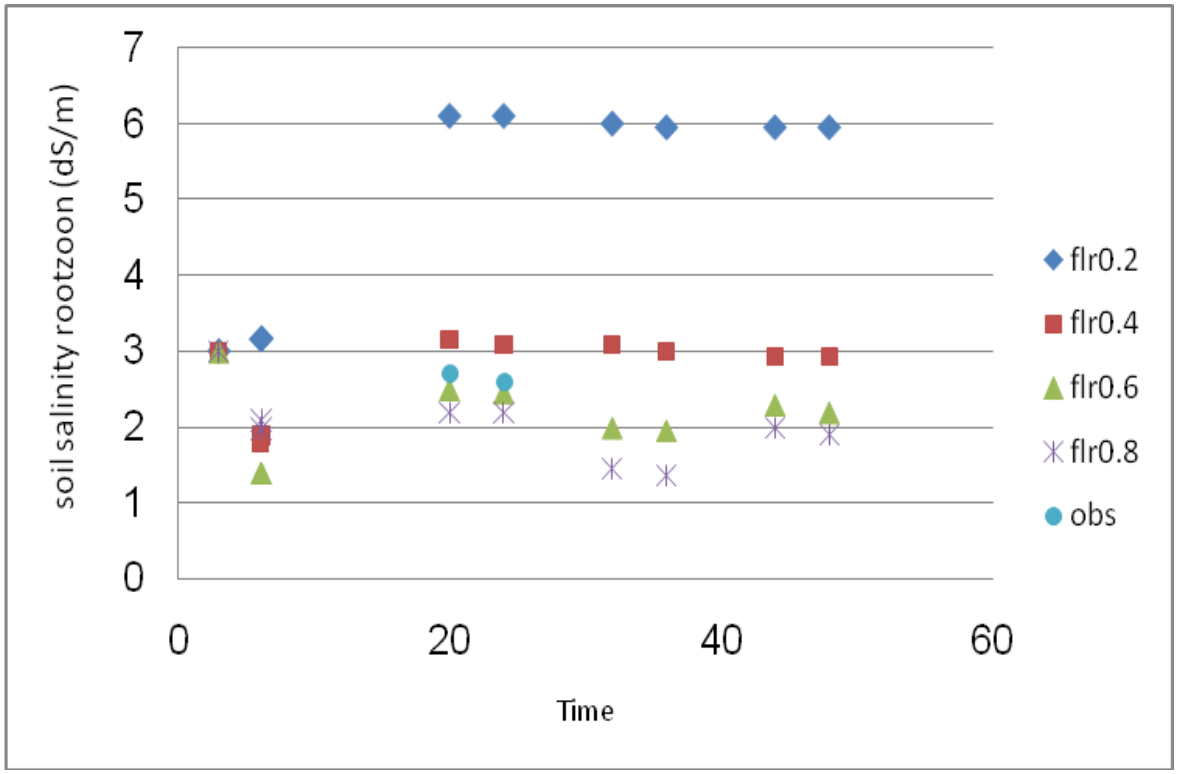
➢ In Garmsar use Kr=4

Calibrating groundwater flow

- As the groundwater flow was unknown it had to be found by calibration
- Previous reports indicated that no upward seepage occurs but rather some natural drainage through the underground
- Therefore trials were made with annual values of natural drainage Gn = 0.0, 0.07, 0.14, 0.21 and 0.28 m
- The results are shown in the next table.

Results and discussion

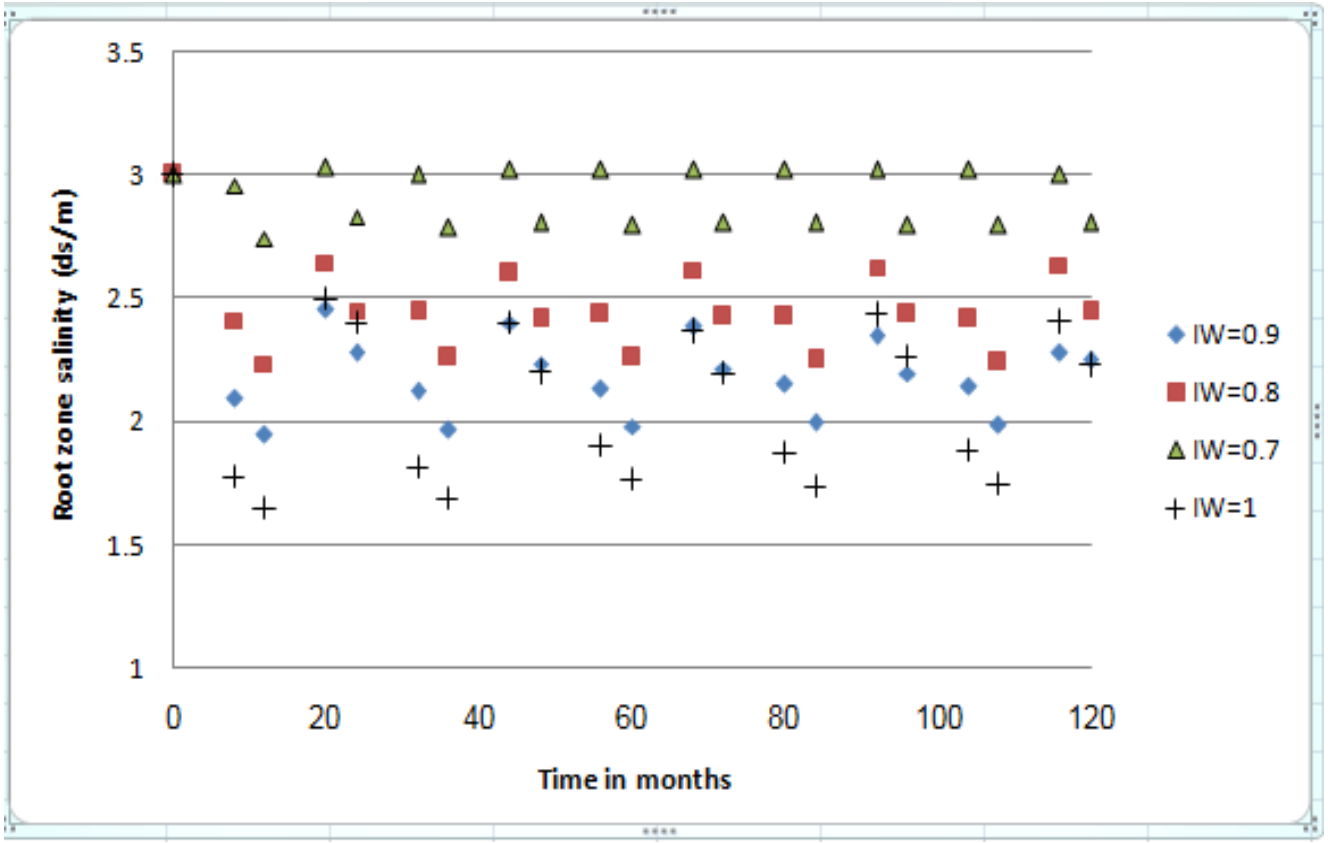
Determination of the leaching efficiency



Estimates of drain depth (Dd, m), soil salinity Cr4(ds/m), seasonal average depth of the water table(m), amount of drainage water(m) for the 10th year.

Drainage control factors	Drainage reaction factors	Gd	Dw	Cr4
0	0.01	2.07	1.12	2.1
0.25	0.075	2.03	0.88	2.2
0.5	0.005	1.81	0.60	2.3
0.75	0.0025	0.84	0	5.25

Effect of changes in irrigation depth on the root zone salinity



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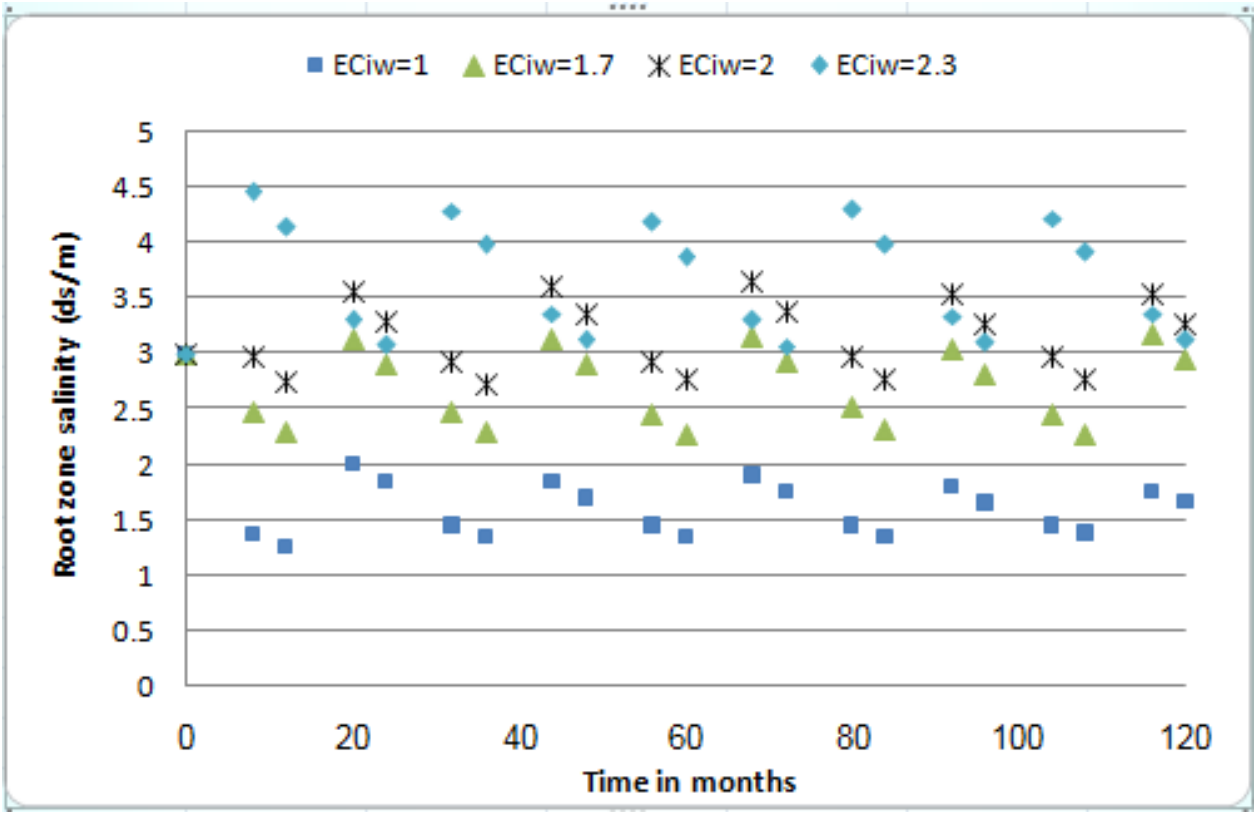
Effects of varying water quality on the root zone salinity



Conclusion

- SaltMod is a useful tool for prediction of the soil salinity and drainage water, the groundwater table depth, drain discharge, and varying water management

- with 20% reduction in irrigation water and assuming drainage control factor until 0.5, no limitation on soil salinity and water table depth would not appeared.

- drainage outflow depth from about 2.07 m during irrigation would decreases to 1.26 m.

- increasing of the subsurface drainage depth over 1.5 m would not have any advantages and any changes in soil salinity.

- If irrigation water was applied with salinity more than 1.7 dS/m, soil salinity in the root zone would be more than 3 dS/m .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