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GLOBAL SYMPOSIUM ON SALT-AFFECTED SOILS

20 - 22 October, 2021
Virtual meeting

Different Furrow Irrigation Modes Help Soil Salinity Management in Permanent Raised Beds

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Soil salinity in irrigated drylands

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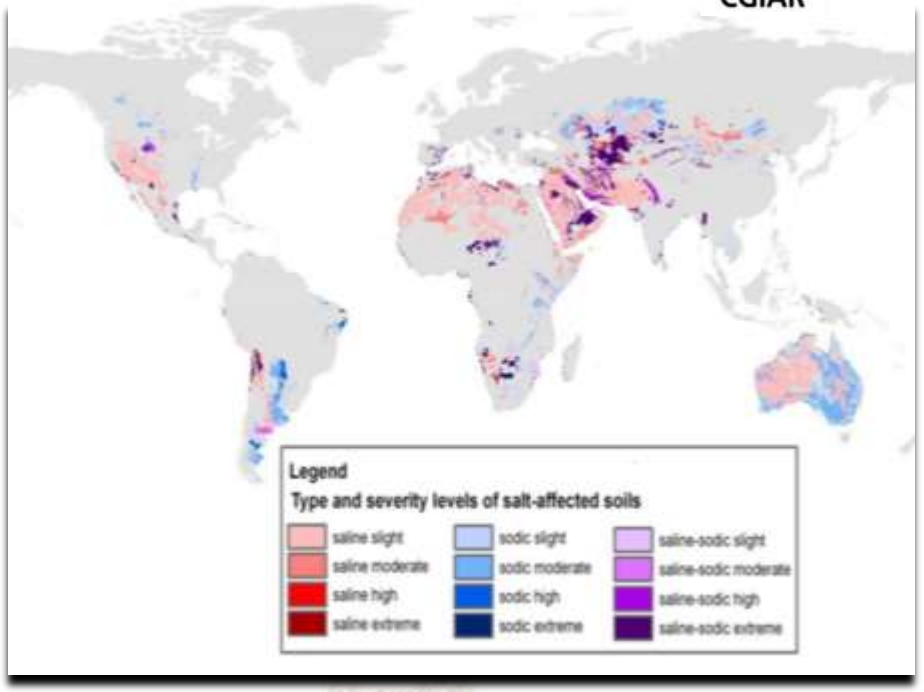
Soil salinity is major threats in irrigated drylands with shallow & saline groundwater

Globally, about 20%, i.e., 63 M ha of all irrigated arable land is salt-affected



Existing Agricultural Practices in Salt-affected Areas in Uzbekistan

Practice of salt leaching

Declining soil health
Increasing secondary soil salinization
Threatening overall sustainability of crop production

Intensive soil tillage

Flood irrigation-over irrigation

It demands innovations which helps to reduce
- Water application
- Improve soil health
- Reducing increasing primary and secondary soil salination

CONSERVATION AGRICULTURE: Permanent raised beds

- **Minimum soil disturbance**
- **Residue retention**
- **Crop rotation**

It helps to reduce

- amount of irrigation water: furrow irrigation
- evaporation loss due to residue cover
- primary & secondary soil salinization
- Better crop growth and crop productivity
- Improve soil health

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Managing soil salinity with permanent bed planting in irrigated production systems in Central Asia

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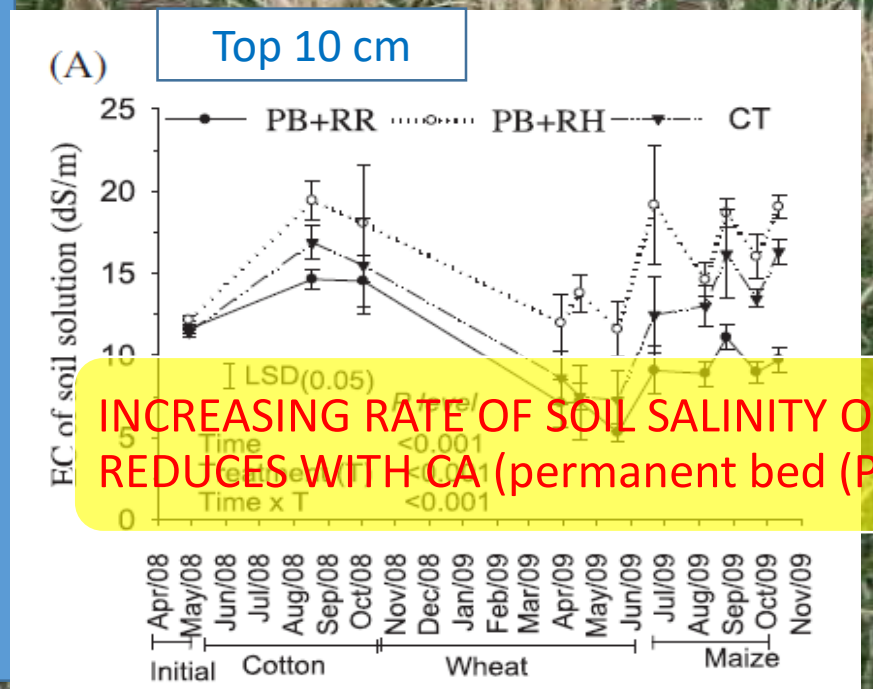
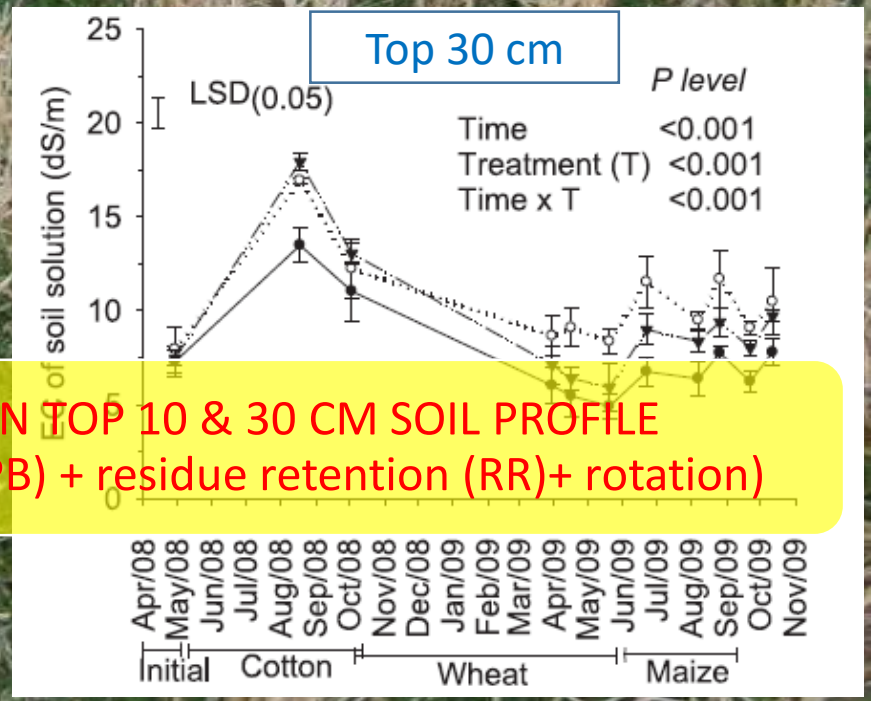
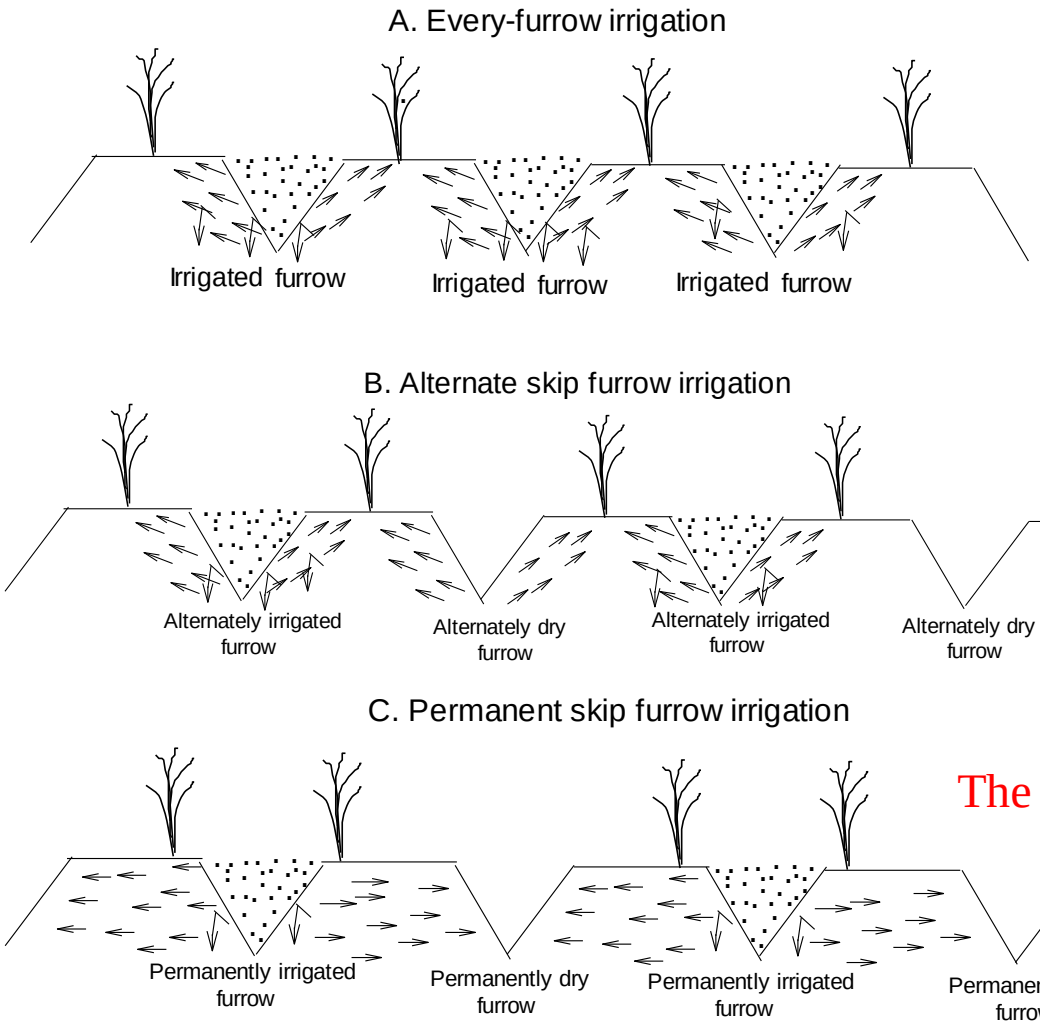




INCREASING RATE OF SOIL SALINITY ON TOP 10 & 30 CM SOIL PROFILE REDUCES WITH CA (permanent bed (PB) + residue retention (RR)+ rotation)

Objectives and Methodology

Objective: To understand the effect of different modes of furrow irrigation and leaching techniques on salt dynamics and crop performance on permanent raised bed



The arrows denote the direction of anticipated salt movement

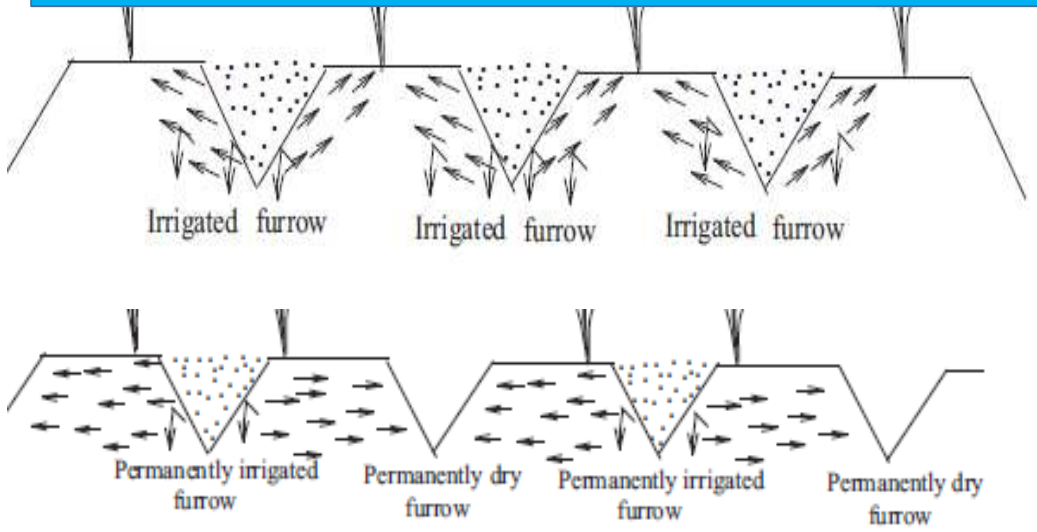
Salt Leaching Technique in Permanent Raised beds

For Leaching salt

Every furrow Irrigation (EFI) and Alternate Skip Furrow (ASFI): irrigation water was applied in all furrows at the same time

Permanent Skip Furrow Irrigation (PSFI): **S**alt leaching started by applying irrigation water to the permanently irrigated furrow first. After filling these furrows, the dry furrows were filled with to leach the accumulated soluble salts from the dry furrows.

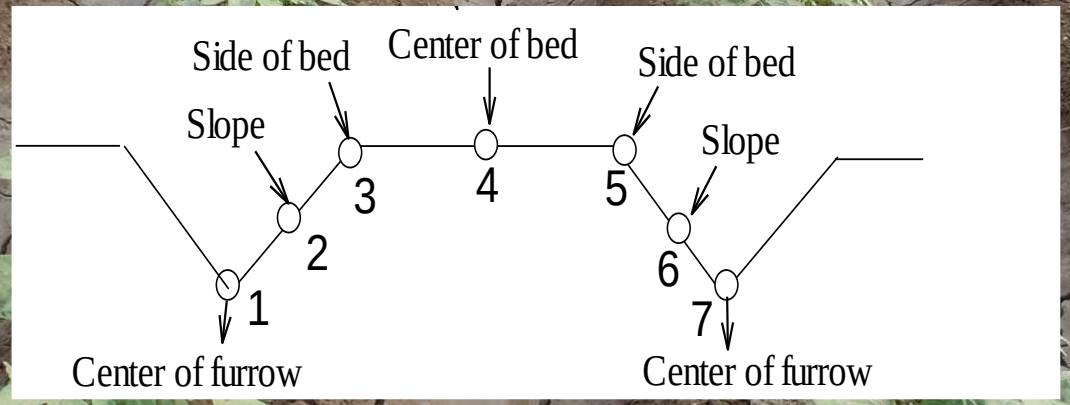
4–5 cm of standing water was kept for about 24 h to leach down the salts with water



GLOBAL SYMPOSIUM

Soil sampling for measuring salinity and crop performance

Soil samples were collected
Before start of the experiment,
Before leaching and
Few days after leaching

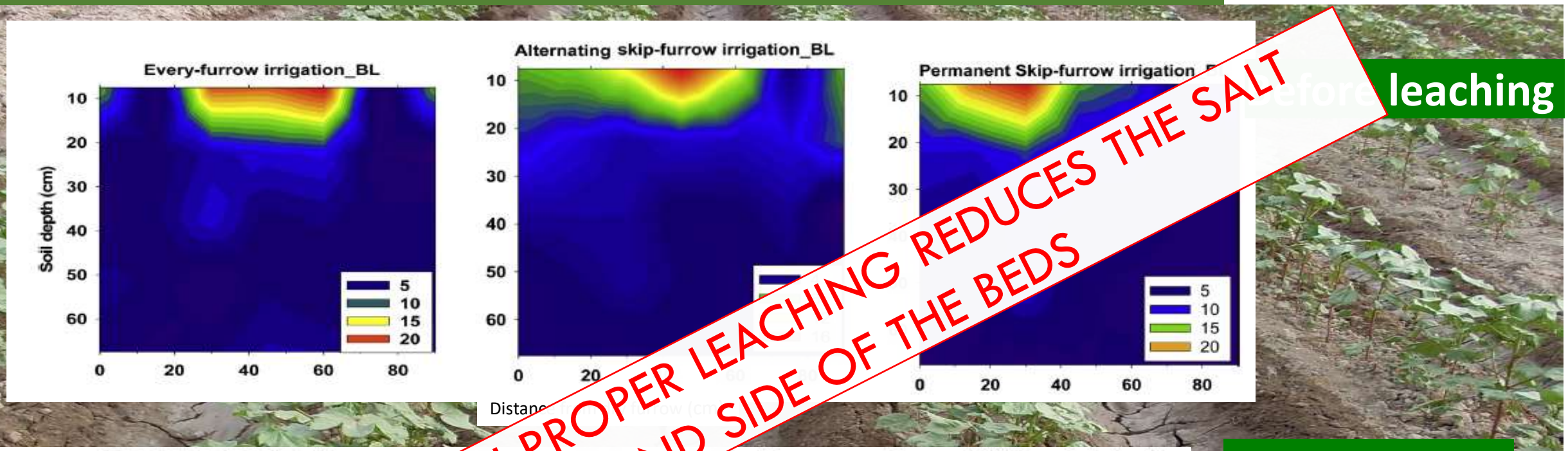


Up to 90 cm soil depth in each 15 cm depth

Cotton yield and yield attributes in different irrigation methods

Irrigation method	Cotton yield (kg/ha)	No. of bolls/plant	Boll weight (g)
EFI	1019 ±40	5.6 ±0.5	4.92 ±0.04
ASFI	1216 ±120	5.6 ±0.9	5.25 +0.23
PSFI	2003 ±182	8.7 ±0.01	6.05 ±0.15

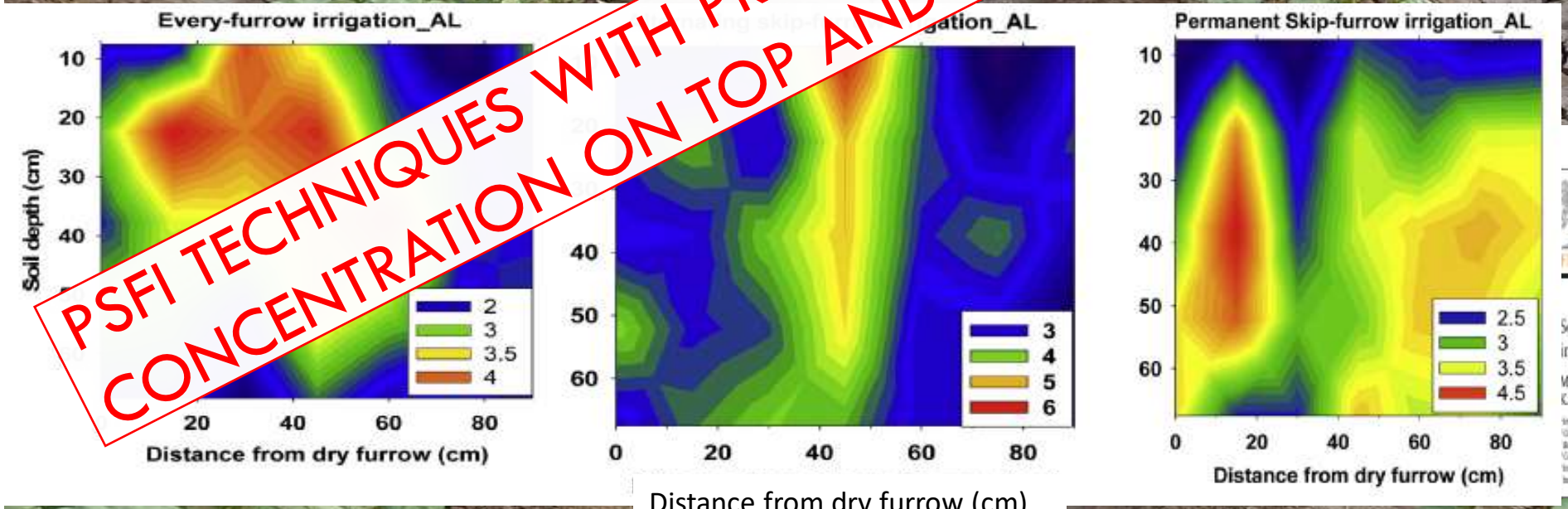
Soil salinity dynamics under different treatment



Before leaching

PSFI TECHNIQUES WITH PROPER LEACHING REDUCES THE SALT CONCENTRATION ON TOP AND SIDE OF THE BEDS

After leaching

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Soil salinity management on raised beds with different furrow irrigation modes in salt-affected lands

M. Devkota, R.K. Gupta, C. Martius, J.P.A. Lamers, K.P. Devkota, K.D. Sayre, P.L.G. Vlek

Summary and Conclusion

- Soil salinity on top of raised beds increases when irrigation water applied to both furrows flanking the beds
- Salinity level on the irrigated side of the furrow under PSFI was always low, and crop roots can grow in the direction of the low saline environment, resulting in higher yield under PSFI.
- In PSFI, salts accumulated towards the dry furrows and hence, this technology has the potential to reduce salt concentrations on the top and the side of the raised beds by 2-3 times compared to EFI and ASFI.
- PSFI facilitated efficient leaching and concurrently reduced the amount of irrigation water and also helps to minimize secondary soil salinization.
- PSFI could be an effective method to manage the salt under raised beds in salt-affected irrigated drylands.

Way Forwards

- The PSFI practice could be possibly more beneficial to farmers if salt-sensitive crops planted on the side of the irrigated furrows and a salt-tolerant less water requiring crop, on the side of the dry furrows : **Facilitate to diversify the cropping system**

- Further research is however needed to identify the combination of the salt-tolerant and susceptible crops/varieties to cultivate on raised beds with PSFI and its benefits to the farmers and the environment.


Thank You