SALAD
Saline AgricuLture for ADaptation

# Crops for saline farming

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# Why is saline soil a problem?

# Saline agriculture: the 4 SALAD crops

The case study species studied in the project are tomato (*Solanum lycopersicum*), potato (*Solanum tuberosum*), quinoa (*Chenopodium quinoa*), and New Zealand spinach (*Tetragonia tetragonioides*)




# Why these crops?

The four crops are not at the same stage of development and awareness among the **general public**

very promising fruit quality **improvements** under saline conditions

already **extensively screened** for their performance **in saline conditions**

still at an **early stage** of research/adoption

**Moderately sensitive crops** ---------- **Salt-loving crops**

# How do plants deal with salt stress?


salinity

Several mechanisms are present in both salt sensitive and salt tolerant species

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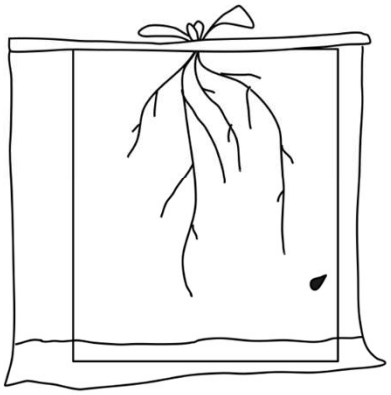
Several mechanisms are present in both salt sensitive and salt tolerant species,
while others have been developed in saline environments specifically to deal with high salinity

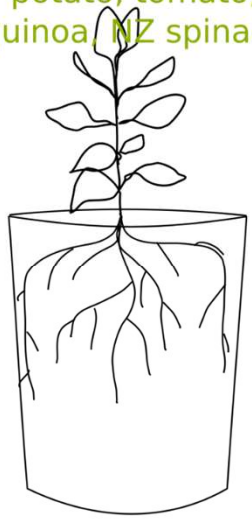
# Investigating crop performance and plant mechanisms to deal with salt stress

## RHIZOSLIDES
quinoa, NZ spinach



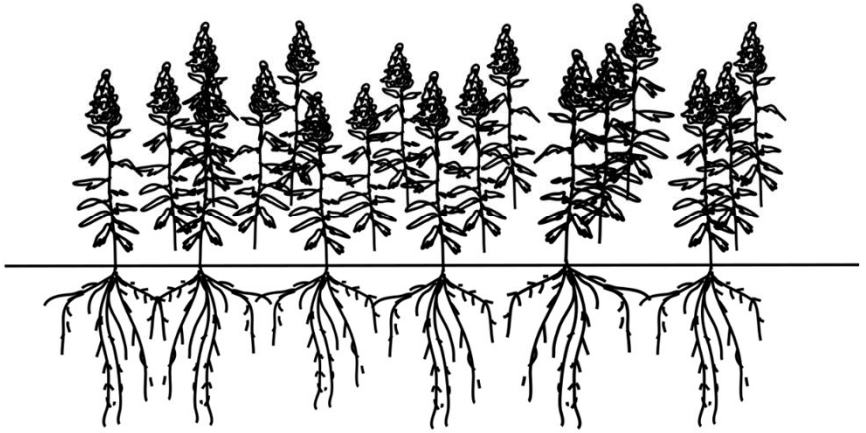
salinity levels x climate

## POT EXPERIMENTS
potato, tomato,
quinoa, NZ spinach



salinity levels x soil texture
(x amendments)

## FIELD EXPERIMENTS
quinoa



salinity levels
in a realistic production environment

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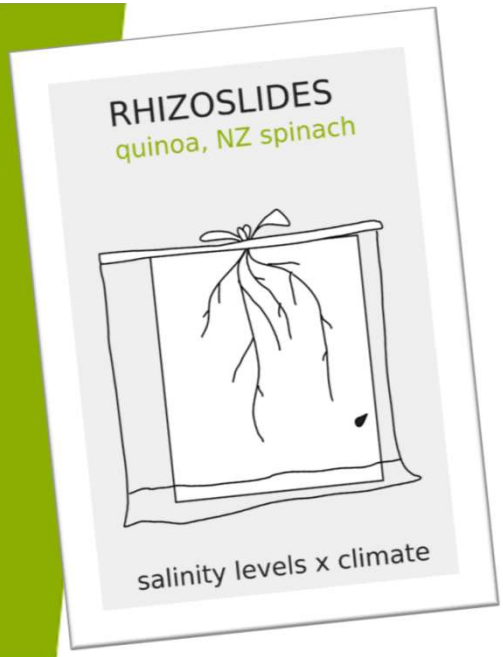
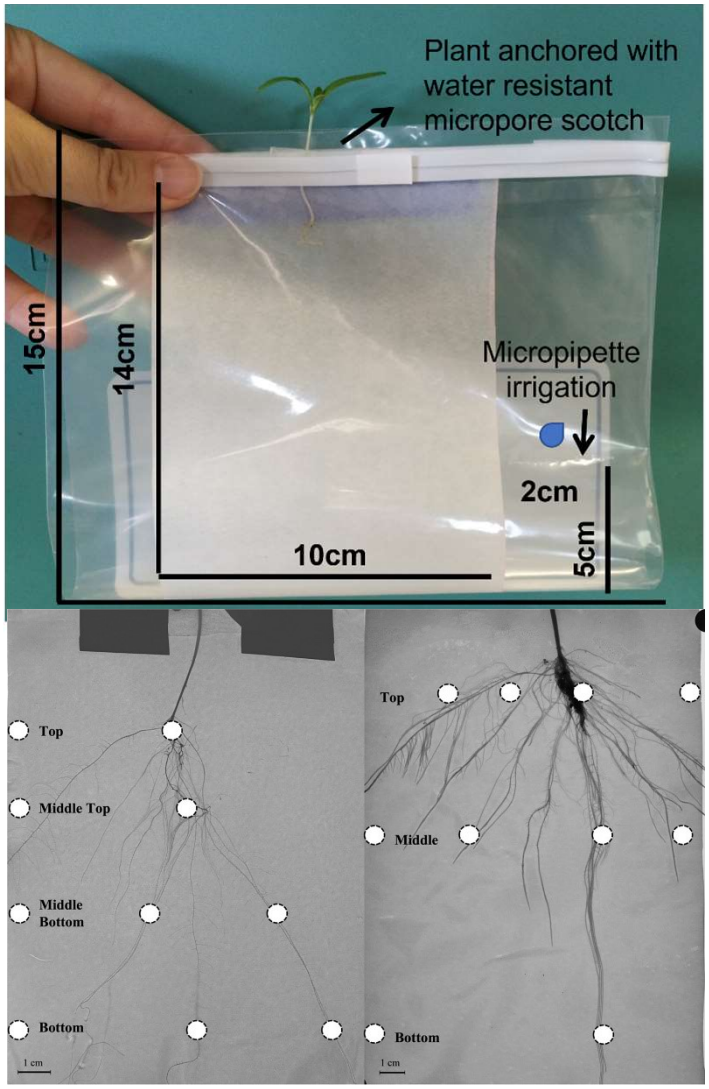



active salt uptake

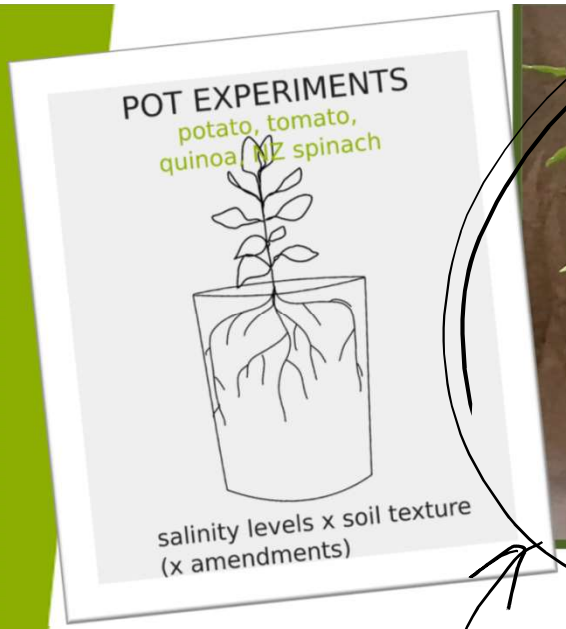



salt exclusion

varieties responded ≠ to increasing salt concentrations

**NZ SPINACH** ( Italy)

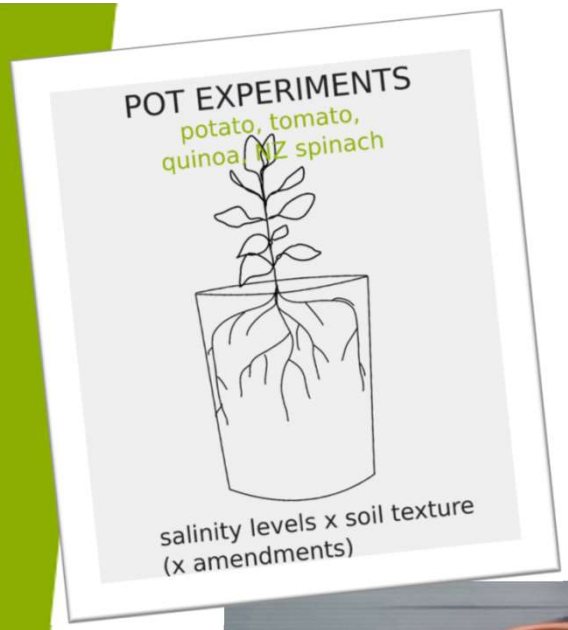
**QUINOA** ( Belgium )




Plants with amendment grow better under salinity

**QUINOA** (Morocco)

- organic amendments improve plant growth and yield under salinity
- amendments + biostimulants improved tolerance even more

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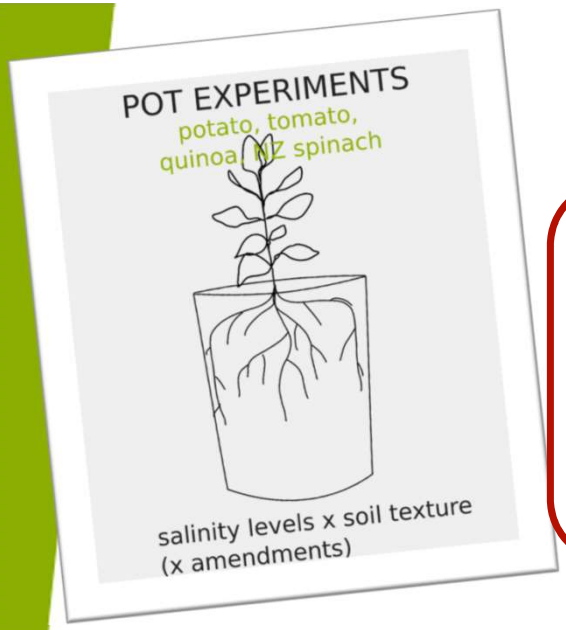
**NZ Spinach**
(Italy)

- interaction between evaporative demand, soil type and irrigation water salinity
- yield highest in spring trial in sandy soil
- Na+includer behavior

→ phytodesalinization?!

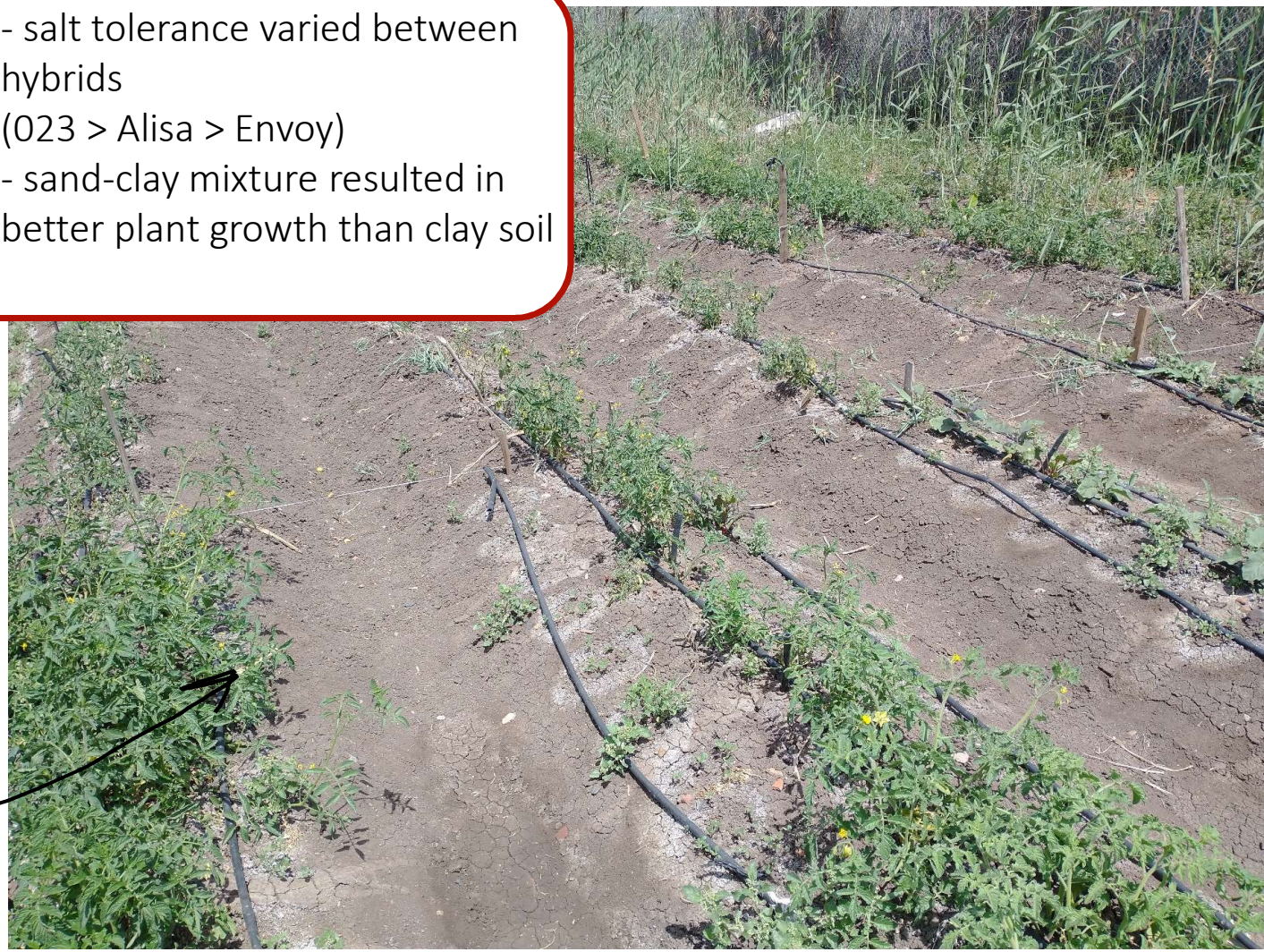
control | 100mM NaCl | 200mM NaCl

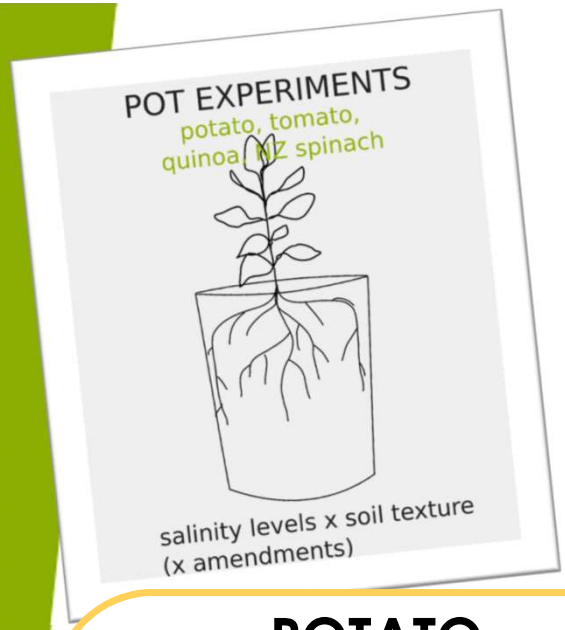



**TOMATO**
(Egypt)

- salt tolerance varied between hybrids
(023 > Alisa > Envoy)
- sand-clay mixture resulted in better plant growth than clay soil

Also in the field, varieties respond very differently to salinity

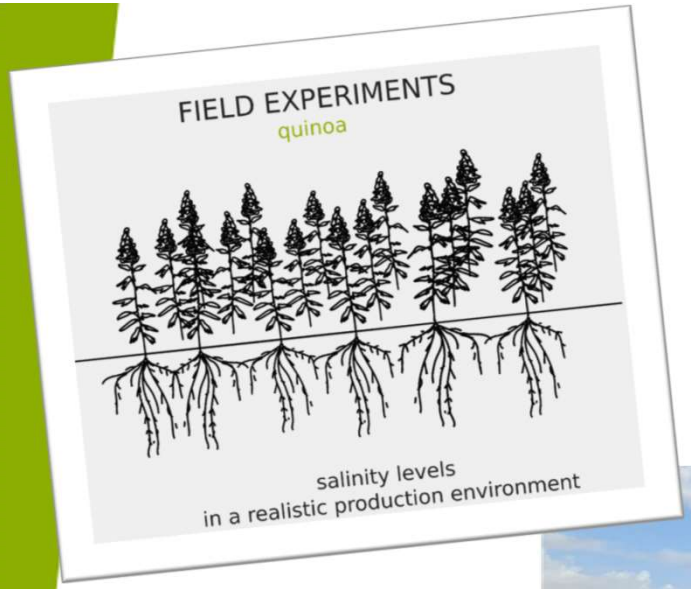






**POTATO**
(Netherland)

- stem length reduced 24% (variety actrice), 31% (Mozart), 50% (Mozart) under saline irrigation
- no clear evidence of root length being affected by salinity




- adding organic amendments  improves quinoa yield under saline conditions (up to a 40%!)
- effect smaller if also water stress, but still improved yield
- Titicaca = robust variety for saline farming in Moroccan conditions

# Conclusion

- Significant variability in salt tolerance between 4 species, but also within one species (quinoa)!
- Includer vs. Excluder behavior important for decision-making → also affects salt build-up in the soil
- Interaction of atmospheric conditions, soil and plant physiology significant and to be considered for upscaling saline farming to regions with different pedo-climatic conditions
- → potential of soil-crop models to help in targeted experimentation for efficient upscaling?

# A collective effort

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# Thank you!

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