Agriculture and Irrigation with Brackish Water in Desert Areas

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outline

- “Hot and dry” – a short introduction to Israel’s southern deserts
- Saline (recycled waste water and groundwater) water resources
- Success stories – three case study crops
  - dates, peppers, olives
- Managing brackish irrigation water
  - The high cost of leaching
  - Environmental responsibility
    - Drainage collection and disposal
    - Desalination
- Conclusions - Can Israel’s experience benefit adaptation approaches for climate change?
  - Sustainable?
  - Appropriate for developing countries?

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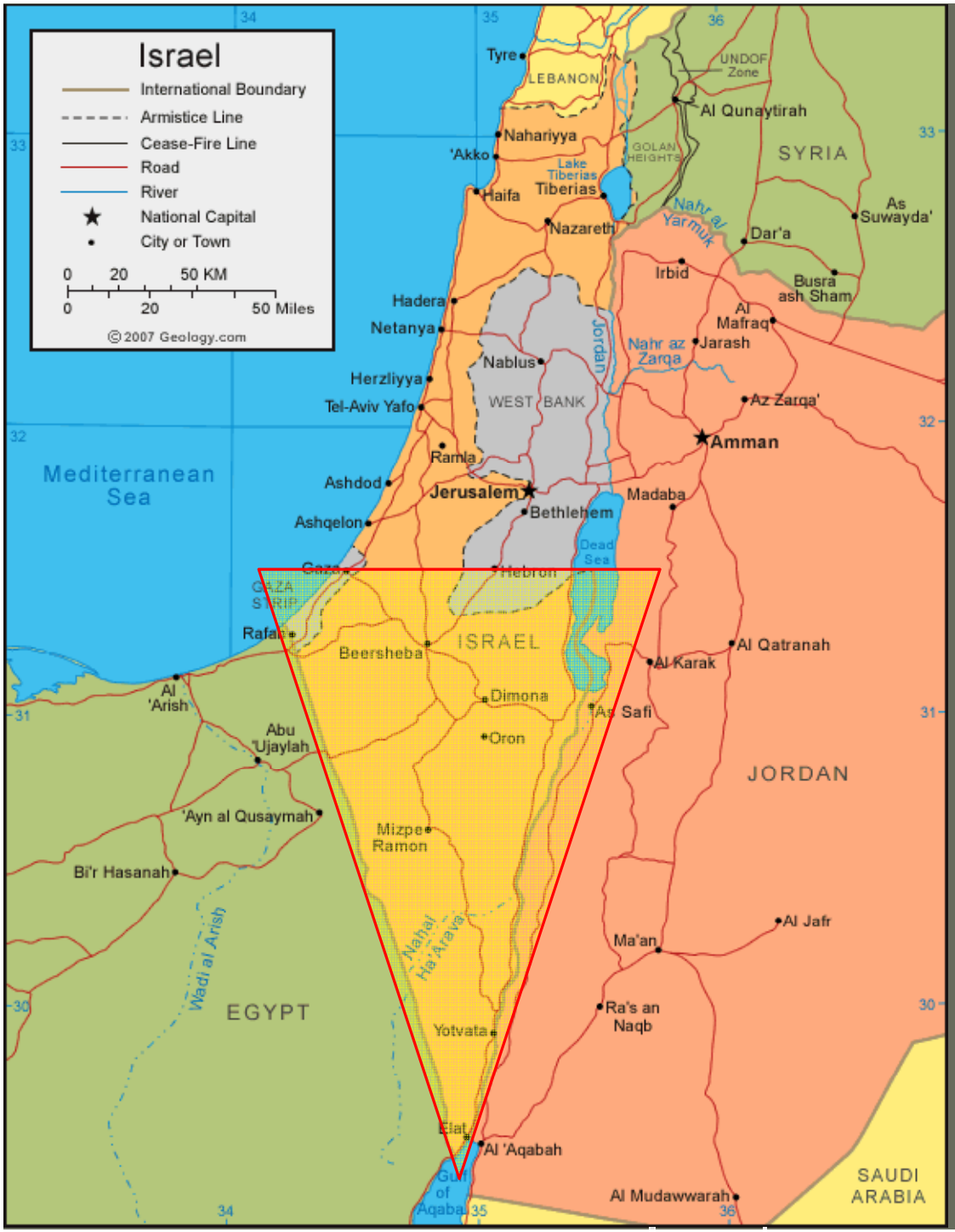
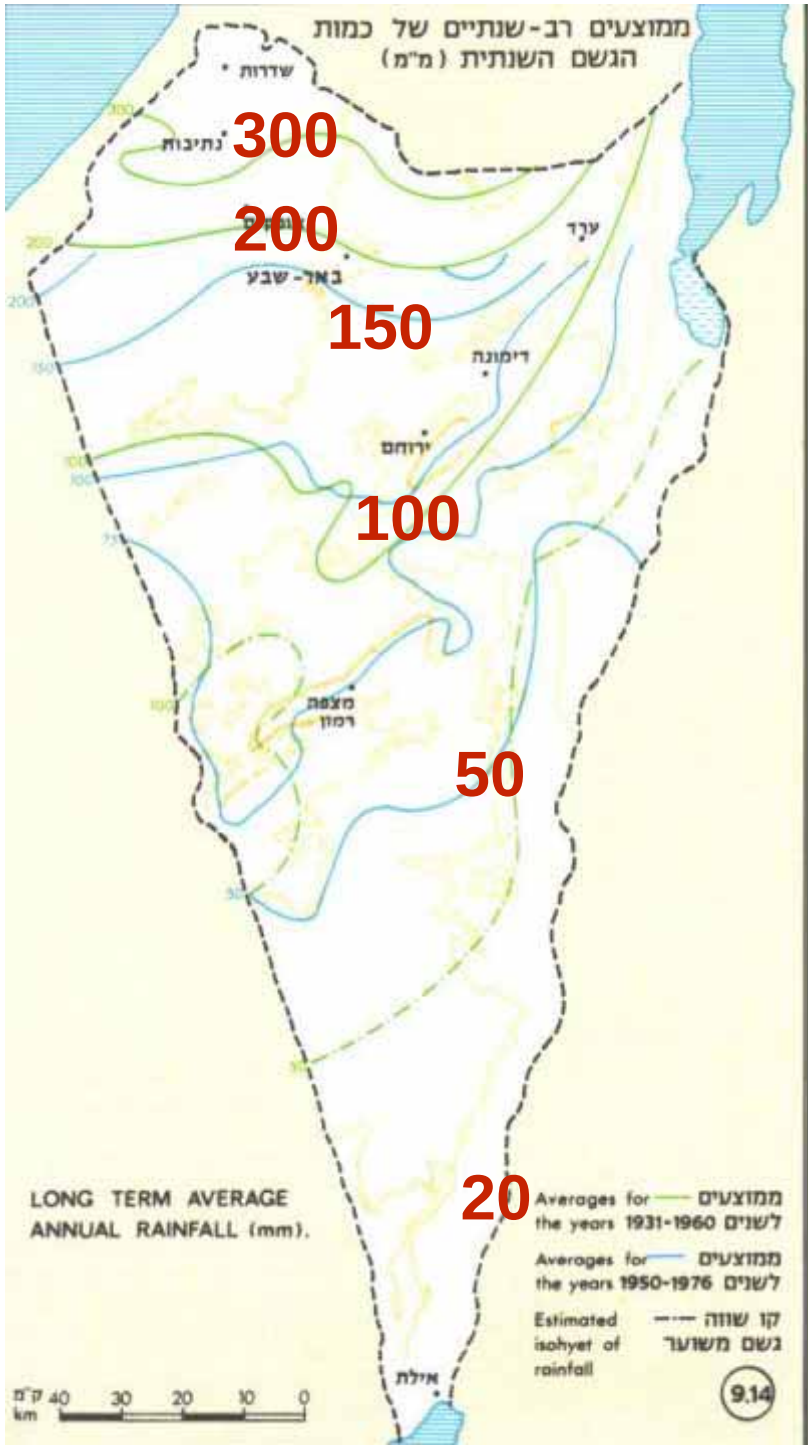
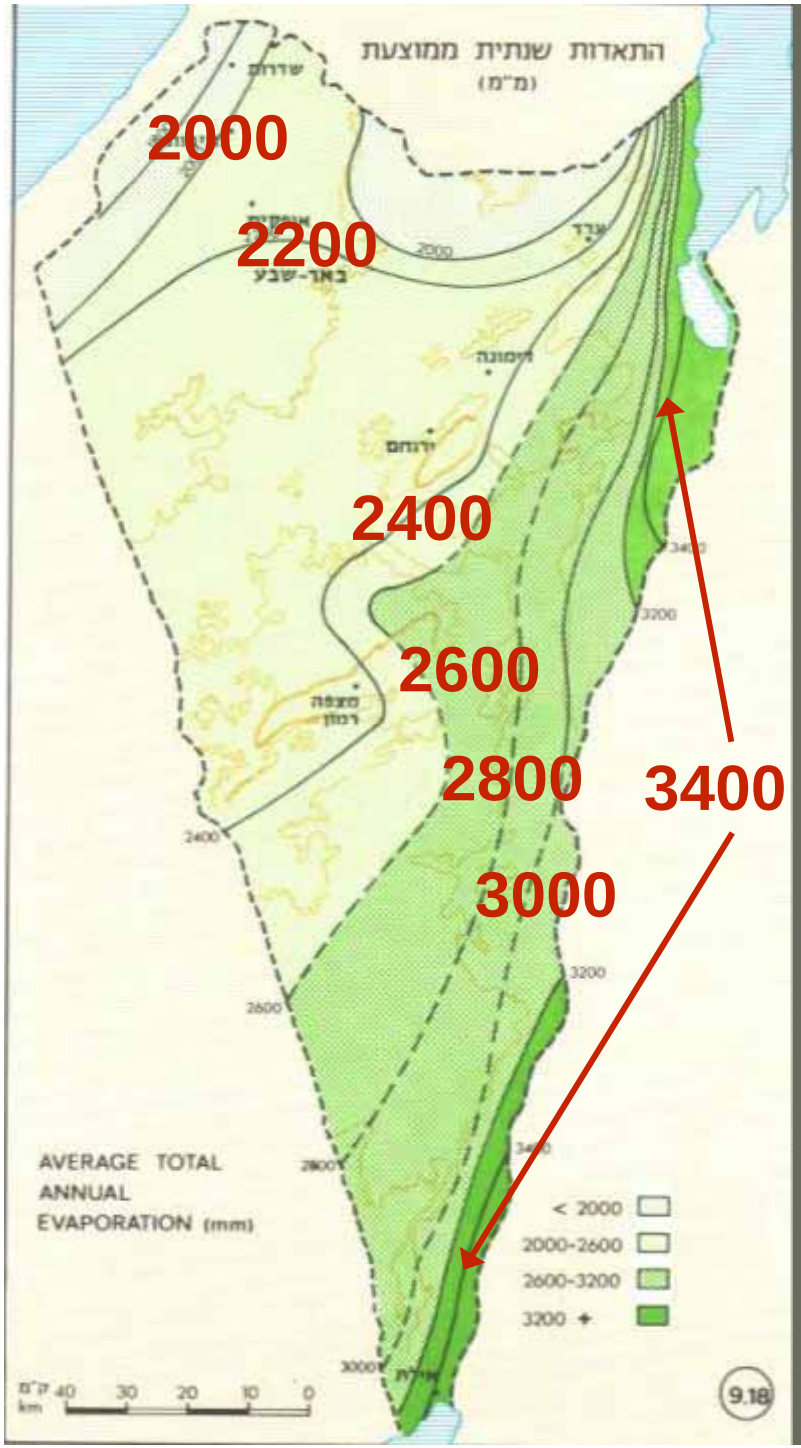


Israel and The Negev



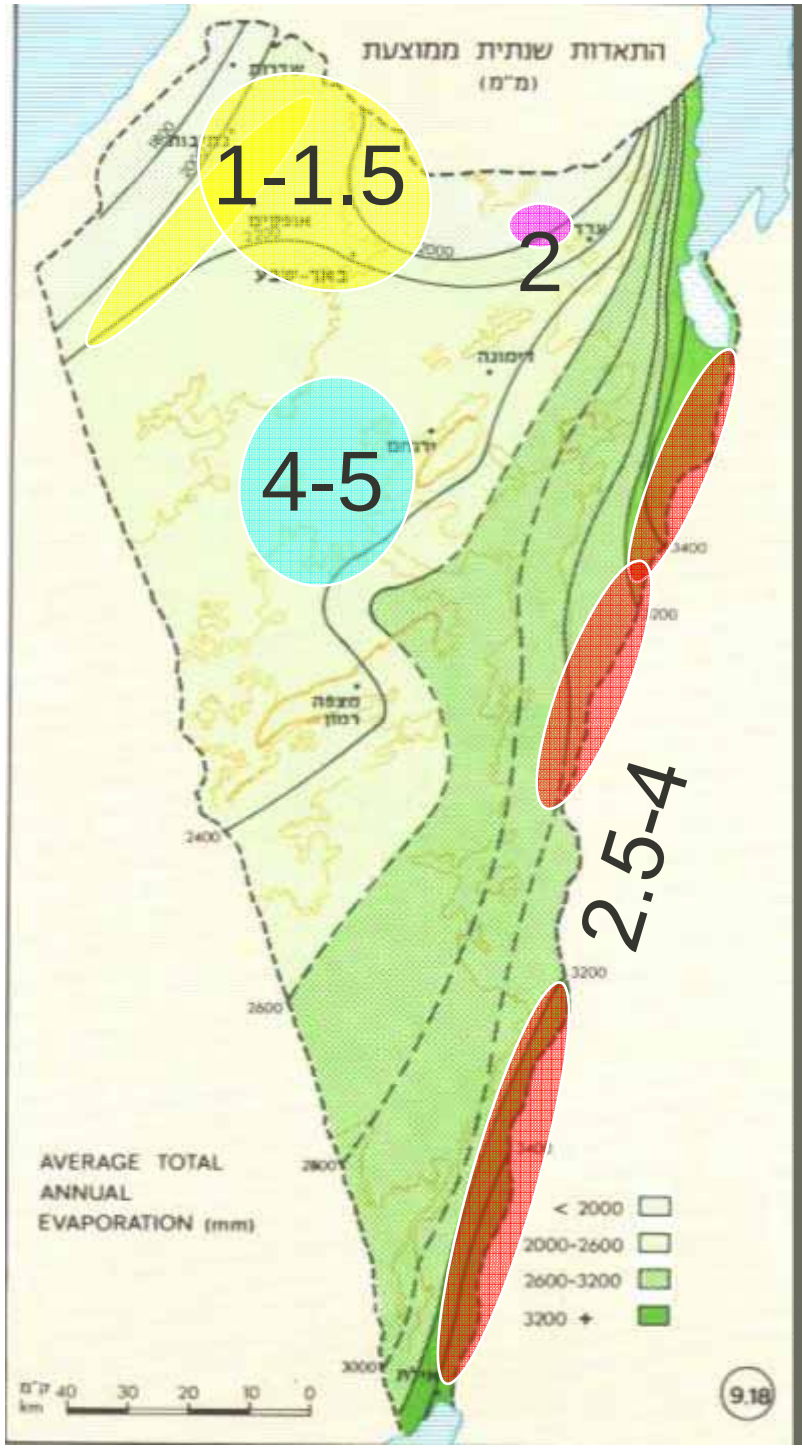
Israel's Negev desert-rainfall

Annual rainfall (mm)
Long term averages
All falls in the winter (Nov-March)



Israel's Negev desert– potential evaporation

Annual average water loss (mm)



Irrigation water sources

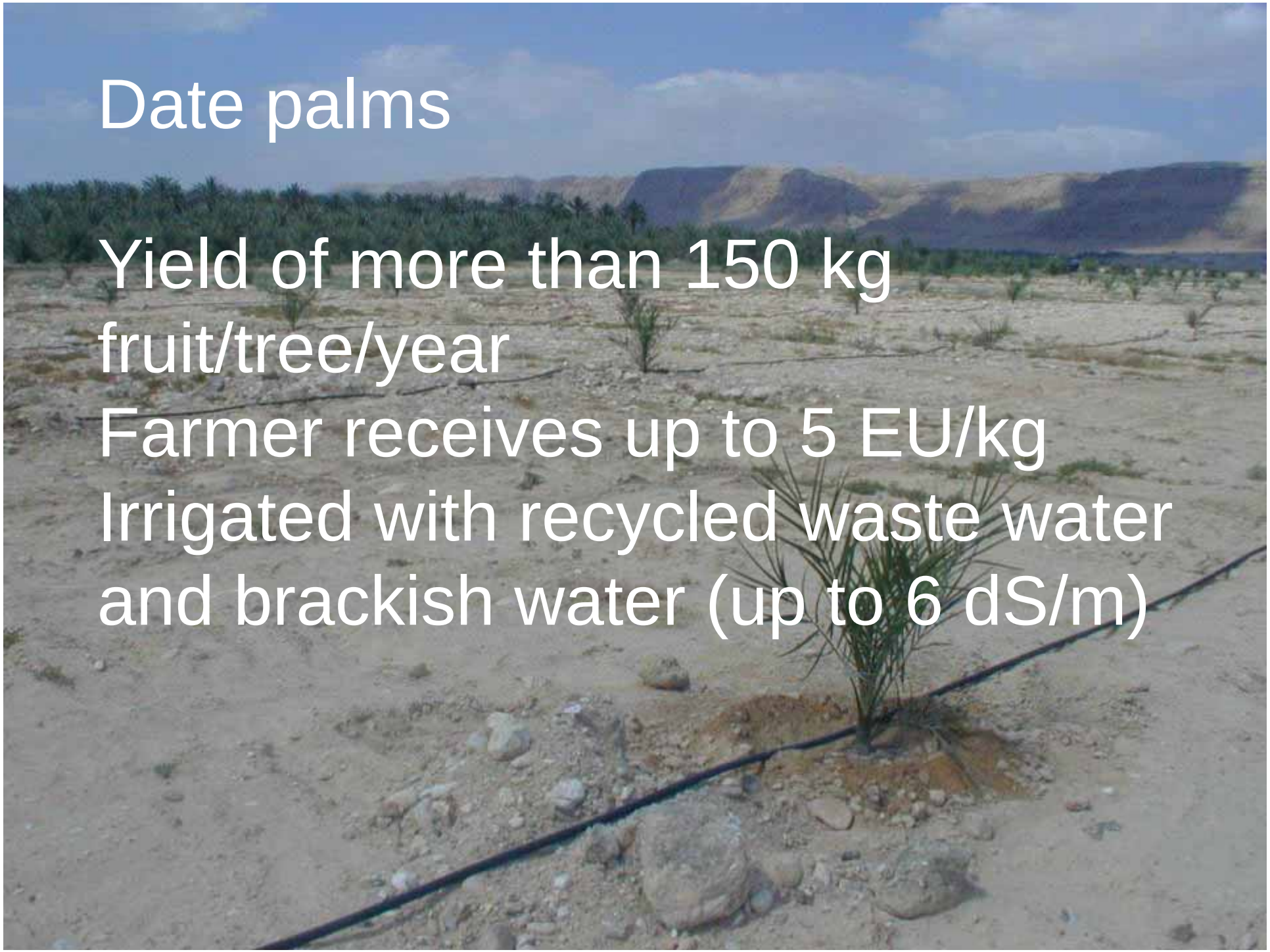
Electrical conductivity (EC) is a measure of salinity

Good quality water < 0.5 dS/m

Available water in Israel's deserts 1 – 5 dS/m

Success story #1: Date palms

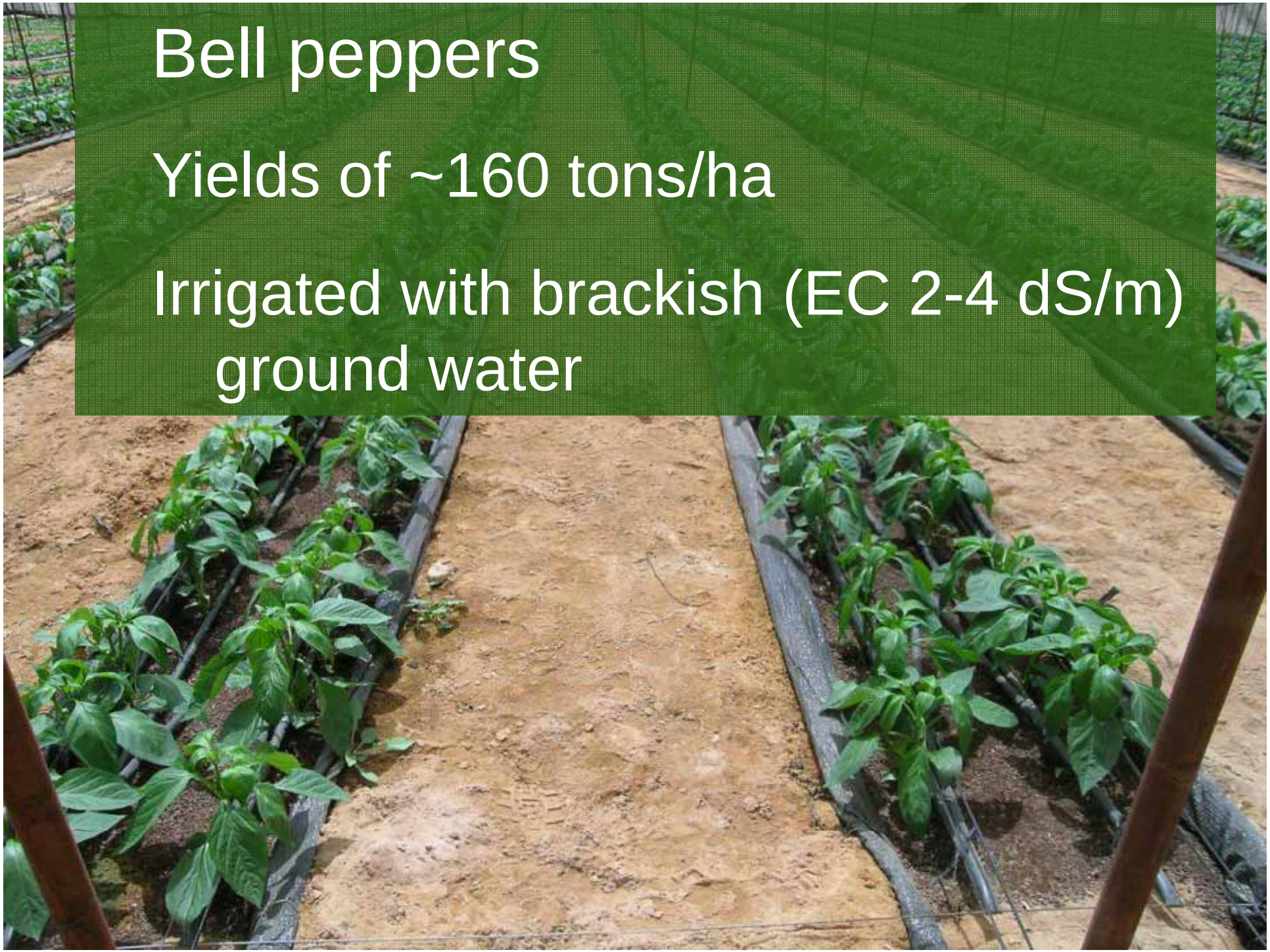
Native, intensified



Date palms

Yield of more than 150 kg fruit/tree/year
Farmer receives up to 5 EU/kg
Irrigated with recycled waste water and brackish water (up to 6 dS/m)


Success story #2: Bell Peppers
No adaptation to desert


Bell peppers
Yields of ~160 tons/ha
Irrigated with brackish (EC 2-4 dS/m) ground water

Success story #3: Olives

Modernization allows movement into deserts

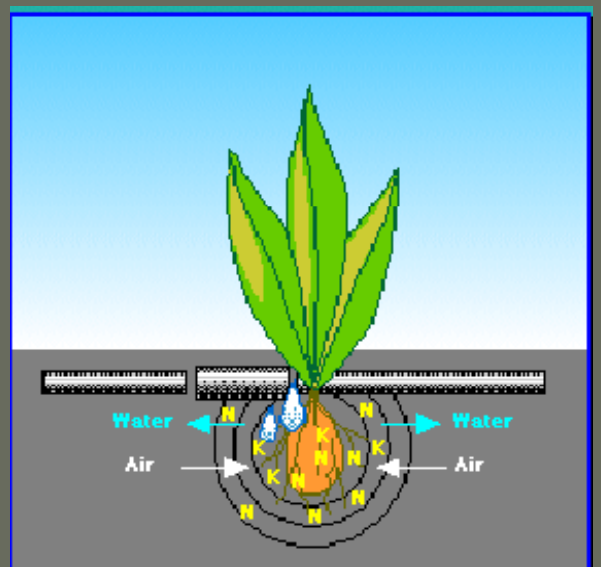

olives

Olives

- irrigated with recycled wastewater or with brackish groundwater (4-5 dS/m)
- >2,000 L/ha
- stress good for oil quality

Agricultural success in dry areas and saline water

- Crop choice for economic success – not food supply
- Technologically advanced
  - Excellent growers
- Drip (micro) irrigation



Drip irrigation

- Partial soil wetting
- Provide plant water and nutrient needs efficiently
- High frequency application
- High water content in root zone + good aeration
- Less concentrations of salts in root zone

Agricultural success in dry areas and saline water

- Crop choice for economic success – not food supply
- Technologically advanced
  - Excellent growers
- Drip (micro) irrigation
- Management of salts

Increasing salinity causes decreased production

Osmotic “drought”
Toxic ions

High climatic demand for water + low rainfall

+

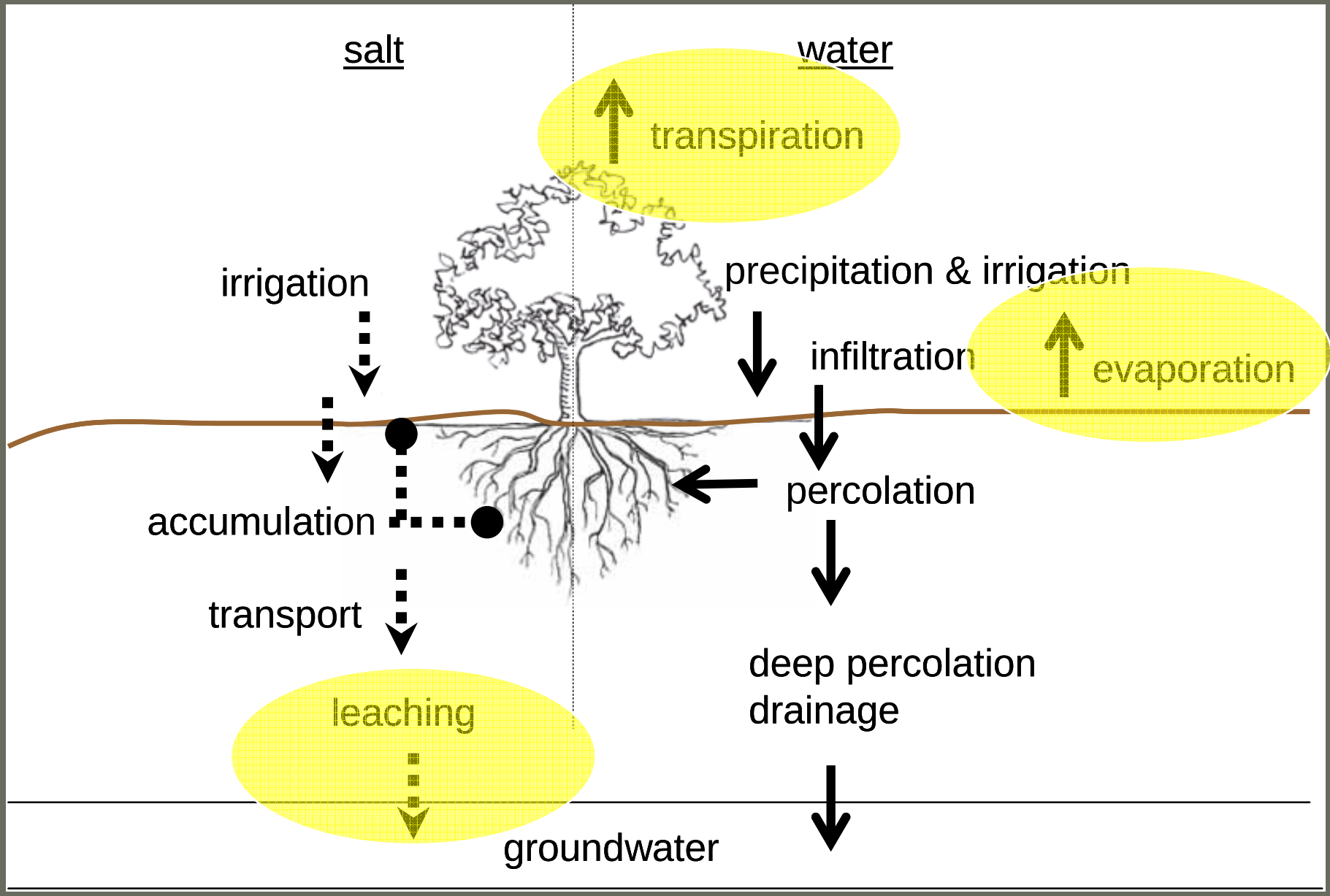
Low quality (high salts) available water for irrigation

=

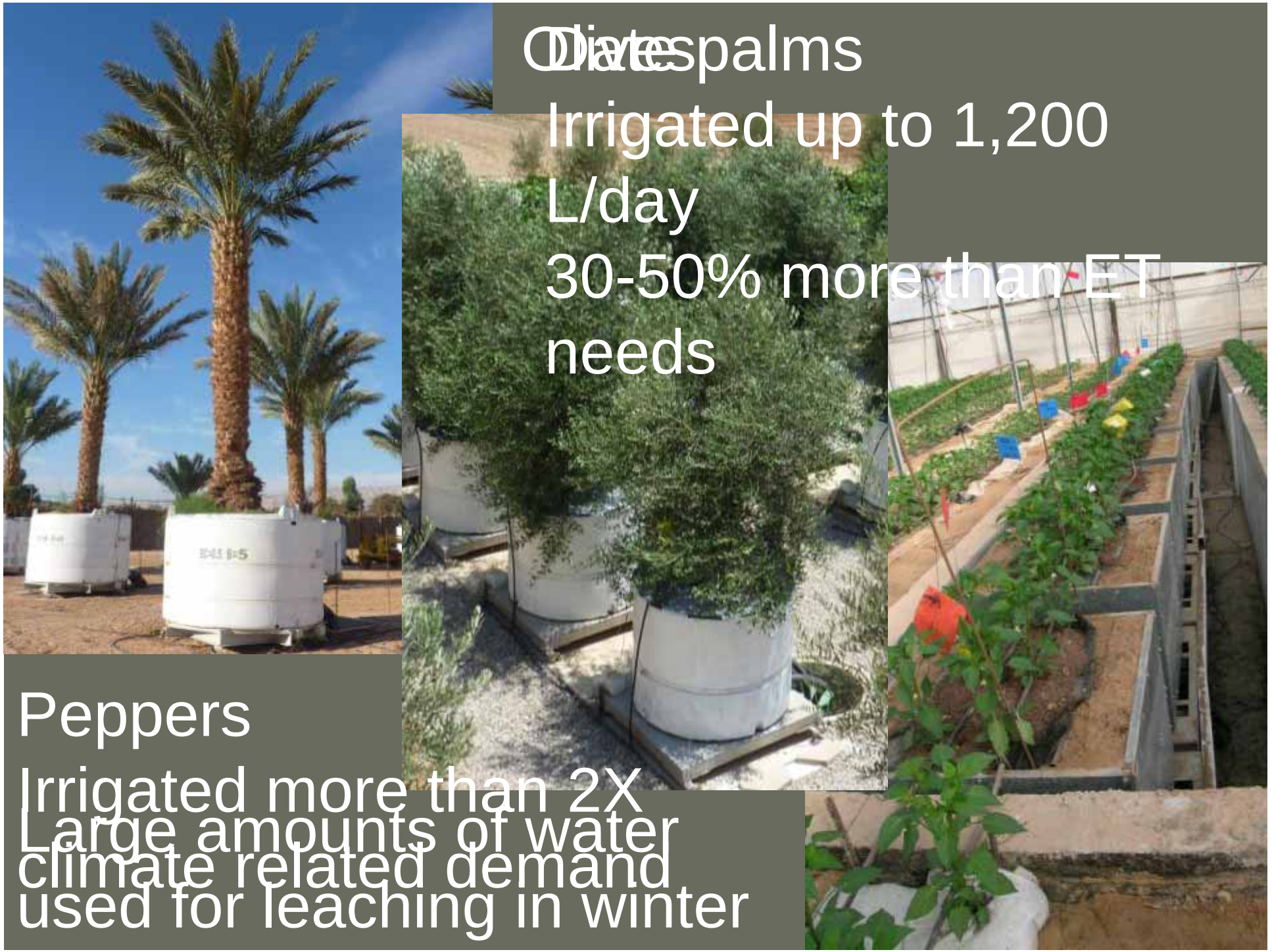
Salt (as NaCl) in a single irrigation season:

pepper in net house in the Central Arava Valley ~6000 kg/Ha
olives in Negev Highlands ~7500 kg/Ha
dates in Southern Arava Valley ~13000 kg/Ha

Irrigation needs:



measuring and modeling to evaluate plant water and leaching requirements



Dates

Date palms

Irrigated up to 1,200 L/day

30-50% more than ET needs

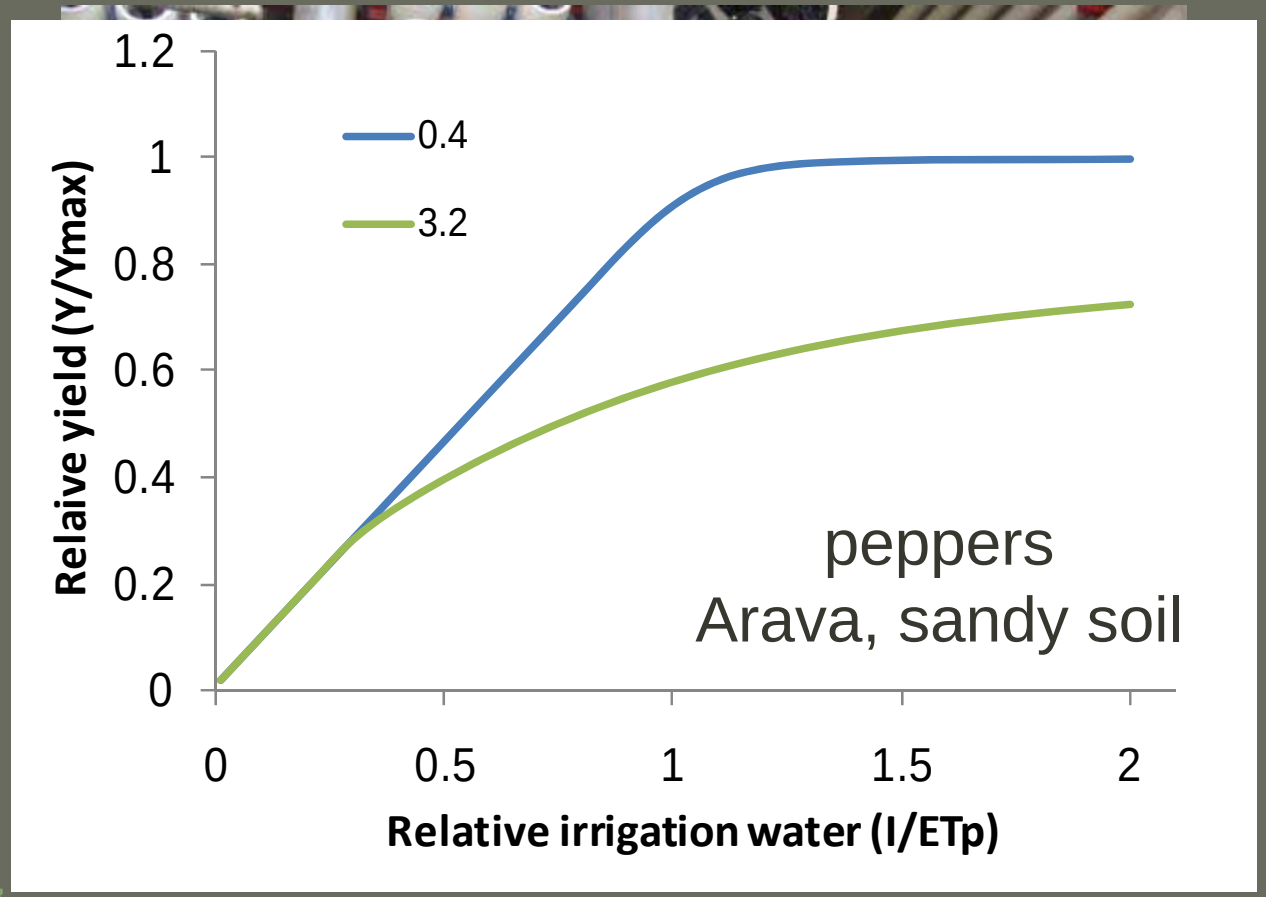
Peppers

Irrigated more than 2X climate related demand

Large amounts of water used for leaching in winter

Sustainable management of salts

- Drainage collection and disposal
- Desalination of water prior to irrigation



Conclusions: irrigation in the Israel's deserts using brackish water

- Economic success (but not necessarily food security) is possible
  - Technology / investment
  - High value crops
- Consequences of irrigation with saline water
  - Need for leaching of salts
  - Environmental implications
- To be sustainable – salts must be managed
  - Deep percolation of leached salts is environmentally irresponsible –
  - Desalination can be more effective (cost and environmentally) than drainage collection for salt management and has great benefit to agriculture

Conclusions: irrigation in the drylands using brackish water

- Can we apply Israel's achievements towards adaptation measures for those facing increased hot and dry climates?
  - Irrigation will be necessary. Micro-irrigation allows most efficient use of water
  - Sustainable irrigation management?
    - Salinity management
      - Drainage collection and disposal
      - Desalination
  - Relevant to developing regions/economies?
    - Incentives/assistance as economies grow

Thank you

For more information

Agricultural Research Organization of Israel:

http://www.agri.gov.il

MASHAV - Israel's Center for International Cooperation

http://mashav.mfa.gov.il

CINADCO - The Center for International Agricultural Development Cooperation

http://www.cinadco.moag.gov.il/

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