Irrigation – An Overview

Part I: Background on Irrigation and Irrigation Techniques
“Irrigation is the artificial application of water to overcome the deficiencies on rainfall for the growing of crops.” (Cantor, 1970)
Challenges for agriculture and the importance of irrigation

Population growth
- in 1900 - 1.6 billion
- In 2006 - 6.5 billion
- Change in lifestyle: higher demand of food

Green revolution
- Started in 1944
- Increase the food production by irrigation
Challenges for agriculture and the importance of irrigation

Problem: Water Scarcity

Challange: produce more food out of less water
Natural factors influencing agricultural irrigation

Climate classifications

Hydrological cycle

Evapotranspiration

Climate

Soil texture

Field capacity

Soil

Slope of the Farmland

Relief

Runoff

Waterbalance

Precipitation

Retention

Evaporation
Traditional irrigation methods

- Canal system
- Flood irrigation
- Furrow irrigation
- Archimedes screw
- Scetch of a kanat
- Noria water weel
Modern irrigation systems

Subsoil irrigation

Drip irrigation

Drip irrigation covered with plastic foil

Modern irrigation systems

LEPA-MMI
(low energy precision application
– mechanical move irrigation)

Sprinkler irrigation
Irrigation – An Overview

Part II: Problems and Possible Solutions
Subdivision of problems

- **Environmental problems**
  - Salinization of the soil
  - Evaporation & overexploitation of water sources
  - Impact on the groundwater table
  - The hygiene of irrigation water
  - Building of embankment dams

- **Social- & Political Problems**
  - Conflicts between neighbouring states
  - Conflicts between social groups
  - Subsidies & foreign aid
  - Tourism
Salinization of soil

1. Irrigation
2. Upward moving of the salts due to e.g. capillary effects
3. Evaporation of the water \(\rightarrow\) Salts precipitate
   \(\rightarrow\) Affected plant growth and crop yield
Overexploitation of water sources

► Example: The Aral Sea

Shrinkage of the lake due to the use as irrigation water

1960: 68,000 km² (salt content: 10 g/l)
1987: Splitting of the lake
1998: 29,000 km² (salt content: 45 g/l)
2004: 17,160 km²

Impact on groundwater table

- Decreasing water table
  - saltwater intrusion
  - subsidence
- Increasing water table
Waterlogging

- Decreasing water table
- Increasing water table
Conflicts between neighbouring states

► Disi-Aquifer
► GAP: Southeastern Anatolia Project
  (Turkish: Güneydoğu Anadolu Projesi)
► The Jordan-Basin
Subsidies & foreign aid

► Example: Spain

EU subsidies provoked many farmers to neglect their irrigated land. Many fields show less cover due to careless seeding.
**Possible Solution**

<table>
<thead>
<tr>
<th>Enlargement of the water supply</th>
<th>Reduction of the water demand</th>
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<tbody>
<tr>
<td>• water imports</td>
<td>• education</td>
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<td>• desalination plants</td>
<td>• computerized sensors</td>
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<tr>
<td>• &quot;water harvesting“ (use of rain water and snow melts)</td>
<td>• drip irrigation</td>
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<td>• cultivation of salt tolerant plants</td>
<td>• lining of irrigation pipes</td>
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<td>• integrated planning</td>
<td>• cultivation of water-thirsty crops in aride or semiaride regions?</td>
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<td>• contracts between different consumers</td>
<td>• increased water prize</td>
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<td>• less subsidies</td>
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