Managing groundwater: links between California and Morocco

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Linking irrigation development in California and Morocco through broad analogies

1. The “California dream”, Morocco producing high-value fruits and early vegetables for the markets of Europe:
   - High number of missions to California > 1928
   - California as a “beacon that could guide colonial Morocco out of its dark agricultural crisis” through its fruit industry (oranges, almonds, apricots, plums etc.)
   - Morocco had not only “California’s mild climate, water resources and rich earth”..., but had low labor costs and was also admirably situated near the large European markets (Swearingen, 1986).
   - Policy of big dams: 1 million ha of irrigated land

2. Inverse travel: Medjool date production in Imperial County, Ca > 1944

3. California as an innovation hub: e.g. Conference in Morocco on drip irrigation by Dr. F.K. Aljibury (Univ of Ca) and Mr. Norton (Rain-Bird International) on Octobre 5, 1972

4. California and Morocco faced with the limits of an irrigation model
   - issues of surface water scarcity, groundwater overexploitation
   - “Ground water management is a major issue in California” (Water Resources Bulletin 118-1980)
The Tadla irrigation scheme: a Moroccan California?

• “at the beginning of the 1950s, [the Moroccan California], imagined for us an objective and programs passionately pursued” (Préfol, 1986)

• 100,000 ha large-scale irrigation scheme

• Two big dams

• Citrus fruits, sugar beet, cattle rearing, cereals
Surface water from dams: an increasing deficit from the 1980’s onwards

- Droughts
- Extension of other irrigation schemes (Doukkala, Haouz)
- Other uses: drinking water, industry

Source: Ormvat
Looking for water: a rich multiple layer aquifer system
A silent revolution since the 1980’s: development of a conjunctive use environment

Coupled with economic liberalization

Source: Hammani et al, 2009
Increased pressure on aquifers
Synthesis: a forty-year conjunctive use environment

- Decreased surface water availability
- Groundwater overdraft
- Inequalities: 46% farmers have access to GW on 70% of the area

Source: Kuper et al., 2012
Two options considered in 2007

Option 1: reinforcement and correction conjunctive use
• What are the complementarities between dam water and groundwater?
  • The water cycle
  • Flexibility vs. volume
  • Drought management (annual, multi-year)

Option 2: Conversion to localized irrigation
• Re-centralize water management (rationalization)
• Reduce groundwater use
An ambitious drip irrigation program

• Individual conversion on 39,700 ha
• Collective conversion on 49,000 ha
• Results in 2018: 25,000 ha individual, 10,000 ha collective
• However, farmers link the public surface water drip irrigation system to private (tube-)wells → continued concerns for groundwater overdraft
Groundwater management: a continued concern in both contexts?

• The notion of circularity, linking surface water and groundwater
• The difficulty of controlling groundwater overdraft
• The continued emphasis on increasing supplies (transfer, desalination)
• Increased uses outside of agriculture: the shift of drinking water from groundwater to surface water
References


