IMPETUS Morocco

Assessing water use, groundwater availability and soil salinity in the Middle Drâa basin

S. Klose [1], A. Klose [2], C. Rademacher [3], H. Busche [2], O. Schulz [2] and B. Reichert [1], B. Diekkrüger [2], M. Rössler [3]

[1] *Steinmann Institute - Geology, University of Bonn, Nussallee 8, Bonn*
[2] *Institute of Geography, University of Bonn, Meckenheimer Allee 166, Bonn*
[3] *Institute of Cultural and Social Anthropology, Albertus-Magnus-Platz 1, Cologne.*

Introduction

Availability and quality of surface water from the upstream reservoir Mansour Eddahbi and individually pumped groundwater determine irrigation within the six Drâa oases.
In order to cover the irrigation demand more and more alluvial aquifers are tapped which are located beneath each oasis.

Problems:

- Water scarcity and soil salinity restrict agricultural production
- Recurrent droughts, unplanned groundwater mining, groundwater and soil salinity as well as population growth and urbanization are the major problems.

Support for solutions

- Interdisciplinary work provides:
  - Assessment of surface water availability from the reservoir Mansour Eddahbi
  - Assessment of domestic water consumption
  - Assessment of crop water demand
  - Groundwater balance modelling
  - Soil salinity modelling
- The developed Spatial Decision Support System IWEGS provides system analysis and the simulation of management options concerning groundwater and soil.

Domestic water use

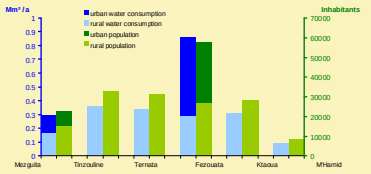

Fig. 9.: Domestic water consumption (2000) accounts only to a minor fraction of the total water demand, whereas the consumption of the urban population is disproportional high in comparison to the rural population (cp. P21).

Crop water demand

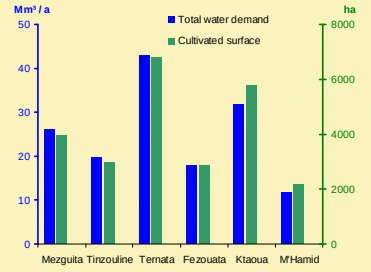

Fig. 8.: Average annual crop water demand and size of cultivated area of the oases (2001-2006) depend on crop compilation and climatic conditions.

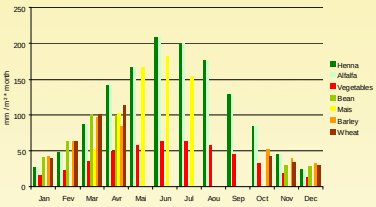

Fig. 7.: Average monthly water demand of the main crops for the oasis Mezguita (2001-2006).

Soil salinity

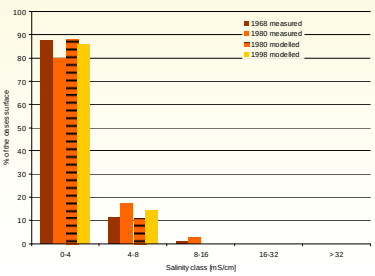

Fig. 6.: Comparison of measured (1968, 1980) and modelled (SahysMod) soil salinity (1980, 1998) for the oasis Mezguita (cp. P20 & P27).

The modelling approach considers:

- Releases from the reservoir Mansour Eddahbi, so-called Lâchers (fig. 1.)
- Groundwater availability (model BIL, fig. 2) based on water extraction and groundwater recharge
- Soil and groundwater salinity (model SahysMod) based on salt balances for groundwater and soil depending on agricultural techniques and climatic conditions (fig. 5 & 6)
- Specific crop water demand calculated by the model Cropwat (FAO) and further processed to the scale of the oases (fig. 7 & 8)
- Domestic water consumption estimated for rural and urban population distinctively (fig. 9) based on demographic projections

Agricultural production and domestic water use in the oases depend on a number of constrains

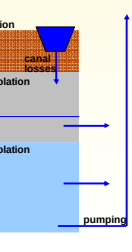

Fig. 5.: Concept of the model SahysMod for calculating water and salt balances.

Surface water availability

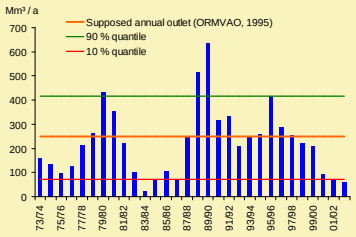

Fig. 1.: Releases from the reservoir Mansour Eddahbi depend on the filling level and show high inter-annual variability. The aim of an annual outlet of 250 Mm³ was reached in only 43 % of years (cp. P23 & P24).

Groundwater availability

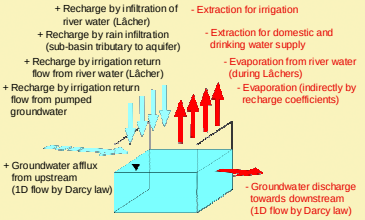

Fig. 2.: Items of the groundwater budget for the Drâa oases implemented in the model BIL (cp. P20).

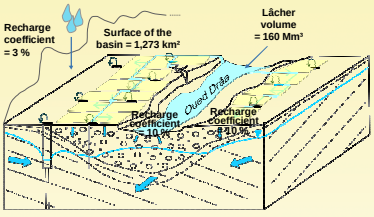

Fig. 3.: Parameters for the groundwater balance (model BIL) of the year 1973 at the oasis Tinzouline.

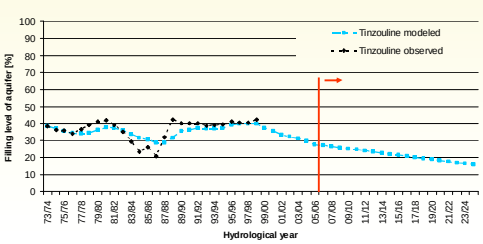

Fig. 4.: Filling level of the aquifer of Tinzouline from 1973/74 to 2024/25, modelled (light blue) and observed (dark blue). Beyond the red line the input data for the Lâchers is extrapolated (cp. P24).

Universität zu Köln
GLOWA
Ministry of Innovation, Science, Research and Technology of the German State of North Rhine-Westphalia
Federal Ministry of Education and Research
universitätbonn