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Water as a Natural Resource in Oases of the Oman Mountains

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Abstract

Groundwater is the most important resource for the agricultural production systems in the desert country of Oman. Other inputs into the date gardens and crop fields are seeds, fertiliser, manure and labour. While the latter inputs can be controlled in amount and distribution, the former is given by the groundwater storage capacity of the surrounding rocks and the spring water outflow near the villages.

This research was conducted to investigate water availability and use in the course of a calendar year in two oases of the central Oman Mountains. Balad Seet is situated at the foot of the northern escarpment of Jabal Akhdar. Most of the 10 springs are found at the same altitude in the lower part of the steep cliff where a 1000 m thick layer of highly permeable carbonates (dolomites and lime stones) rests over red-greyish-green silt- and clay stones of the Muaydin Formation which had been deposited during Prepermian times. Monthly measurements of spring outflows over the last 20 months in the range of $580 \text{ m}^3 \text{ d}^{-1}$ to $760 \text{ m}^3 \text{ d}^{-1}$ indicate, that the spring outflows decrease by about 3 percent per months in longer periods of drought. Because of the large catchment area a rain event of 50 mm (measured at Balad Seet) stabilized the spring outflows for 8 months. Additionally about 63 m^3 of groundwater are daily withdrawn using 14 wells, which have been dug into the wadi sediments. The wells are fed by seepage water from the valleys under the cliff and leaching irrigation water. The total amount of available well water is lower in drought periods than in periods after strong rain events. During the summer season 2001 62% of the cropping area of field crops had to remain under fallow because of the higher crop evapotranspiration rates and the slightly lower amount of available irrigation water from wells. Analyses of the water quality show a low level of salt content (electrical conductivity of $505 \mu\text{S cm}^{-1}$).

The oasis of Maqta is situated in wadi Khabbah in the Al-Hajar Asha'sharqi range. Around Maqta dark coloured, often fractured ophiolitic rocks, mainly harzburgites, dominate. The groundwater circulates in the fractures of these rocks or in loose sediments of the wadis. The total outflow of the 22 widespread springs declined during the last dry year from about $190 \text{ m}^3 \text{ d}^{-1}$ to about $130 \text{ m}^3 \text{ d}^{-1}$. Only 3 springs contribute with more than $10 \text{ m}^3 \text{ d}^{-1}$ to the total outflow. To use each of these springs an extended network of storage basins and irrigation channels has to be managed by the farmers and the location of the fields is often very close to the springs. Because of water scarcity field crops are not grown during the summer season, but even during the winter season more than 50% of the cropping area has to remain bare. Because of poorer water quality (high pH, higher salt content) the use of irrigation water is also more restricted than at Balad Seet.

Future investigations will also have to address how the number, location and outflow of the springs may have influenced agricultural development and settlement patterns over the millennia of the oases' existence.

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