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The traditional technology for optimum subterranean water use in the cold desert of Northwest China

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The 2000-year old irrigation technology, known as Karez, has dominated water use in the cold desert in NW China, because it is optimally adapted to the natural eco-hydrological environment of extreme aridity in the region. During this period the Karez system has made this region an oasis in the desert. Karez wells are mostly situated in the Turpan Basin, the second deepest inland basin worldwide.

Since the 1950s, population growth, agricultural expansion, and the use of new technologies (such as motor pumps accessing groundwater supplies) impact the eco-hydrological structure and function of the Karez hydro-ecosystem. Due to the use of new technologies, the groundwater level has dropped 20-30 meters from the level at the beginning of 1980s, resulting in the dry-out of many (70%) Karez-wells.

The presented research focusses (a) climatological, hydrological, and agricultural characterization of this northwestern Chinese arid region, and (b) strategies for future groundwater management and sustainable agriculture.

We investigated problems and possible solutions in protecting and developing this important traditional technology. Adaptive research into the effective use of groundwater in this arid area and the improvement of traditional irrigation systems (eventually combined with modern technologies) would be a more effective approach solving groundwater problems in this area than focussing on modern technology alone.