



## **When was irrigation first used in Bat (Wadi Sharsah, northwestern Oman)?**

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The extensive archaeological site of Bat, registered as a World Heritage Site by UNESCO in 1989, is situated within the Wadi Sharsah and around the modern village and palm grove of Bat, approximately 24 km from the modern city of Ibri in northwestern Oman. The archaeological remains from the Bronze Age excavated by the Bat Archaeological Project are located in two main areas. The northern area consists of a chain of low limestone hills cut by wadi tributaries leading to the main Wadi Sharsah. It is characterised by an exceptionally high density of graves from two successive Bronze Age periods: Hafit (ca. 3100-2700 BCE) and Umm an-Nar (ca. 2700-2000 BCE). South of the Bat cemetery, in the flat part of the valley, there are several large circular structures (known historically as "towers") and remains from both Hafit and Umm an-Nar periods, as well as later periods. Geomorphological mapping of the floodplain, associated with archaeological survey, have identified walls suggesting that during the Umm an-Nar period there was a system of irrigation which controlled flood water. Sedimentological, malacological, C14 dating and micromorphological studies of a 10 m long and 2.5 m high section located 143 m northeast of the Tower 1146 on the left bank of a small tributary of the Wadi Sharsah provide strong arguments for the presence of an irrigation system that began before the Hafit period. Botanical macro-remains collected during the excavation of early Bronze Age structures at Bat further indicate the presence of date palm gardens since the early 3rd millennium BCE allowing the cultivation of several crop species, in particular cereals. Most generally, the global palaeoenvironmental reconstruction from our data supports a model of a general trend of aridification from Bronze to Iron Ages.

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