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The Mزاب foggara: an original technique for collecting the water rising

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Abstract

This paper describes for the first time an original foggara, different from the classical foggara (foggara of Gourara) which collects water from the Intercalary Continental aquifer. Located in the middle of the Mزاب River, this hydraulic system called the Mزاب foggara is intended to exploit the flood waters. Two missions were carried in 2009 and 2010 in the Mزاب Valley to describe the hydraulic system. The Mزاب foggara constitutes of a gallery of ovoid form 200 m long equipped with 9 air shafts and a 900 m long seguia. The foggara of the Mزاب River can drain water flow of $5 \text{ m}^3 \cdot \text{s}^{-1}$ to irrigate western part of the palm plantation of Ghardaïa (located 600 km south of Algiers).

Key words: *foggara, Ghardaïa, Mزاب, rising, wadi*

INTRODUCTION

The creation of oases is conditioned by the presence of a water source. Thus, in hyper-arid regions of the Algerian Sahara characterized by low rainfall, farmers developed over time different traditional techniques of extraction of ground and surface water (floods). To capture and store flood water, farmers developed small dams (made of local materials) and seguias for the distribution and delivery of water to gardens. For the acquisition of groundwater, villagers developed techniques for capturing groundwater from wells that evolved over time from a vertical well driven by human or animal energy to a well using only the horizontal slope. The water arrives more easily to gardens by gravity.

This technique called foggara is extensively developed in the oases of Touat and Gourara, since the topographic and hydro-geological conditions in the region are favourable for realization of this hydraulic

system. Over 1400 foggaras were dug in these regions over the last centuries. Today, because of technical and socio-economic problems, only about 880 remain in operation [REMINI *et al.* 2011].

The foggara has been developed in all arid regions of the planet, since it exists in over 35 countries [BOUSTANI 2008]. Iran is the country which possesses the greater number of foggaras known as the qanat. There are about 22000 qanats operating in arid regions of Iran [LARSON, McLAUGHLIN 2006]. Morocco has 570 khattaras out of which 250 are operational [Ministry ... 2006].

The hydraulic system was developed for the exploitation of surface water. Improvements and enhancements have been introduced to this system during time. For example, in Iran there are qanats with two galleries superimposed one above the other [SAFI NEZAD-BALLAND 1992].

In this paper, we describe an original foggara that we saw in 2009 during a study on flooding in the