The Orontes basin has been home to water supply practices with diverse amenities. These are irrigation channels, aqueducts, *qanats* (underground galleries connected to the surface through a string of wells), dams, *norias* (waterwheels), watermills but also wells, built or simply summarily dug in alluvial table. These developments would make it possible to exploit water from springs, shallow groundwater and the river, to supply cities such as Baalbek-Heliopolis, Hama and Homs and to provide water for irrigation. The earliest water amenities were likely located in areas receiving less than 300 mm of mean annual rainfall, in the south-eastern part of the watershed from the Beqaa to the regions of Wadi al Majarr and Salamiyah.

One of the characteristic examples of spring exploitation involves those in Laboue, whose waters were collected and carried through channels to the north of the Beqaa. The longest of these canals, including a *qanat* on part of its course, flows along the foothills of the Anti-Lebanon to Syria (fig. 1).

**Figure 1:** “Canal of Zenobia” (a) and detail of its course on the foothills of Anti-Lebanon (b) (M. Al-Dbiyat)
Ancient Hydraulic Structures in Lebanon and Syria
According to local legend this canal was built by Queen Zenobia (267-272 AD) to carry freshwater from Laboue to Palmyra in central Syria, the capital of her kingdom. Although its origin actually dates back to the Roman-Byzantine period (64 BC - 636 AD), there is no evidence supporting this narrative and its route seems to end before Hisyah to the south of Homs, at the foot of the Anti-Lebanon Mountains. The water supply of the Roman city of Baalbek-Heliopolis was also provided in part by a canal that carried water from the source of Nabaa Lejouj, located on the slopes of the Anti-Lebanon (Parrot 1929). The few traces preserved from these developments suggest the existence, from the Beqaa to the Al Ghab plain, of a whole network of canals that could go back to these ancient times. In Syria, it is worth noting the existence of the *qanat al ‘Ashiq* (the “lover’s canal”). Dated 116-117 AD, it carried water flowing from ‘Ayn ez Zarqa', west of Salamiyah, down to the city of Afamiya, on a journey of about 150 km (Balty 1987). The canal was destroyed by an earthquake in 1157 and restored in 1491; its course was modified to flow towards Hama² (Kamel 1990).

*Qanats* collect subsurface groundwater and convey it by gravity to their outlet, sometimes several miles away (Lombard 1991). They are used for irrigation and domestic purposes. *Qanats* in the Orontes watershed are grouped in the most arid areas like the northern part of the Beqaa Valley and the Eastern-most areas of the watershed in Syria: the Salamiyah area and the Wadi al Majarr region (fig. 2). The oldest *qanats* date back for the most part, to the Roman –Byzantine period, perhaps in rarer cases to the Persian period (537-332 BC; Lightfoot 1996).

**Figure 2:** Qanats in Ar Ruhaybah (wadi al-Majarr area; 34°16'42"N, 36°55'50"E)
The Orontes waters were exploited mostly with *norias*, which permit to raise the water and pour it in an aqueduct through a system of bucket wheel (Delpech et al 1997; De Miranda 2007; Al-Dbiyat 2010). They are distributed along the Orontes River downstream of the city of Homs and there are many of them between Ar Rastan and Al ‘Asharina, where 95 norias were identified (fig. 3). The norias are rural, used for field crop irrigation, or urban, supplying towns and gardens (Al-Dbiyat 2010). The famous gardens of Hama flourished until the 1940s and were served by a dozen *norias* that were exclusively dedicated to them (Boissière 2005; fig. 4). The existence of the Orontes *norias* is attested from the Byzantine period (395-636 AD.), thanks to a mosaic in Afamiya dated 469 (Dulière 1974; fig. 5), but the first waterwheels could go back to the Hellenistic period (300-64 BC; Balty 1987). Construction continued into the 1940s, with the exception of the Al Rawaniyya waterwheel in Hama built in the 1990s (De Miranda 2007). The Orontes *norias* are no longer used for irrigation but some have been restored and are maintained in operation for patrimonial purposes (De Miranda 2007).

There is also the network of canals diverting the Orontes waters for irrigation in the area of Al Qusayr. The canals are associated to three ancient dams, one on the bridge of Hermel and two in Syria, Saiyad Aali and Homariyeh, close to the border. Dams and irrigation channels are difficult to date, although they have been documented in the Near East from the Bronze Age onwards (3600-1200 BC). Canals on the right bank are considered as “Romans” by locals (Métral & Métral 1990), which means that they were “ancient”. They are indeed made from a different kind of workmanship than the others and were originally built underground, then discovered and restored around the 1830s (Duraffourd 1929, quoted by Métral and Métral 1990).

Finally, the presence of many watermills, sometimes associated with *norias*, should be noted in the Orontes River basin. Few details exist to date these. Many of them may go back to the Ottoman period (Al-Dbiyat, pers. com.), as mention is made of the Rabun mill and waterwheel southeast of Hama for example, in texts that date them back to 1563 (De Miranda 2007). But this type of facilities were used in antiquity, at least since the Roman period (Mays 2010 and endnote 3), and milling technology may have reached Syria by the first century AD (Lewis 1997).

While the ancient facilities that are known and dated with certainty would therefore not predate the Roman-Byzantine period, it is likely that water projects -- wells, canals or dams -- were built much earlier. We must not forget that it was in the flourishing period of the Bronze Age that witnessed the urban phenomenon on the banks of the Orontes River. We will discuss here, the case of the Qattinah Lake dam (or Lake Homs; Calvet and Geyer 1992), a little upstream of Homs, which allowed water to flow to the orchards of this important and ancient city and meet the needs of its inhabitants The scarcity of references to water projects earlier than the Roman period is easily explained by difficulties to date such structures, by their subsequent reuse, or by their disappearance, (especially if they were not in masonry). Beyond these difficulties, archaeological knowledge demonstrates that the Orontes River had been a centre of attraction for thousands of years, especially for the development of prestigious cities, overlooking rich territories: Homs as well as Hama or Tall an Nabi Mindu, the ancient Qadesh. This prosperity was due, in particular, to the presence of the river, but also to the exploitation groundwater resources in a relatively well-watered region, but still subject to aridity -- and, more importantly, to the seasonality of precipitations.
Figure 3: Noria in Al 'Asharinah in 1932 (IFPO) (a) and in 2002 (M.-L. Chambrade) (b)
Figure 4: Tell, gardens and norias in Hama in the 1930s (IFPO) (a) and in 2009 (M. Al-Dbiyat) (b)
Notes

1. Following A.T. Hodge (1992), P. Leveau (2004) and Z. Kamash (2012), we define aqueducts as masonry channels, open or roofed and less than one meter wide, providing water by gravity flow from a spring, a river or a reservoir to a settlement as primary purpose. Therefore, in the text as on the map, we will refer to the broad term “canals” because their construction or primary purpose are in some cases not well-defined yet and some of them can be of different type along their course (e.g. “canal of Zenobia”).

2. Only that portion could be plotted accurately from topographic maps and satellites photos.

3. J-Ch. Balty does not give any argument for his hypothesis but we know that Romans have used waterwheel technology, and also watermills (cf. infra in the text), thanks to the book of Vitruvius (1st century BC) De Architectura (Maufras 1847).

Figure 5: Mosaic in Afamiya representing a noria (Kamash 2012)
References


Dulière C., 1974, Mosaiques des portiques de la grande colonnade, Apamée digs in Syria, Miscellanea fasc. 3, Brussels: Centre Belge de recherches archéologiques in Apamée, Syria.

Duraffourd C., 1929, Rapport sur le recensement et l’établissement des droits sur les eaux en vue de completer la Réforme foncière, en voie de realisation, par celle des eaux, Travaux Cadastre et d’amélioration agricole, Damas.


Parrot A., 1929, Les fouilles de Baalbek : Deuxième campagne (9 juillet-29 septembre 1928), Syria 10, p. 103-125.