

Ancient Water Supply System in Tall Tanis, Archaeological Area Northeastern Nile Delta Region, Port Said, Egypt

Elsayed Abbas Zaghloul

Abstract During the geological history, the Nile developed his valley and built up the Delta. The floodplain extends from El-Tina Plain east of Port Said city to Alexandria city in the west. The contour map shows that the surface of the eastern Delta is higher than the western surface; this leads to the formation of many depressions and lakes in the northwestern of the Delta. Lake Manzala is located at the northeastern corner of the Nile Delta. Within the Manzala lagoon, there are many archaeological sites, the most important being Tall Tanis which is located 6 km south of Port Said and covers an area of about 8 km². It was a seaport and center of commerce of some importance. It is the remains of the settlements such as the water tanks and the textile factory dated to the early Islamic era that might have been destroyed or demolished by the outlaws.

Economic and social activities in the Tanis region were influenced by three main water bodies throughout its history: the Mediterranean Sea, the River Nile throughout the Tanitic ancient Nile Delta Branch, and Lake Manzala which extended to the south and southwest of the site.

The water supply and storage systems relied on the annual Nile flood, during which the lake became potable; water was collected from the waterway by using shaduf or saqiya and stored in tanks or cisterns on the island for use throughout the rest of the year. There are two types of water tanks used to store the Nile water. The big tanks and their connecting channels/ditches may indicate that it was controlled by authorities as public facilities, while the small foundations were endowed by the private sectors.

Keywords Archaeology, Cisterns, Tanis Island, Tanitic Nile Delta branch, Waterway

E.A. Zaghloul (✉)

National Authority for Remote Sensing and Space Sciences (NARSS), Cairo, Egypt

e-mail: eazaghloul@narss.sci.eg

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1 Background

1.1 Geomorphology

Lake Manzala represented one of the most distinctive geomorphic features in the north-eastern corner of the Nile Delta in Egypt since the Holocene period. At present, Lake Manzala is a body of shallow brackish water, and within the lake area, there are some archaeological sites, the most important being Tall Tanis which is located 6 km south of Port Said (Fig. 1) and covers an area of about 8 km². It is located on the top of the coastal sandbar which runs parallel to the ancient shoreline of the Mediterranean Sea during the Pleistocene time (Fig. 2). Its present surface elevation is little more than 5 m above the present water level in the northeastern sector of El-Manzala Lake.

The ancient Tanitic branch of the Nile bifurcated at the head of the Delta and took an easterly route, passing by a number of towns and settlements until it reached the town of San El-Hagar (Djane) and the harbor of Tanis (Fig. 3). This canal/branch was to play an important role in riverine transport to and from the city during the Hellenistic and Roman periods. The canals and drainage channels carry to the lake the industrial and domestic wastes from the eastern Nile Delta regions, as well as agricultural runoff from the cultivated lands. The lake also receives water from groundwater seepage and rainfall and is connected with the seawater by three inlets locally named Bougaz.

1.2 Historical Background

The majority of the excavated artifacts and portable parts of structures have been housed in magazines, but it is the remains of the settlements such as the citadel, houses, water tanks, and textile factory dated to the early Islamic era that might have been destroyed or demolished by the outlaws. The textiles were unique to the



Fig. 1 Satellite image showing the location of the Tanis archaeological site



Fig. 2 Pleistocene coastal sandbar

island, which gave its name to the Tanis textile during the Abbasid era (750–1517 AD) when the Kaaba clothing used to be made there.

The island was a prominent trading post. It was also a bishopric and important Christian center and the site of a battle during the Arab conquest of Egypt in 642 [2–4]. The town was attacked and damaged on several occasions in the eleventh and early twelfth centuries and finally evacuated by order of the Ayyubiy Sultan Al-Malik M. Al-Kamil in 1227, though the island nonetheless continued to be used as a trading base until at least the fifteenth century. The enclosure walls and citadel were raised to prevent their being used by the crusaders or other hostile forces. The archaeological area was located on the northeastern edge of the Nile Delta, opposite to, and protected by, relatively large sandbars (Fig. 2) which had made the area suitable for being utilized as a harbor since the pre-Hellenistic period.

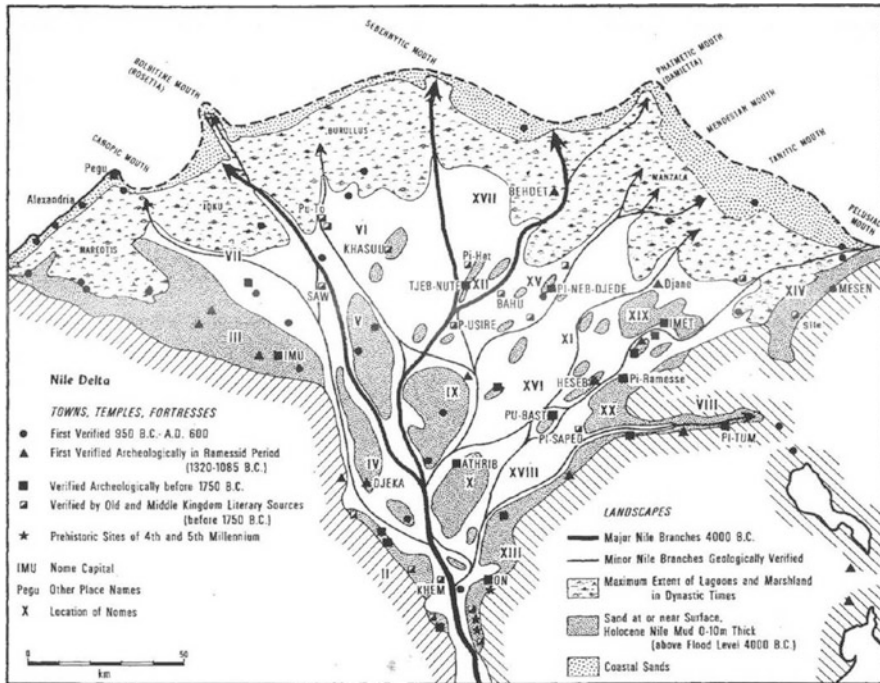


Fig. 3 Landscape and settlement evolution in the Nile Delta (Courtesy of the Oriental Institute of the University of Chicago) [1]

2 Water Supply System

Strabo [5] states that "... at the beginning of summer the Nile, being full, fills the lake." Thus when the Nile flooded, the water level in the lake would rise, and when it dropped so did that of the lake. In the flood season when the lake's level rose, it could have threatened to inundate the land around it. The water reservoirs (tanks) are extremely numerous. Surrounded by brackish water, on the annual Nile flood, during which the lake became potable, water was collected and stored on the island for use throughout the rest of the year (Figs. 4 and 5). An examination of the channels and tanks revealed two phases of construction. The big tanks (Fig. 6) and their connecting channels (Figs. 7 and 8) may indicate that it was controlled by authorities as public facilities, while the small foundations were endowed by private hands (Fig. 9).

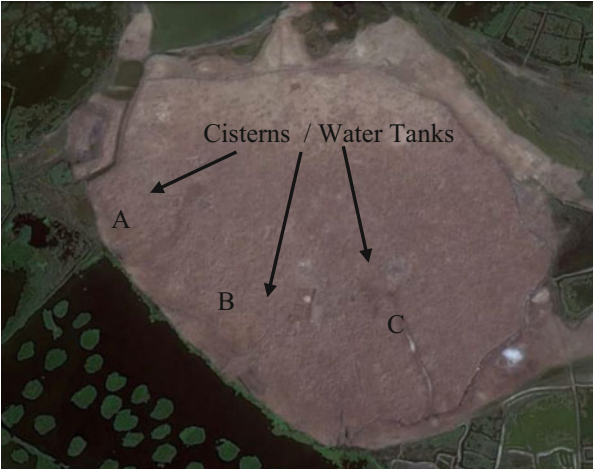


Fig. 4 Waterway to fill the underground reservoir/tanks

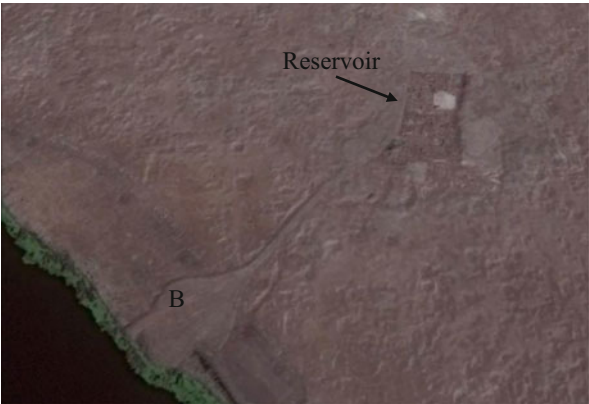


Fig. 5 Satellite image showing the waterway no. B (intake) and the reservoir



Fig. 6 Water storage system (reservoirs/tanks)



Fig. 7 Water channel to feed the tanks with potable water

3 The Water Lifting System

The Nile floodplain and Delta are free-draining, seasonally inundated alluvial surfaces that have marked the focus of human settlement since the Paleolithic times. Most settlement sites of 10–20 millennia ago were already situated on the immediate banks of the Nile and the Nile Delta branches. Local rains were of some ecological significance at first and Nile flood levels were also substantially higher during the predynastic times.

The water pattern in the lowest margin suggests lifting out of an irrigation canal.

The basket (jar) remained the only water-lifting tool in Egypt until the New Kingdom era (c. 3500 years ago) when the shaduf (Fig. 10) was introduced 3500 years after the beginning of agriculture in Egypt and 1500 years after the rise of the nation-state. It was not until 1000 years later that the waterwheel (Fig. 11) and the water screw (Archimedean) were developed in Alexandria (Fig. 12).

3.1 *The Shaduf*

It is the first mechanized by the introduction of the lever or shaduf (Fig. 10) during the New Kingdom era (c. 3500 years ago) 18th dynasty and then revolutionized by the waterwheel or saqiya in the early Ptolemaic times. The mechanism of the shaduf depends on the gravity to lift water from one level to another. Normally it lifts water from a depth of 2–6 m and can deliver as much as 500–2,500 L/day.

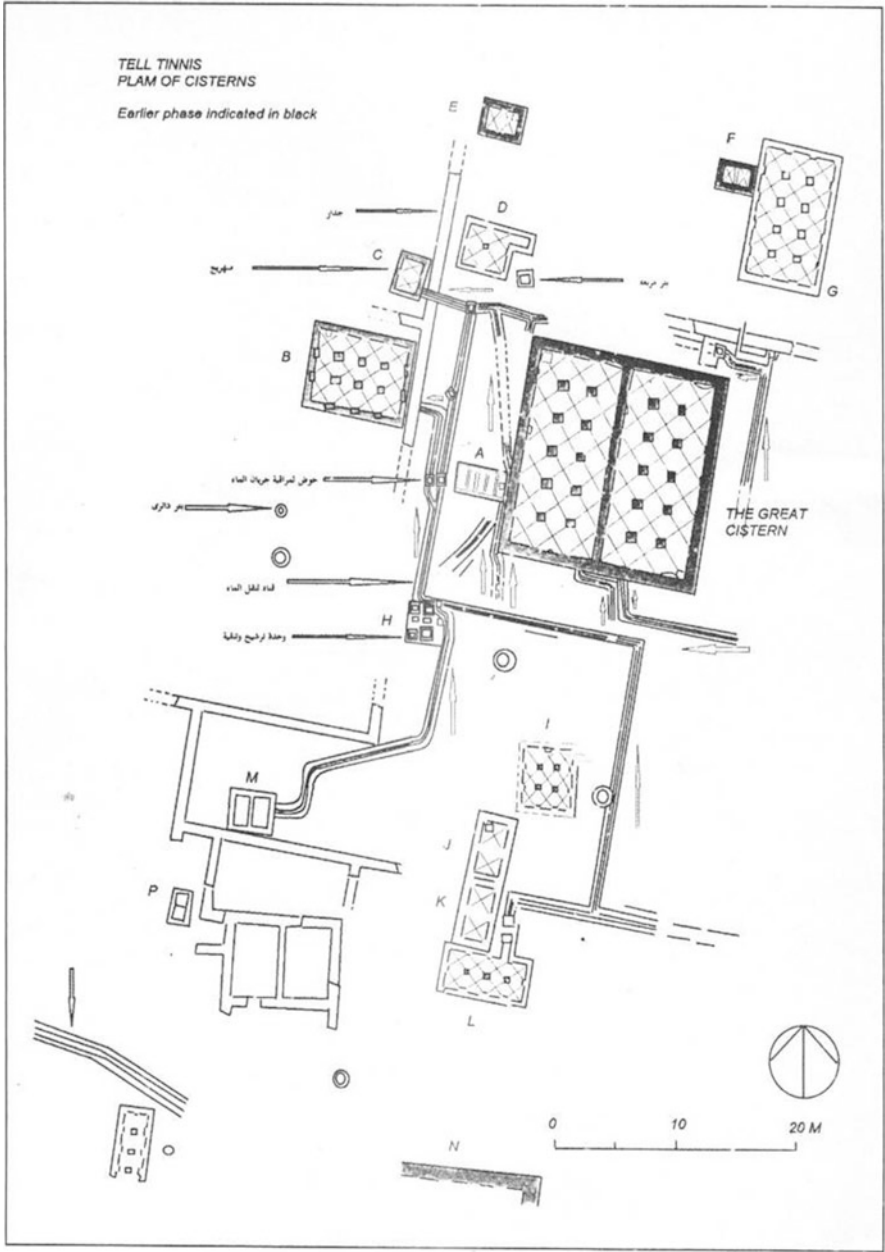


Fig. 8 Tall Tanis plan for cisterns and canal networks [6]

Fig. 9 A small (private) water reservoir



3.2 *The Saqiya (Noria-Waterwheel)*

It was the first known device that used a system of gears to transfer energy from one spatial dimension to another (horizontal to vertical). The wheels were usually turned by animals (Fig. 11). Buckets or pots made of wood, bamboo, or pottery were attached by chains or ropes to the rim of the wheel which was set to be below water level in the source (well, canal, stream). As the machine rotated each bucket, in turn it would dip below the water level and fill with water [7]. When a full bucket reached the top of the rotation, it would be emptied and transmitted from the ditch to the tanks.

4 The Water Stored System

Zaghloul [8] reported the occurrence of 19 tanks and 7 dug wells in addition to about 155 m of ditch canal to transport the water from the main canals to the big tanks. The tanks aligned in a north–south trend. The size of the big tanks was 16×16 m and the height was about 1.8 m and the wall thickness ranged from 45 to 55 m, while the dimension of the small tanks varies from 4×2 m to 4.5×2.5 m with a height of about 1.8 m. There is some evidence that the big tanks were endowed by the authorities as public facilities, and the small tanks rested increasingly in private hands [9].

5 Conclusion and Recommendation

Field work was undertaken using a shallow-draft outboard motor boat to discover the site all the way through Tanis Island and its surroundings in the west and southwestern sectors of the island.

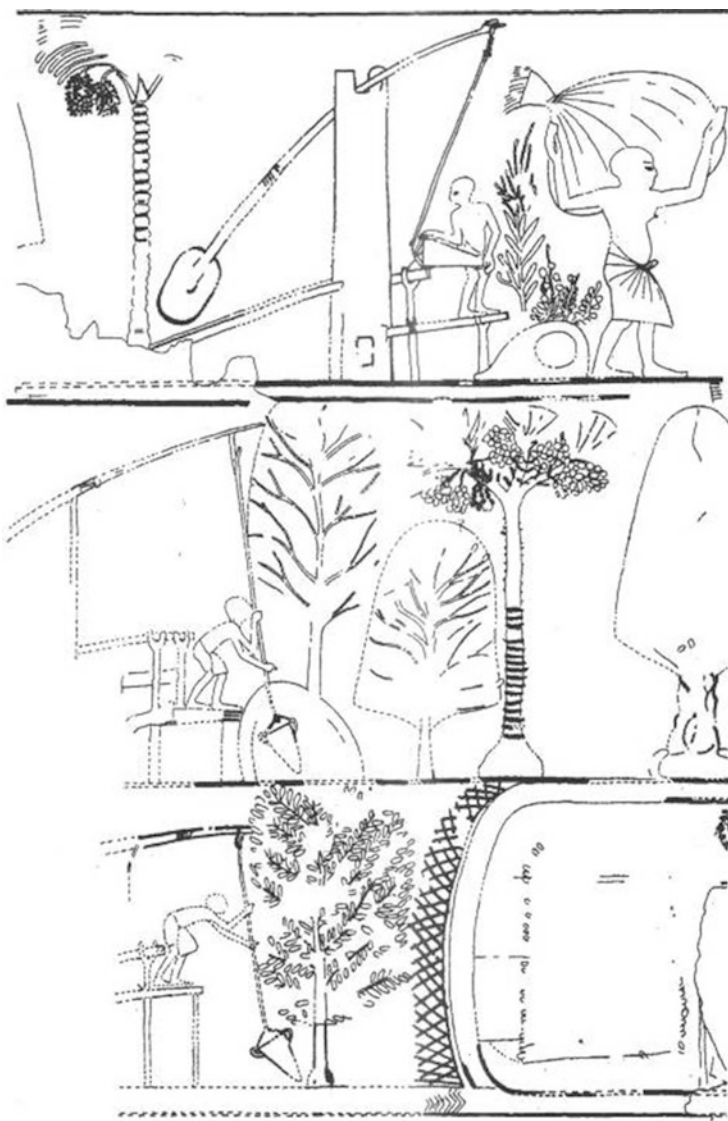


Fig. 10 Shadufs of the Amarna period. From the tomb of Nefer-Hotep (Courtesy of the Oriental Institute of the University of Chicago) [1]

There were two types of water reservoirs (tanks) for storage of the Nile water during the annual Nile floods. The big tanks and their connecting channels/ditch may indicate that it was controlled by authorities as public facility, while the small foundations were endowed by the private sectors.

It is highly recommended to preserve the remnants of these hydraulic structures as good examples for the water harvesting ancient system.

Fig. 11 Waterwheel turned by animal



Fig. 12 Archimedean water screw



More geophysical surveys using ground penetrating radar (GPR) should be carried out.

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