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# **The Family Cistern: 3,000 Years of Household Water Collection in Jordan**

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**NB** \*This is the unedited paper as given at the Joensuu conference. An updated and edited version has been published in Sabour and Vikør, [\*Ethnic encounter and culture change\*](#), Bergen/London 1997, 233-49. Please quote or refer *only* to the published article.\*

## **Abstract**

Around 850 B.C. King Mesha of Moab was victorious in war and conquered a considerable territory east of the Jordan. This is at least what he himself claimed in the famous "Moabite Stone" text. One detail in King Mesha's self-praise is of particular interest to the theme of this paper:

*... and I made two reservoirs in the midst of [Qerkhah]. Now there was no cistern in the city, so I said to all the people, Make you every man a cistern in his house!"...*

While this may be one of the first texts mentioning water cisterns, the valuable device itself must have been invented considerably earlier. The paper discusses the age-old Jordanian habit (present in the surrounding countries as well) of cutting and maintaining at least one rainwater-collecting cistern at one's homestead. The cisterns were often technologically sophisticated, with sedimentation basins to separate mud and sand before the water was let into the main cistern. The combined storage capacity of these cisterns must have been considerable. Most of them are since long out of use and filled with debris and sediment. As many of Jordan's villages have become supplied with water through pipes from some distant source, households do not seem to sense any personal responsibility to help themselves to part of their water needs. When a lack of water is felt it is more likely that "the minister" is implored to do something about it. It should nevertheless be possible to clean out at least many of the ancient cisterns and bring them back into use. This would, as indicated, add a considerable storage capacity to the country. It is estimated that about 92 per cent of Jordan's annual rainfall evaporates; if one per cent of that can be collected instead it would mean "another King Talal Dam".

The paper is made in preparation for field-work that can hopefully be carried out in the winter of 1996. The research area will be the *Allan Area* north of *as-Salt*, a region the author has already explored in other respects since the late 1970s.

## Significance of the cisterns

In the era of *Agenda 21*, when we say we strive for sustainability and good husbandry with the earth's resources, people sometimes appear to know less (or, worse, care less) about such matters than did people who lived centuries and even millennia ago. One field in which this is obvious is water management and conservation. Modern engineering practice and the ever more pervasive influence of do-it-all modern governments tend to make people less and less interested in caring for their own needs, in the Middle East just like elsewhere. Calls for "the Minister" are heard not only when the rains fail but when they have been normal or plentiful, because people have been led to believe that water (re)sources are infinite and it is the Government's duty to tap them.

Jordan has a serious and worsening water supply problem. It should then be heartening to realize that at least some relief can be had through a reliable and time-tested device which furthermore is partly already in place. The existence of the device is known to many, although its significance is still only understood by few. This is true even though claims can be found that "it is now understood that towns in the more arid regions [of the Middle East; LW] relied on surface water resulting from winter rains which was collected and stored in man-made reservoirs or cisterns." [1] Anthropologists and geographers like to point out that the location of human settlements depends on water. There "must be enough water to grow winter cereals" and "sufficient permanent water for drinking, watering the animals, cooking ..." etc. [2] But the same scholars seem to have missed that villagers in many parts of the Middle East since long have been able to *create* for themselves a near equivalent of permanent water where Nature was not kind enough to place a river or a spring. It is surprising and disconcerting that even modern scholarly works, to which one would like to turn for sound thinking and efforts to keep earlier achievements alive, pay little attention to cisterns and other "folk" ways of harnessing and storing water. In a nineteenth century Swedish textbook on Biblical geography one can find something that is unusual but would be most welcome in more recent works: a whole page of text devoted to "Cisterns and Wells". As the presentation and analysis in that old textbook are lucid and still valid, I quote a good section:

*Of wells there are two kinds: 1) Source-wells, that were highly valued, and 2) cisterns, of which every large house had its own. It was laid down that all living wells or springs with its own exit should be common property, but those without such an exit should belong to the one who first discovered it or who had had it dug. Where both were lacking one had to dig or hew from the rock cisterns, i. e. such that are not filled by water from the veins of the earth but to which rain or snow water is being led; this, while commonly highly stenching and distasteful, will nevertheless keep during the warm season and save people and cattle from dying of thirst. [3]*

The quotation spells out a distinction not often noted in the literature. Generally, springs and groundwater wells are publicly or communally owned, while cisterns for the collection of rainwater are private property. We shall see below that this is verified in the land ownership records of the *Allan Study Area*. Furthermore, water from cisterns is rarely if ever used for irrigation: it is used for cooking, watering cattle etc. [4]

Considering the prevalence and importance of cisterns it is surprising that they have been given so scant attention both in archaeological and other scholarship on the Arab village and in the development literature. [5] The reason may be that the individual cisterns are so small. What makes them valuable is however the fact that they are found precisely where people historically have been able to live, and their *combined* tremendous capacity. This capacity may well exceed the largest reservoir in Jordan, the King Talal Dam, and their intelligent distribution minimizes the transport effort required to bring the water to its users. And contrary to Palmblad's claim, cistern water is generally regarded as sweet and good.

## Where are the cisterns found?

The "Project Rainkeep" that inspires the present project is concerned with the region around Hesban and

Madaba in central Jordan. [6] There the cisterns are numerous: a nineteenth century scholar reported that the ground in Madaba is "honeycombed" with them. [7] Raouf Abujaber, in his admirable monograph on the agricultural renaissance of Transjordan in the late nineteenth century, notes that

*Shortage of water has been a major problem for the population since ancient times; all the khirab (old ruined settlements) have their wells, cisterns and pools to attest to this fact. The older generations took advantage of every possibility to collect and preserve water. The Jordanians of the nineteenth century, when venturing eastwards to settle new lands, had only to clean, repair and use these thousands of wells and water reservoirs that had been in disuse for many centuries. To give an idea of the numbers involved, the author confirms hearing from elders at al-Yaduda that there were more than 300 wells in its domain, that water was stored in these wells and that it was not unusual for the population to drink, during the drought years, water that was three years old. [8]*

Cisterns are plentiful also in other parts of Jordan [9] as well as in Palestine and Syria. They are found among the semi-nomads of Libya's *Jebel al-Akhdar* [10] and were seen as a commonplace in fourteenth century town-planning in Tunis. [11]

## Historical background

Around 850 B. C., King Mesha of Moab was victorious in war and conquered a considerable territory east of the Jordan. This he proudly commemorated in the famous "Moabite Stone" text. One detail in King Mesha's self-praise is of particular interest to the theme of this article:

*I made two reservoirs in the midst of [Qerkhah]. Now there was no cistern in the city, so I said to all the people, Make you every man a cistern in his house!" [12]*

This may be the first time that water cisterns are mentioned in a text, but the device itself must have been invented considerably earlier. A progression has been suggested "from the primitive use of natural rock holes to the digging of open cisterns and finally the construction of roofed-over cisterns excavated in rock." [13] According to an *Archaeological Encyclopedia*,

*The first cisterns were dug in the Middle and Late Bronze Age [2200-1200 B.C.; LW]. The rainwater that collected in them during the short rainy season would be enough for at least one dry season. In some parts of Palestine cisterns were the main (sometimes even the only) source of drinking water in peace time as well as in war time. In the early Iron Age [1200-1000 B.C.; LW] the sides of cisterns began to be covered with watertight plaster, which considerably prolonged the time for which water could be stored. It was this important innovation that made it possible to extend the areas of settlement into the mountainous parts of the country. [14]*

The dating of the first cisterns to Middle Bronze may be too late, however. At Jawa in the black lava desert of northeastern Jordan a sophisticated water-collecting system was planned and built already before 3000 B.C. While man-made cisterns were apparently not part of it, a natural cave was utilized as an early forebear of the later, man-made structures. [15] The oldest house-cisterns found in Palestine also belong to the Chalcolithic, before 3000 B.C. [16] However, cisterns would not be constructed in large numbers before the Iron Age. At Hesban, "already in the Iron I [1200 - 1150 B.C.; LW] village we encounter a significant water management complex consisting of at least one, and probably many (had our excavations been more extensive) cisterns, and an overflow tank, which possibly also served as a channel for leading water to a yet-to-be-discovered reservoir." [17] In the Negev cisterns from the Iron II period were dug into loess soil and lined with large stones to insure the stability of their walls. Also in the Negev, rock-cut cisterns began to appear in Nabatean times, i.e. the last two centuries before our era. [18]

Cistern construction and (re-)use varied in intensity over time and space, e.g. intensifying at Hesban and elsewhere, for instance in Umm al-Jimal, in what is sometimes called the Greco-Roman millennium (332

B.C. - A.D. 640), but which is perhaps more relevantly called the Nabatean period. [19] A later period of intensive cistern-building at Beit Ras in northern Jordan has been dated to the Crusader-Mamluk period (A.D. 1100-1516). [20] Much work is still needed before we have a consistent and reasonably accurate understanding of the history of rainwater collection in the Levant. That the consistent and accurate picture is not yet established may be because the topic has not been considered important enough. Ancient cisterns have been seen as remarkable and picturesque but rarely as efficient and relevant in a modern context.

## How are they constructed and how large are they?

The largest of the cisterns generally are community projects which are not the focus of this paper. Large or small they were often technologically sophisticated, with sedimentation basins to separate mud and sand before the water was let into the main cistern. [21] A reservoir in Madaba could hold about 42,750 cubic metres. [22] Masada west of the Dead Sea was supplied with cisterns of up to 4,000 cu. m. individually and together holding some 40,000 cu. m. [23] The largest projects were meticulously planned systems of cisterns, channels and collecting surfaces:

*In Petra [...] huge cisterns were hewn in the rocks into which the rain water was run through surface channels. These cisterns were high up in the side of the rock, so as to prevent defilement. The interior was divided by rock partitions into reservoirs, oft-times many in number, and so arranged that when one was full it would overflow into another. In these rock-hewn reservoirs millions of gallons of water could be stored and be always cool, clean, and available. [24]*

The household cisterns that interest us are generally smaller, although volumes are not always given in the literature. The rock-cut cisterns are most commonly bell-shaped, with a narrow opening at the top and symmetrically widening below (see Figure 1, below). [25] The cisterns in Samad in northern Jordan range from about 35 to 200 cubic metres, [26] the pear- or bottle-shaped cisterns on top of *Umm al-Biyara* in Petra are 4 m deep. [27] The cistern in Figure 1, near Jerusalem, could hold about 2,700 cu. m. [28]

The rainwater was generally collected from the roof and courtyard of the house, in cities as well as in the countryside. A private cistern was seen as a necessary element in the planning of a new house in Tunis in the fourteenth century. [29] A 1921 census in Jerusalem counted 7,000 cisterns collecting runoff water. [30] One informant stated that even today in Amman it is legally required to include a cistern in any new house, but that some people fill them with piped water instead of rainwater. [31]

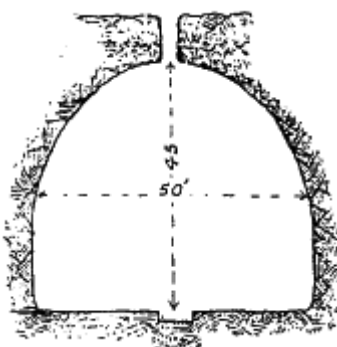


Figure 1. Section of Cistern at Aîsâwîyeh. [32]

## Why did they go out of use?

Today most of the cisterns are out of use and filled with debris and sediment. We see from the quotation of Abujaber above that this was so also in earlier periods, when settled agriculture was rare and many villages had been deserted by their population. Today a settled population is more widely distributed over

Jordan than perhaps ever before, and the non-use of cisterns has other reasons. As many of Jordan's villages have become supplied with water through pipes from some distant source, people have allowed themselves to become dependent on water supplied by the public sector. Households apparently no longer feel any responsibility to help themselves to part of their water needs, especially as the turning of a tap is so much more convenient than maintaining a cistern and its collection area.

## Are the cisterns relevant today?

Probably no serious person will deny that Jordan has a water supply problem. And the problem is one not only for Jordan, but for most Jordanians. In many villages, and even in most parts of Amman, water delivery is unreliable. If the pipes are dry you can order a tanker, but that is expensive. And if the situation is bad today, it is likely to get worse in the near future. As LaBianca points out, the *Status Quo* is not sustainable. [33]

If, then, there is a water supply problem: can household cisterns change that? The answer seems to be that even if they cannot change the total supply, they can make a significant difference for many poorly served localities, and particularly for poor households. It is not even "news" that this is so. Nelson Glueck wrote as early as in 1940:

*We visited el-Bared in the spring, and some of the cisterns still contained water from the recent rains. It is easy to see that by multiplying these instances literally by the hundreds, huge quantities of water could be stored, serving large numbers of people and numerous herds throughout the dry months of the year.* [34]

And Bert De Vries writes that "Study of this ancient water system [of Umm el-Jimal; LW] leads one to believe that similar systems could easily be designed and built to support the growing populations and increasing agriculture in the village settlements of Jordan's semi-desert regions today." [35]

We should remember that the cisterns we discuss were traditionally used for household water including the watering of flocks, but not for irrigation. That probably is one reason why writers in their discussion of water not even mention the existence of household cisterns: their interest is focused on agriculture. But for household purposes the potential usefulness of cisterns is great. They give a greater security of supply, it is in the power of the individual household to uphold that security, and the water is being stored right at the place where it is to be used. No doubt, at least many of the ancient cisterns can be cleaned and brought back into use, and there is no reason why new ones cannot be built. The combined storage capacity of all cisterns, small and large, in Jordan or any of the neighbouring countries is no doubt considerable. It is estimated that about 92 per cent of Jordan's annual rainfall evaporates. [36] If one per cent of that water can be collected it would mean "another King Talal Dam".

## The `Allan Area of northern al-Balqa' : some initial information

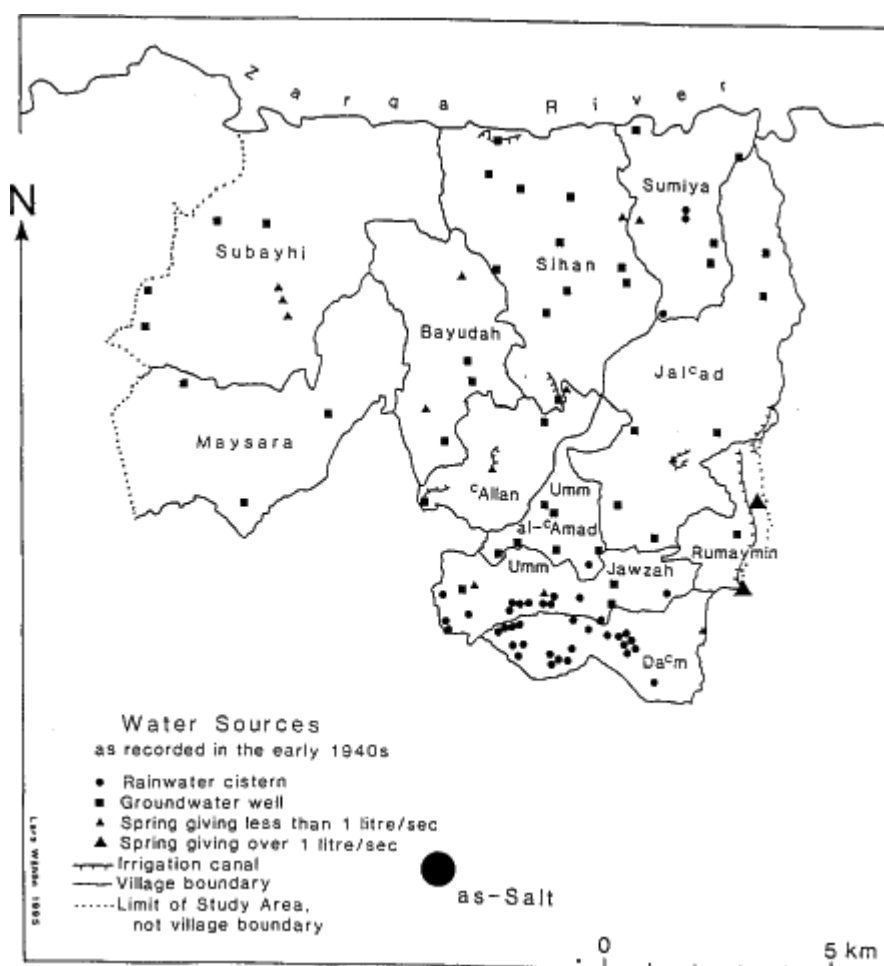
A period of field research on water availability and use is being planned for some winter season in the `Allan Area north of as-Salt, a region the author has explored in other respects since the late 1970s. [37] As yet only some 15 per cent of the required financing has been secured, so it remains to be seen when the fieldwork can be done.

In the early 1940s titles to land were legally settled in the Study Area. [38] Of the around 2,400 plots of land surveyed and recorded in the eleven villages of the study, 93 had some kind of water source. I have classified the water sources in four categories. The first category is household cisterns, the next is groundwater-fed wells, the last two are springs for which technical information is found in a Government report. [39] Over half of the water points (categories 2 - 4) were fed by ground-water, either (as far as can be deduced from the ownership records) dug wells (category 2) or natural (even if improved) springs. 36 plots contained one or occasionally more than one cistern (category 1) of the kind that mainly interests us here. In complete agreement with Palmblad 1842 (quotation above, p. 1) the cisterns are privately owned.

The other water sources are registered in the name of the Government, sometimes with a remark that the water is "for the use of the population of the village". Table 1 lists the water sources according to village, Figure 2 shows their spatial distribution.

**Table 1. Water in the `Allan Area according to Settlement records**

Village	(1) Cistern	(2) Ground- water well	(3) Spring, less than 1 l/sec	(4) Spring, 1 - 10 l/sec	Total
ar-Rumaymin	-	1	-	1	2
as-Subayhi	-	4	3	-	7
Maysara	-	3	-	-	3
Bayudah	-	3	2	-	5
Sihan	-	11	1	-	12
°Allan	-	2	2	-	4
Umm al- °Amad	1	6	-	-	7
Jal °ad	-	6	1	-	7
Umm Jawzah	14	3	2	-	19
Da °m	22	-	1	-	23
Sumiya	3	4	1	-	8
<b>Total</b>	<b>40</b>	<b>43</b>	<b>13</b>	<b>1</b>	<b>97</b>



*Figure 2. Distribution of water sources in the the `Allan Study Area*

The Study Area apparently only has one large spring (category 4), in Rumaymin. Actually the same village has another large spring, outside the Study Area (shown in the map), its water flowing through the village territory. Rumaymin therefore boasts the largest area of irrigated land in the Study Area. [40] Otherwise, small springs and wells are relatively evenly spread between the villages. But cisterns are only found in four of the eleven villages, for reasons that are not immediately obvious.

To begin with we should try and understand what it means that cisterns are mentioned at all in the

ownership records. They are recorded like houses and caves, and given a value additional to the value of the land. They are valued at from 5 to 20 Palestine Pounds, rather substantial amounts at the time. It is therefore obvious that they were being used. It is also probable that there were more cisterns in the Study Area than the records show. I saw numerous cisterns that were in use around 1980 which cannot be found in the records from the 1940s. While I did not attempt (nor had the requisite knowledge) to estimate when they had been constructed I believe that most of them must have existed in the early 1940s but either were not then used, or were not considered valuable enough to record. And those who have cisterns value them highly: good tea should be made on cistern water, not piped water from the tap.

Regarding the spatial distribution of the cisterns in the `Allan area, judging from a generalized geological map (scale 1:250,000) they are all found in limestone areas, while areas of sandstone lack cisterns. It is not clear why this should be so, however, considering the many large and small cisterns found in the Petra sandstones. (Incidentally, the area around Madaba mainly consists of loose quarternary deposits which would appear even less suitable to build cisterns in.) The cisterns also are found in the higher parts of the area: there is actually a co-variation between altitude and geology because the limestone strata are younger. The older sandstones have become exposed through erosion at the sides of the deep Zarqa River valley. Higher areas probably receive more rain, but while it sounds reasonable that water is saved where it falls profusely one could equally well expect it to be even more coveted where it is rarer. Neither geology nor meteorology therefore seem to explain the unequal distribution of the cisterns.

Searching for another explanation for the unequal distribution of cisterns in the `Allan area, we can see that all four villages with cisterns are *Salṭiyyah*, that is, are inhabited by people with sedentary traditions, but so are three of those without cisterns as well. All four `Abbadi villages, with a population of a nomadic ethos, are without recorded cisterns. [41] The ethnological factor therefore also seems to be insufficient to explain the distribution of cisterns. For the time being my main assumption will be that the land registration of the 1940s gives an incomplete picture of the true situation.

The field research in the `Allan area will address numerous tasks. A survey will be made of springs, wells and all cisterns that can be located, that is of all items that together with irrigation canals, pumps, streams and bore-holes make up the local "water landscape". The traditional and legal rules governing people's access and use of water in its different forms will be discussed with the local population as well as with scholars and legal practitioners. Thus a view will emerge of where water is available now and has been available historically, the reasons for the pattern that is, how people use the water, and what people think of various ways to ensure and improve the future availability of water for different purposes. [42]

## Acknowledgement

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## Notes

1. Helms: *Jawa*, 1981 p. 9. [\[\\*\]](#)
2. Coon: *Caravan*, 1958 p. 172. [\[\\*\]](#)
3. Palmblad: *Palaestina*, 1842 p. 174. Translation LW. [\[\\*\]](#)
4. The latter difference was pointed out to me by Dr William Lancaster in a conversation in Amman in July 1994. I have not seen it expressed in writing, but all discussions of water I have seen, as well as my own experience (although I was not then attuned to the question), bear it out in fact. [\[\\*\]](#)
5. Cisterns are not mentioned at all in many works where it could be expected, such as Goichon: *Jordanie réelle*, 1967 and 1972; Tuma & Darin-Drabkin: *The Economic Case for Palestine*, 1978; Gischler: *Water Resources in the Arab Middle East*, 1979; Amiry & Tamari: *The Palestinian Village Home*, 1989; Eickelman: *The Middle East*, 1989; *Jordan's Water Resources and their Future Potential* (conference proceedings), 1992. In most of the works referred to in this paper the cisterns are mentioned only in passing. For example, in Salameh & Bannayan: *Water Resources of Jordan*, 1993, cisterns are mentioned on p. 99 as one supply of water for the four per cent of the population that are not served by piped networks. While this probably is true it should not be a matter of complacency for experts planning for the future water supply for the Jordanian people. [\[\\*\]](#)
6. LaBianca: "Project Rainkeep." Research proposal, March 1994. [\[\\*\]](#)
7. LaBianca: *Sedentarization and Nomadization*, 1990 pp. 87 etc. "Honeycombed" is from Conder: *Survey of Eastern Palestine*, London 1889 p. 180. [\[\\*\]](#)
8. Abujaiber: *Pioneers over Jordan*, 1989 p. 8. [\[\\*\]](#)
9. Antoun: *Arab Village*, 1972 pp. 1, 6, 111. Khammash: *Notes on Village Architecture*, 1986 pp. 35, 91. [\[\\*\]](#)
10. LaBianca: *Sedentarization and Nomadization*, 1990 pp. 46 ff., referring to Johnson: *Jabal al-Akhdar*. University of Chicago, Department of Geography, Research paper No. 148, 1973. [\[\\*\]](#)
11. Hakim: *Arabic-Islamic Cities*, 1986 pp. 46f, 112. [\[\\*\]](#)
12. From the translation in Harding: *Antiquities of Jordan*, 1967 p. 43. *Qerkhah* is generally identified with al-Karak. [\[\\*\]](#)
13. Evenari, Shanan & Tadmor: *The Negev*, 1982 p. 156, [\[\\*\]](#)
14. *Archaeological Encyclopedia of the Holy Land*, 1972 p. 332. [\[\\*\]](#)
15. Helms: *Jawa*, 1972 pp. 160 f., 177 f. [\[\\*\]](#)
16. Evenari, Shanan & Tadmor: *The Negev*, 1982 p. 171. [\[\\*\]](#)
17. LaBianca: *Sedentarization and Nomadization*, 1990 p. 149. LaBianca widens his perspective in a personal letter: "I am not aware of any evidence for them being constructed on a large scale anywhere in Transjordan any earlier than in the Iron Age, especially Iron 2 (ca. 900-500 B.C.)." Letter to LW dated April 27, 1995. See also LaBianca: "On-Site Water Retention Strategies", 1992. [\[\\*\]](#)
18. Evenari, Shanan & Tadmor: *The Negev*, 1982 pp. 14-17, 159. [\[\\*\]](#)

19. LaBianca: *Sedentarization and Nomadization*, 1990 pp. 188-192. Glueck: *The Other Side of the Jordan*, 1970 pp. 165, 171. De Vries: "Research at Umm el-Jimal", 1979. The historians have probably not yet established all the facts, but there are many indications that the extremely successful development of Middle Eastern water technology in the Hellenistic, Roman and Byzantine periods was largely the fruit of the Nabatean genius. An early discussion of this is in Hammond: "Desert Waterworks of the Ancient Nabateans", 1967. [\*]
20. Lenzen, Gordon & McQuitty: "Excavations at Tell Irbid and Beit Ras", 1985 p. 158. [\*]
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