

SOME REMARKS ON THE TERMINOLOGY OF IRRIGATION
PRACTICES AND HYDRAULIC CONSTRUCTION
IN THE EASTERN ARAB AND IRANIAN WORLD
IN THE 3RD-5TH/9TH-11TH CENTURIES

C. E. Bosworth

Manchester University

I. *Introduction*

The Arabs and Persians of the mediaeval Islamic period inevitably fell heirs to the extensive and complex irrigation systems of their pre-Islamic predecessors; immediately preceding them in Iraq the Aramaic-speaking population whom the Arabs called an-Nabat, but beyond these the Akkadian-speaking Assyrians and Babylonians and ultimately the Sumerians; and immediately preceding them in Persia and Transoxania (the *mā warā' an-nahr* of the Arabs) the Persians of the Sasanid period, the Soghdians and the Khwarazmians, and beyond these the ancient Iranians of Achaemenid times and earlier. Areas like Mesopotamia (the Tigris-Euphrates basin), Ahwāz or Hūzistān (the basin of the Kārūn river and its affluents) and the river basins of the Oxus, Zarafshan and Jaxartes, with such oases as those of Hurasān, Marw, Buḥara, Samarqand, etc., in northeastern Persia and Central Asia, exhibit the hydrological phenomena and their attendant political and social institutions of what the American sinologist Karl A. Wittfogel has called "hydraulic societies"¹. The researches of such scholars as the Russian archaeologist S. P. Tolstov in Hwārazm (in the modern Uzbekistan and Turkmenistan)² and the American one R. Mc C. Adam in the Tigris-

¹ See his *Oriental despotism, a comparative study of total power*, New Haven and London 1957.

² See his *Auf den Spuren der altchoresmischen Kultur*, Berlin 1953.

Diyala rivers plains to the northeast of Baghdad³, have shown the essential continuity of land utilisation and irrigation practices there from pre-Christian up to Islamic times. Not surprisingly, the language of Islamic times of the technical terminology of practices in these regions of highly-organised, irrigated agricultural exploitation goes back frequently to such more ancient tongues as Aramaic, Middle and Old Iranian, Akkadian, Sumerian and perhaps Elamitic.

A considerable part of this terminology is known to us from certain early Islamic writers, such as the mathematician in Persia and Iraq Abū l-Wafā' Muḥammad b. Muḥammad al-Būzaǧānī (d. 388/998 or in the preceding year)⁴; Abū 'Abdallāh Muḥammad b. Aḥmad al-Ḥwārazmī (*floruit* in the second half of the 4th/10th century), secretary in the bureaucracy of the Sāmānid amīrs of Buḥara and author of a pioneer encyclopaedia of the sciences, the *Kitāb mafātīḥ al-'ulūm*, which has valuable information on the terminology of irrigation practices in the oases of Ḥurasān and Transoxania⁵; and the unknown author of a mathematical treatise, probably written in the second quarter of the 5th/11th century under the last Būyids as a guide for the use of financial officials in Iraq, the *Kitāb al-Ḥāwī li-l-a'māl as-sultāniyya wa-rusūm al-ḥisāb ad-dīwāniyya*⁶.

³ See his *Land behind Baghdad, a history of settlement on the Diyala plain*, Chicago and London 1965.

⁴ See *El*² art. "Abū l-Wafā' al-Būzaǧānī" (H. Suter).

⁵ See on him in general, *El*² art. s.v. (A. L. Sabra); on his book, C. E. Bosworth, "A pioneer Arabic encyclopedia of the sciences: al-Khwārizmī's 'Keys of the sciences'", *Isis*, LIV (1963), 97-111; and specifically on the section of the book dealing with irrigation terminology, *fī alfāz tustā'malu fī dīwān al-mā'*, idem, "Abū 'Abdallāh al-Khwārazmī on the technical terms of the secretary's art: a contribution to the administrative history of Mediaeval Islam", *Jnal. of the Economic and Social History of the Orient*, XII (1969), 151-158.

⁶ See Cl. Cahen, "Le service de l'irrigation en Iraq au debut du XIe siècle", *Bull. d'Études Orientales*, XIII (1949-50), 117-143.

II. The Terms

As a preliminary, one may note that many of the basic Arabic terms relating to agriculture, the processes of cultivation, sowing and harvesting, and the names of plants and crops, seem to have originated – not surprisingly – in the well-watered region of Mesopotamia, where the terrain and climate were so suitable to growth, and go back to the pre-Islamic Semitic society there or even beyond that to the preceding Sumerian civilisation. Thus Arabic *akkār* “peasant, cultivator” goes back, probably via Aramaic *akkārā* (Hebrew *ikkār*) to Akkadian *ikkāru* (root ḫ - k - r) and Sumerian *engar*⁷. Arab *ḥaraṭa* “to plough, till the ground” (Ugaritic *ḥrt*; Hebr. *ḥāraš*; Ethiopic *ḥarasa*) goes back to Akk. *erēšu*⁸. Ar. *dara’a* “to sow seed” (Ug. *dr*; Hebr. *zāraʿ*; Aram. *dʿraʿ* or *zʿraʿ*; Eth. *zar’a*, i.e. with glottal stop for the third radical ‘ayn here in South Semitic, as in the Arabic also) goes back to Akk. *zarū*⁹. Ar. *ḥiṭa* “wheat” (Ug. *ḥtt*; Hebr. *ḥittā*; Aram. *ḥiṭtā* “wheat”; Eth. *ḥettat* “grain”) goes back to Akk. *utta/etu* “corn, barley (the word for the latter cereal in Arabic, *šāʿir*, coming from a West Semitic form, Ug. *šʿrm*; Hebr. *šʿōrā*; Aram. *šʿartā*)¹⁰. Ar. *sunbula* “ear of corn” is from a common Semitic origin (Hebr. *šibbolet*; Aram. *šbaltā*; Syrian *šablʿtā*; Eth. *sabl*), with its oldest form seen in Akk. *šubultum, šumbultu*)¹¹, whilst Ar. *ḥaql* “field” is likewise common Semitic, Hebr. *ḥēleq* “share”; Aram. *ḥaqlā* and Akk. *eqlu* “field”.¹²

⁷ A. Salonen, “Akkadian lexicography”, *Orientalia*, N.S. XIX (1950), 405; idem, *Alte Substrat- und Kulturwörter in arabischen* (*Studia orientalia, Societas orientalis fennica*, XVII/2), Helsinki 1952, 10.

⁸ Idem, *Agricultura mesopotamica nach sumerisch-akkadischen Quellen* (*Annales Academiae scientiarum fennicae*, Ser. B, vol. CXLIX), Helsinki 1968, 29-30.

⁹ *Ibid.*, 30.

¹⁰ *Loc. cit.*

¹¹ *Ibid.*, 30-31.

¹² *Ibid.*, 31.

What now follows is only a brief selection of words dealing with irrigation, canals and the control of river waters; an exhaustive examination of the topic would certainly need a complete book.

1. *Ma'şir*. This is defined by al-Ḥwārazmī as “a chain or cable which is fastened right across a river and which prevents boats from getting past”¹³, and more specifically by Ibn Rusta in the geographical section of his *al-A'lāq an-nafīsa* as a barrier across the Tigris at Ḥawānit near Dayr al-Āqūl consisting of a cable stretched between two ships at each side of the river, preventing ships passing by night (and thus evading the tolls levied by the official traffic and toll-house regulators, the *aṣḥāb as-sayyāra wa-l-ma'āşir*¹⁴. Then from being a barrier across the river to halt shipping, it soon acquired the meaning of “customs house where tolls (*mukūs, ma'āwīn*) were collected” and then the actual tolls themselves, so that in the caliphate of al-Mu'taḍid (279-289/892-902) one hears of a body of officials attached to the *şurta* or police of Baghdad called the *ma'āşiriyyūn*, who collected tolls from river traffic on the Tigris¹⁵

The Arabic root *'-ş-r* “to confine, constrict; to attach a tent to the ground by means of a short rope, *īşr* or *aşr*” (*Lisān al-ʿarab* V, 80-82) gives some clue to the word's general meaning of a barrier preventing river traffic, but the actual form may go back to Akk. *maşāru* “to delimit, fix a boundary”, *muşsuru* “to set a border line”, *maşartu* “watchman, guard, watch house”¹⁶.

¹³ *Mafātīḥ al-ʿulūm*, ed. G. van Vloten, Leiden 1895, 70, Eng. tr. in Bosworth, “Abū ʿAbdallāh al-Khwārazmī on the technical terms of the secretary's art”, 155.

¹⁴ Ibn Rusta, ed. M. J. de Goeje, Leiden 1892, 185, French tr. G. Wiet, *Les atours précieux*, Cairo 1955, 213.

¹⁵ Hilāl aṣ-Şābi', *Kitāb al-wuzarā'*, ed. ʿA. A. Faraġ, Cairo 1959, 20, German tr. in H. Busse, “Das Hofbudget des Chalifen al-Mu'taḍid billāh”, *Der Islam*, XLIII (1967), 21-22. See also M. ʿAwwād, *al-Ma'āşir fī bilād ar-rūm wa-l-islām*, Baghdad 1948, and *El'* art. “Ma'şir” (Bosworth).

¹⁶ See *Chicago Akkadian dictionary*, Letter M, x/1, 333 ff., x/2, 245; W. von Soden, *Akkadisches Wörterbuch*, Wiesbaden 1959-81, II, 619-621, 659.

2. *Musannāt*, this is dismissed by al-Ḥwārazmī as being well-known and thus requiring no elucidation¹⁷. It denotes, in fact, a dam or embankment with sluices or gaps to let the water through in a controlled flow, and is mentioned quite often in early Islamic sources on the conquest and history of Iraq. The great Umayyad governor al-Ḥaḡḡāḡ b. Yūsuf constructed *musannayāt* in the lands of Mesopotamia under his charge¹⁸. al-Ya'qūbī describes the Round City of Baghdad constructed by al-Manṣūr as having a fore- or outer wall (*faṣīl*) with towers, beyond which lay a strong rampart, *musannāt*, made from fired brick bonded together by quicklime mortar (*al-āḡurr wa-ṣ-ṣārūḡ*), and then a trench (*ḥandaq*) filled with water led in from the Karḥayā Canal¹⁹. The Qur'ān commentators and authorities on the lore of the ancient Arabs explain the South Arabian term *al-ʿarim*, used in Qur'ān, 34. 15, in connection with the story of the breaking of the Dam of Mārib, as a *musannāt* or strongly-constructed barrage²⁰. The Arabic plural form must be via Aram. *m^ešann^eyāt*; in Judaeo Aramaic we have *m^ešōnītā*, used in the Mishna to mean "dam". The ultimate origin of the term is Akkadian; in late Babylonian documents and letters it is fairly common, with the meaning "embankment, barrage" for *mušannita*/*mušennita*²¹.

3. *Bazand*. This is defined by al-Ḥwārazmī as a garden (*bustān*), which must be merely a stab in the dark²². The word does not appear in any of the native dictionaries and is frequently mis-written, with

¹⁷ *Mafātīḥ al-ʿulūm*, 70, tr. in Bosworth, *op. cit.*, 154.

¹⁸ al-Balāḍurī, *Futūḥ al-buldān*, Cairo 1959, 290-291.

¹⁹ *Kitāb al-Buldān*, ed. de Goeje, Leiden 1892, 239, French tr. Wiet, *Les Pays*, Paris 1937, 13.

²⁰ Cf. al-Masʿūdī, *Murūḡ al-dīḥab*, ed. C. Barbier de Meynard and Pavet de Courteille, Paris 1861-77, III, 371-372; Yāqūt, *Muʿḡam al-buldān*, Beirut 1374-76/1955-57, IV, 110, s.v. "al-ʿArīm".

²¹ Salonen, "Akkad. *musannitu* = arab. *musannāh*", *Orientalia*, N.S., XXXII (1963), 449-451; idem, *Agricultura mesopotamica*, 219-223.

²² *Mafātīḥ al-ʿulūm*, 70, tr. in Bosworth, *op. cit.*, 154, cf. 164.

displacement of consonantal dots, as *barīd*, *yazīd*, etc., by e.g. authors like al-Balāḍurī, Abū Yūsuf, Yaḥyā b. Ādam, but is clearly written in the manuscripts of Qudāma b. Ġaʿfar's *Kitāb al-ḥarāġ*. It is often associated with *sukūr* "weirs" and *butūq* "diversions from a river in order to feed water into a canal"²³, and its meaning emerges plainly from the *Kitāb al-ḥāwī* as denoting an embankment of brushwood, reeds and packed-together earth used to block up a breach in the banks of an irrigation canal. Although given an Arabic plural as *bazandāt*, the word looks basically Iranian and may date from the period of Sasanid domination in Iraq during the centuries before the Arab conquest²⁴.

4. *Mallāḥ*. This well-known word is defined, obviously, by al-Ḥwārazmī, as *ṣāḥib as-safīna* "sailor, man connected with boats", and less obviously as *mutaʿabhid al-māʾ* "one who frequents the waterways"²⁵. In early Islamic times, and assuming that al-Ḥwārazmī's two definitions are not synonymous, this last seems to have denoted a person responsible for maintaining the river banks, keeping the channels clear of débris and obstructions, etc., a meaning found in some of the native dictionaries (e.g. *Tāġ al-ʿarūs*, II, 229: *mutaʿabhid an-nahr*). The word is ultimately from Akkadian (as is, indeed, the common Arabic word for

²³ On *baṭq/biṭq*, see the comments on the word's use by Abū Yūsuf given by E. Wiedemann, "Beiträge zur Geschichte der Naturwissenschaften. X. Zur Technik bei den Arabern", in *Aufsätze zur arabischen Wissenschaftsgeschichte*, ed. W. Fischer, Hildesheim 1970, I, 279-280. The same word or its root would appear to lie behind the name of the river channel or canal in the neighbourhood of Wāsiṭ mentioned by al-Balāḍurī, *Futūḥ al-buldān*, 289, as al-B.zāq, in the local Aramaic speech, al-B.sāq.

²⁴ Cahen, "La service de l'irrigation en Iraq", 123-124, 135-138.

²⁵ *Mafātīḥ al-ʿulūm*, 69, tr. in Bosworth, *op. cit.*, 153.

"ship", *safīna*²⁶) *malāhu* "seaman, captain of a ship", itself going back to Sumerian *ma₂-lah₆*, cf. Mishnaic Hebrew *mallaḥ*, Aram. *mallaḥā*²⁷.

5. *Šādurwān*. This is defined by al-*Hwārazmī* as a constructional work (*asās*) which protects and strengthens the foundations of a bridge (*qanṭara*)²⁸. *Ahwāz*, in particular, was the region where *šādurwāns* were used extensively, and the great *šādurwān* or weir across the *Duḡayl* at *Tustar* built by the *Sāsānid* Emperor *Šāpūr I* was regarded by the Muslims as one of the wonders of the world²⁹. al-*Maqdisī* describes in considerable detail the *šādurwāns* on the river of *Ahwāz*, i.e. the *Kārūn*, barriers which divide up the waters dammed up behind them and direct them into channels for irrigation, also at the same time relieving the pressure of accumulated waters in winter and spring when snow and rain in the *Zagros Mountains* to the north swelled the rivers of the plains below³⁰.

The word has clearly a wide range of meanings, in Arabic usage alone, some of which are enumerated by *Dozy*, such as a basin for ablutions; a fountain with jets of water; a raised platform; a pipe or conduit conveying water to a tank or basin; and the base on which the

²⁶ *Salonen, Die Wasserfahrzeuge in Babylonien nach sumerisch-akkadischen Quellen... Eine lexikalische und kulturgeschichtliche Untersuchung (Studia Orientalia, Societas orientalis fennica, VIII/4), Helsinki 1939, 19: Akk. sapīnātu; Hebr. špīntā; cf. H. Kindermann, "Schiff" im Arabischen. Untersuchung über Vorkommen und Bedeutung der Termini, Zwickau-im-Sa. 1934, 40, 108.*

²⁷ See *H. Zimmer, Akkadische Fremdwörter als Beweis für babylonische Kultureinfluss, Leipzig 1915-17, 45; Salonen, op. cit., 133-134; von Soden, Akkadisches Wörterbuch, I, 592.*

²⁸ *Mafātīḥ al-ʿulūm, 70, tr. in Bosworth, op. cit., 154-155.*

²⁹ See *G. Le Strange, The eastern lands of the caliphate, Cambridge 1905, 57-58, n. 3, 235-236; Abū Dulaf Miṣʿar b. Muḥalhil, Travels in Iran (circa 950 A.D.), ed. and tr. V. Mirowsky, Cairo 1955, text 28, tr. 61, comm. 110.*

³⁰ *Aḥsan at-taqāsīm, ed. de Goeje, Leiden 1906, 411; Wiedemann, op. cit., 322-327.*

Ka^cba at Mecca stands³¹. It is this last meaning which seems to come nearest to al-Hwārazmī's definition of *šādurwān* as a revetment or supporting course of masonry, etc., round the base of the pierre of a bridge or some other hydraulic construction. The etymology of the term was extensively investigated by the French Iranist E. Benveniste. He showed that this obviously Iranian word was probably Parthian in origin, i.e. stemming from pre-Sāsānid Iran, and spreading into the languages of neighbouring countries such as Armenia and into the Semitic Mandaean language of southern Iraq, where it seems to denote a large sheet of water, on which boats can sail, in a basin. The basic meaning is apparently that of a raised platform or dais (which might be covered with carpets or such coverings, hence the word's sense in Armenian and in Middle and New Persian), which was extended to constructions with walls and embankments to raise the level of water in basins, and thence to various other hydraulic devices for raising or directing the flow of water for fountains, to weirs, to dams with sluices, to streams canalised between brick and stone embankments, etc³².

6. *Ṭawf*. This is explained by the Arabic lexica (see Lane, *s.v.*) as a raft constructed either from inflated goat or water skins lashed together with ropes or palm fibres or else from wooden spars similarly fastened together. In the first sense, it is obviously identical with the well-known *kelek* used especially on the Tigris above Baghdad and its tributaries like the Great and Little Zab, mentioned as in use till modern times by Western travellers in that region. The use of such rafts of inflated skins must be ancient in Mesopotamia, for Arabic-Turkish *kelek* goes back to

³¹ R. Dozy, *Supplément aux dictionnaires arabes*, Leiden 1927, I, 715; see also for the term's usage in the Arab world, G. Marçais, "Salsabil et Šādirwān", *Études d'orientalisme dédiées à la mémoire de Lévi-Provençal*, Paris 1962, II, 639-648.

³² "Le sens du mot persan *šādurwān*", *Mélanges d'orientalisme offerts à Henri Massé*, Tehran 1342/1963, 31-37.

Akkadian (Old Babylonian), the *kalakku* being depicted also on Assyrian reliefs, and ultimately to Sumerian *ka.lá*³³.

The term was used in 'Abbāsīd times, for when the general al-Afšīn planned his clandestine escape from arrest by the Caliph al-Mu'taṣim in 225/839-40, he got ready materials for constructing *aṭwāf* in his palace at Sāmarrā, with the intention of crossing the Little Zab and fleeing northwards³⁴. Also, an anonymous, mid-4th/10th century work written in early Būyid times and very probably in Iraq, dealing with various categories of officials and somewhat misleadingly entitled *Siyāsat al-mulūk*, as if it were one of the familiar "Mirrors for Princes" genre, speaks in its section concerning the duties of the *muḥtasib* or market inspector about the *ṭā'if* (= *ṭawf*), and in as much as this construction was clearly used also as a means of controlling river traffic as well as for transportation, consideration of the *ṭawf/ṭā'if* is appropriate here. The unknown author says:

"It is necessary for the *muḥtasib* to place in the river a *ṭā'if* which is chained up with the skiffs (*zawraqs*), and [the ensemble of these] prevents anything from passing along the river by night except with a licence (*ḡawāz*). The *muḥtasib* should appoint at each docking-place (*furda*) a supervisory official (*'arīf*) who can act as an arbitrator of disputes between the boatmen (*al-mallāḥīn*) and deal with each of them in turn (? *yunāwibu baynahum*), who will not treat them inequitably and who will prevent them from demanding excessively high rates of hire (i.e. for transporting goods)³⁵.

³³ See Salonen, *Die Wasserfahrzeuge in Babylonien*, 66-68; von Soden, *Akkadisches Wörterbuch*, I, 423; *Chicago Akkadian dictionary*, Letter K, 64; Kindermann, "Schiff" im Arabischen, 59-60; *EP* art. "Kelek" (Kindermann).

³⁴ aṭ-Ṭabarī, *Ta'riḥ*, ed. Leiden, III, 1305-1306.

³⁵ J. Sadan, *Une nouvelle source sur l'époque būyide. Étude préliminaire, Haḍāra, texts and studies in the civilization of Islam*, Dept. of Arabic Language and Literature and Dept. of Middle Eastern and Islamic History, Tel Aviv University, Tel Aviv n.d. [ca. 1981], Arabic text, 22.

From this passage it emerges that *atwāf* were also used in the composition of a static barrier of boats plus inflated pontoons or rafts placed across a navigable river, fulfilling the same function as a *ma'şir* (see 1. above).

The etymology of *tawf* is, however, somewhat obscure. In Biblical Hebrew the root *ş.w.f* means "to float on the water", and Fraenkel adduces Aramaic and Judaeo-Arabic *t.f*, requiring Arabic **z.w.f.*³⁶. Arabic *z.w.f* does actually exist, see Lane *s.v.*, with the general meaning of "to get hold of someone by the scruff of the neck, by the hair hanging down at the back of the neck, the *şūf raqabatihī*", but apart from the vague connotation of such hair with the hair of the goat skins used in the construction of a *tawf*, this is not of any help. The indigenous Arabic root *t.w.f* "to go round, circumambulate (e.g. a ritual object) does not help here either, although Arabic *tūfan* "flood, the Deluge", Rabbinical Hebrew *tōfnā*, has the requisite connection with water³⁷. It does not seem possible to trace *t.w.f.* any further back, and the exact origin of *tawf* must remain obscure.

³⁶ Koehler-Baumgartner, *Lexicon in Veteris Testamenti libros*, 798a; S. Fraenkel, *Die Aramäischen Fremdwörter im Arabischen*, Leiden 1886, 220.

³⁷ A. Jeffery, *The foreign vocabulary of the Qur'ān*, Baroda 1938, 207.