



Lessons Learned from Qanat Studies: A Proposal for International Cooperation

Iwao Kobori^[1]

General situation surrounding Qanat studies

Almost all researchers on Qanat have their interest in its origins, diffusion and dispersal, however there are no many studies conducted for its rehabilitation. As Qanat system is globally distributed, even at the present time, re-evaluation of the system with appropriate case studies are highly recommended. Regional unbalance of case studies is another problem to be tackled in future cooperation. For example, in the Iranian case, including Afghanistan, we notice that scientific contributions mainly by local institutions are not well known by international scientific groups because of the language barrier. Fortunately the first international conference on Qanat was held in Iran (Yazd) in 2000. As one of the results of the international conference, the Iranian Government has decided to establish an International Qanat Research Center in Iran in collaboration with UNESCO and the centre has already started their activities from last year. Publications of Yazd conference includes a glossary and bibliography on Qanat which may constitute the first challenge of Qanat studies. They have built a water museum in Yazd with a rich collection of Qanat tools and related documents such as water sharing and using contract. After this international symposium we had three related symposiums

- 1) Colloque internationale de Qanat, Madrid 2001
- 2) International symposium in water conveyance which was held in 2002, Muscat Oman.
- 3) Qanat technology, Luxemburg 2003

In the case of China, “the Proceedings of International Conference on Karez Irrigation” has been published in 1993, it includes 39 original papers by Chinese and foreign scholars covering past, present and future of Karez ; the meeting was held in 1990, Urumqi. This presents a milestone in order to develop Karez studies in China. I have organized a Sino-Japanese joint mission for Karez studies in Xinjiang from 1987 up to present. Nowadays we have two or three Japanese groups who are doing researches in the field directly or indirectly in connection with Karez studies including advanced technologies such as Geographical Information System (relation between landforms and Karez information sites). In Trupan they established Karez museum which includes exhibition of our joint activities on Karez research.

In the Case of the Sahara, although there is a hiatus between French colonial and post independence era still , there are abundant materials to be re-examined. Recently, local authorities such as Wilaya de Adrar (Department of Adrar) organized an international workshop on Foggara in 1996 in collaboration with university of Oran. Starting a field research in Algeria Sahara from 1961, especially during past 40 years, I examined the socio-economic changes of oasis with Foggara. In my observation, the ministry of Agriculture and local governments of Algeria are interested in the rehabilitation of existing oasis with Foggara. Recently, the Algerian government categorized Foggara as a National Cultural Heritage, and they are expecting to be also recognized by UNESCO as a World Cultural Heritage.

Through my individual observations, regions such as Iran (including Afghanistan), Pakistan, Arabian peninsula, Central Asia, the Sahara and the Xinjiang are the main regions

^[1] United Nations University.

where we must continue the research of the sustainable development of Qanat system. Of course, we have small scale intensive case studies such as in Syria, Palestine, Arabian peninsula and Mexico, Peru, Chile and even the Mediterranean Europe. And these references also could be assimilated in our future cooperation.

Personal Experience

I started my research on Qanat and Karez Oases in 1956 when I extensively observed Qanat in Iran and in West Asia at first as a member of the Tokyo University Iran- Iraq Archeological mission. From that time on, I have extended my field works to other parts of the world, to confirm the Qanat system in situ as a geographer. Results of those surveys were published by various national and international journals and proceedings. (A part of the collected papers were also published in Japanese and English, in 1996). A case study in the Sahara (*Le japonis de In Belbel*, 2002) was filmed by an Algerian television.

On the other hand, as it was difficult for me alone to conduct global research, I have concentrated on carrying out intensive research on the Evolution of Qanat oases in three regions – Tidikelt (Algeria), Palmyra Basin (Syria), and Turpan Basin (China). I have visited Iran several times in order to refresh my knowledge on Iranian Qanat, and collected first-hand information on Falaj in Oman and the Arabian Peninsula in general, Khattara in Morocco, Karez in Turkmenistan and small, similar systems in Latin America etc.

Reasons for declining of Qanat system

Through these researches and observations, I have found that this unique and indigenous technology (probably invented in the Iranian Plateau) is now in danger of fading out if we do not give serious concern about the future of Qanat system. The reasons for the decline of Qanat may be listed as follows:

A) Changes in the socio-economic backgrounds concerning Qanat construction: To construct one Qanat, it needs considerable pre-investment and a number of skilled and ordinary workers. For example, Arbab (landowner) in Iran had played a big role in the construction, but difficulties in securing suitable workers. For example, in Iran, many Afghan refugees are hired for construction work of Qanats. The introduction of pumping wells have changed the balance between Qanat and modern wells. Digging Qanat in the underground aquifer is difficult and brought with risks of accidents. Besides, maintenance operations are also not a so easy task. A village's younger generation prefers to work in urban areas to obtain higher income, than the hard work in rural areas. So far, this has been a common reason for the reduced adoption of the Qanat system.

B) Technical Problems: There are several technical improvements in the use of concrete pipelines for tunnels, such as replacing animal power to tractors, recharging pumped up water to the Qanat, etc. However, partial support does not solve the difficulties in digging deep shaft and long underground tunnels during construction of a Qanat. Ambitious technological innovation such as the Robot may solve the question, but probably fairly difficult to implement because it initially involves a high investment cost.

In Xinjiang case, I must mention that Song Yudong group in close collaboration with Xinjiang local authorities and peoples already published several comments on how to vitalize existing Karez system including overall plan for protection and improvement of existing Karezes. I had very much appreciate their proposal in his paper.

The planning and layout of Karez should be based on the overall planning of water resources and hydrogeological condition of the locality, harmonizing between the economy, society development and environment protection and coping with the conflict between Karez, pumping well and canal lining. The experiences from the Turpan prefecture on water resources development can be summarized as follows ;

- Diverting river water nearby for irrigation in the upper reaches of river.
- Diverting springwater for irrigation of the areas nearby outlet mountain valley marginal fringe of the alluvial fan.
- Abstracting water from karez and pump well for irrigation at the middle and lower reaches of the river.

-Building pump well at the lower places of karezes to minimize mutual interference. (Song Yudong *et al.* (2000) "*Research on Xinjiang Karez* " in the proceedings of the First International Symposium on Qanat, Yazd, Iran).

Their proposal is not only for Xinjiang Karez and may be applied to Qanat in Iran or Foggara in the Sahara as a whole.

Urgent Need for bilateral and international cooperation

Under the above-mentioned situation, we need precise and detailed information on each region. For example, very recently the Iranian Ministry of Agriculture has published a very extensive directory for agricultural land that includes an abundant information on Qanat. In Xinjiang I know there are accumulated hydrological information on Qanat in Turpan which will be useful for future sustainable development of existing Qanat system. Recently international organizations such as UNESCO and UNU have shown their interest to support Qanat studies either through IHP which covers member states or traditional technology in dry lands program which support young researchers in Qanat countries. In case of UNU fellowship on traditional water management in dry areas, we have already six young fellows in Syria, Oman, Tunisia, Yemen, Morocco, China and Japan. We are still looking for young Ph.D. candidates who are willing to undertake research on Qanat. From 2004, EU scientific commission have started to support ambitious Foggara project for coming three years concentrating on Maghreb countries and southern Europe. For this purpose, we must continue historical studies based on manuscripts and collection of interviews with aged Qanat experts such as Muqqani in Iran.

Besides the present and future of Qanat system, we would still need to carry out international research projects on the origin and diffusion of the Qanat system. For this purpose, increased south-south cooperation is extremely important. This means not only to hold workshops or conferences but also to proceed actual exchange of researchers, administrators, and diggers (Moqqani in Iran or Kunchang in Xingian). For example, Xinjiang Karez people may visit Iran or vice-versa exchange their experiences face to face.

For international networking, it will be necessary to prepare lists of researchers (not forgetting to include social and human scientists because research on Qanat system is not only a technical issue but also very much related to socioeconomic cultural ones of local communities that are involved with the Qanat system) and bibliographies on Qanat in each regions, and translate precious information on Qanat written in several languages into other languages. The second international conference on Qanat will be held in Iran during this year, and another international conference making a stress on applying of Qanat technology in modern tunnel digging will be held in Luxembourg. Those forthcoming events will present a good opportunity to enhance concrete cooperation and commitment from international institutions, researchers and decision-makers on various interrelated issues. Another important EU program on a comprehensive survey on Qanat around the Mediterranean basin is starting this year. This big project will allow real opportunity for local researchers to be involved in a well supported programme and they are trying to develop a systematic inventory on Qanat in the Mediterranean basin.

Finally we must think about the role of future generations who will continue on our experience to preserve this unique Qanat system. I think that there are some information on Qanat in university or high school texts, however public interests on Qanat system may not be enough. For the conservation of this excellent cultural heritage it would be recommended to establish some teaching programs on Qanat for school children. UNESCO is now preparing to publish an introductory book on Qanat for school children and UNU is planning an exhibition on deserts including traditional technology on the occasion of international year of deserts and desertification, 2006. FAO too is also interested in Qanat as an indigenous knowledge on agriculture. Those approaches by international organizations would help to develop Qanat studies.

References

- BALLAND, D. , « Les Eaux Cachées – Eudes Géographiques sur les Galeries Drainantes Souterraines », 142P., Département de Géographie, Université de Paris-Sorbonne.
- Beaumont, P; Bonine M, and McLachlan K., (1989), "*Qanat, Kariz and Khatara*", 305p., Whitstable Litho Ltd.
- BARCELO, M *et al.* : (1986), « *Les Aiguës Cercades* » – Els qanat(s) de l'illa de Mallorca – 145p. Institut l'Estudis Balearics.
- BEHNIA, A. (1989) : « *Kanat : construction and maintenance* » (in Persian), 236p. (Comprehensive bibliography in Persian & Foreign Languages included).
- BRIAN, P., (2001), "*Irrigation et drainage dans L'Antiquité, qanats et canalizations souterraines en Iran, en Egypte et en Grece*", Collège de France, p.190.
- BORINGHIERI, B. (2001), "*Pietro Laureano – Atlante d'Acqua – Conoscenze tradizionali per la lotta alla desertificazione*", Laila Libros, p.424.
- CRESSEY, G.B., (1958): "*Qanats, Karez and Foggara*", Geographical Review, vol. 48, No. I: pp. 27-44.
- GOBLOT, H. (1979): "*Les Qanats – une technique d'acquisition de l'eau –*" 231p., Mouton, Paris.
- HARA, R. Nanri, H. (1980): "*Village Community and its Irrigation System: a case study of the Village of Fulk in Birjamd, Iran*" (in Japanese), Journal of Asian & African Language & Culture, vol. 19: pp. 49-82.
- HOYONAGI, M. (1975): "*Natural change of the region along the old silk road in the Tarim Basin during historical times*", Memoires of the Research Department of the Toyo Bunko, pp. 85-113.
- KOBORI, I.:
- (1962), "*Human geography of irrigation in the Central Andes*", Land Use in Semi-Arid Mediterranean Climates, (UNESCO Arid Zone Research XXVI, pp.135-137.
- (1964), "*Some considerations on the origin of Qanat system*" in Memorial collected papers dedicated to Professor E. Ishida, Tokyo, pp. 157-163.
- (1969), "*Le système d'irrigation dans le Sahara central – Tidikelt-*" Bulletin of the Department of Geography, University of Tokyo, No. 1, pp. 1-32.
- (1973), "*Some notes of diffusion of Qanats*", Orient, vol.9: pp. 43-66.
- (1976), "*Notes on Foggara in the Algerian Sahara*", Bulletin of the Department of Geography, University of Tokyo, No. 8, pp. 1-32.
- (1979), "*Qanawat Romani of Taibe oasis*", The Tokyo University Scientific Mission for the Comparative Study of the Foggara Oasis in the Arid Zone of the Old Continent, Report No. 1, 98p.
- (1980), "*Qanawat Romani of Taibe Oasis*", The Tokyo University Scientific Mission for the Comparative Study of the Foggara Oasis in the Arid Zone of the Old Continent, Report No. 1.
- (1982), (ed.) "*Case Studies of Foggara Oases in the Algerian Sahara and Syria*", The Tokyo University Scientific Mission for the Comparative Study of the Foggara Oasis in the Arid Zone of the Old Continent: Report No. 2, 101p.
- (1987): "*Manbo Qanat in Japan*", (in Japanese) 279p.
- (1993), The Proceedings on International Conference on Karez irrigation, (in Chinese and English), Urungi, Xinjing, China, 230p.
- (1995), "*Water System in Arid and Semi-Arid Lands*" (Kansoo-chiiki no Suiri-taikei) in Japanese and English, Taimei-do, Tokyo, pp. 328.
- (1996): "Water System in Arid Lands: Formation and Diffusion of Qanat" (in Japanese and English), 236p.**
- (1999), "*How to Cooperate with International Activities for Research and Development in Deserts: A Japanese View Point*". The Proceedings of the Fifth International Conference on Desert Development: the Endless Frontier, I.R. Traylor Jr., H. Dregne and K. Mathis (Eds.), International Center for Arid and Semiarid land Studies, Office of International Affairs, Texas Tech University, pp. 6-14.

(2000). "*Urgent Need for International Cooperation for Comparative Studies*", in the proceeding of The First International Conference on Qanat, Vol. VI, pp.161-162 (in Persian and English), Yazd, Iran, 228p.

(2002) *Le japonis de In Belbel, documentary film by Procom International (45mts).*

LAESSOE, J. (1951): "*The Irrigation System at Ulhu, 8th century B.C.*", *Journal of Cuneiform Studies*, vol.5, No. 5, pp.21-32.

PAPOLI-Yazdi et al., (2000), "*The Quassbeh Qanat in Gonabad*", (in Persian), 279p.

NEEDHAM, J. (1954): "*Science and Civilization in China*", Cambridge, England, vol.4, pt. 3, pp.334-335.

OKAZAKI, S., (1989): "*The Japanese Qanat (Mambo): Its Technology and Origin*", pp. 267-279, in "Qanat, Kariz and Khattara: Traditional Water Systems in the Middle East and North Africa", Eds. Peter Beaumont, Michael Bonine and Keith McLachlan.

Sayyed Mansour Sayyed Sajjadi (1982), "*Qanat/Kariz – Storia, Tecnica contruttiva ed Evoluzione*", Istituto Italiano di Cultura Sezione Archeologica, Teheran.

SHIMAZAKI, A., (1997): "*A Study of History of Eastern Turkestan in the Times of Sui and T'ang*", (in Japanese), University of Tokyo Press, 592p.

The First International Conference on Qanat, (2000): "*Qanat Bibliography*", (in Persian and English), Yazd, Iran, 228p.

The Proceedings on International Conference on Karez Irrigation, (1993), (in Chinese and English), Urumqi, Xinjing, China, 230p.

TROLL, C. (1963): "*Qanat-Bewasserrung in der Alten und Neuen Welt*", *Mitteilungen der Osterreichischen Geographische Gesellschaft, Wien*, vol. 105, pp. 313-330.

UNU Desertification Series, 1998, *New Technologies to Combat Desertification*, Proceedings of the International Symposium held in Teheran, Iran, 12-15 October 1998, Environment and Sustainable Development, UNU, Tokyo, Japan

UNU Desertification Series, 1999, *Water Management in Arid Lands*, Proceedings of the International Workshop held in Mednine, Tunisia, 18-22 October 1999, Environment and Sustainable Development, UNU, Tokyo, Japan.

The Proceedings of International Conference on Karez Irrigation, 1993, Xinjing People's Publishing House. Educational and Cultural Press Ltd. Urumqi, China.