Domestic water use in Morocco's Tessaout Amont irrigation system

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When a new irrigation scheme is introduced, water rights need to be allocated — not only to crops for irrigation, but also for domestic purposes.

In arid regions where water is scarce, water use and water rights are of critical importance in the day-to-day functioning of society. When an old water delivery network is replaced or complemented by a more technologically complex irrigation system, the overall pattern of local water-use and water rights also changes. Yet in planning and implementing new irrigation systems, the need for water for domestic use is seldom integrated. The results of such exclusion are exemplified in the Tessaout Amont irrigation system in the Haouz plain of central Morocco.

The semi-arid Haouz plain has long been irrigated. In this traditional system, rivers and *wadis* (rocky water courses) originating in the High Atlas Mountains were dammed and the water directed for long distances through partly subterranean canals until it reached the fields. Water rights, usually expressed in units of time, were assigned to a person or field.[1] Flowing surface water, especially near houses, was often used for drinking and for other domestic activities. According to custom, nobody could be refused water for drinking.

Since the late 1960s, several modern surface irrigation systems have been built to improve the exploitation of rivers flowing from the High Atlas. The Tessaout Amont irrigation system, about 70km north-east of Marrakech, was built with a maximum capacity of 17m^3 per second for 53 000ha. The physical infrastructure is typical of modern Moroccan surface-irrigation systems and consists of a large dam and storage lake, trapezoidal, lined primary canals, semi-circular elevated concrete conduits as secondary and tertiary canals, earthen quaternary canals and a complementary drainage network. The elevated canals require sizeable 'U'-shaped siphons to take the water underneath paths and access roads. A typical tertiary siphon (Figure 1) consists of two rectangular boxes measuring 0.8m by 1.1m and 2m deep, connected by an underground pipe (0.4m in diameter).

1. Pascon, P., *The Jaouz Marrakech*, Vols.I and II, Editions Marocaines et Internationales, Rabat, 1983.

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Doing the laundry next to a siphon box — villagers complain that drinking-water often tastes of soap.

Water sources

Groundwater

Access to sub-surface water is determined by the level of the groundwater-table. Close to the foothills of the High Atlas, the water-table lies a hundred metres or more beneath the surface, while 10 to 20km away it is located at a depth of only 16m. Where the water-table is relatively close to the surface, people have long dug wells for their domestic water needs.

In areas of Tessaout Amont where the groundwater is very deep, however, few people have the means to drill private wells. In the new irrigation system, many of the planned villages were provided with domestic water via a deep well, diesel pump, water-tower and public taps; the

operation of these systems was to be the responsibility of the local community. In some of the new villages, the potable water system functioned well at first, but when the pumps broke down or spare parts had to be bought, it proved difficult for community leaders to raise the support (and financial contributions) needed for repairs. Also, families did not want to move to a new village, even if it was closer to their reallocated fields. Thus, in practice, many people in these areas still depend on the surface irrigation system for domestic water supplies.

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Reservoirs

In some villages, the traditional irrigation channels were used to divert water for domestic use to *metfias* — partly underground, covered reservoirs, originally built of mud and stones, but mostly renovated with cement and concrete. Many of these reservoirs, some communal, others inside individual houses, are still in use. In the past, water needed for communal reservoirs was provided according to special water rights, while individual farmers provided water for their own *metfia* from their own irrigation share or allotment.

Although water brought in through the modern irrigation system is, in theory, intended for agriculture, in practice some of it is still diverted to the *metfias* for drinking and other domestic purposes. Under the new water regime, the water needed for private tanks (an individually owned *metfia*) comes from the standard water allotment apportioned to each farmer for crop cultivation. For the communal reservoirs, as a concession to customary usage, the Irrigation Board provides a special water-usage allotment, three times a month in summer and twice a month in winter.

A preliminary survey in two sections of Tessaout Amont where the groundwater is deep, found 101 *metfias* of different sizes and with different water-use rights. Unfortunately, most *metfias* are not large enough to provide water throughout the long interval between water allotments. Another problem is that the water still flows into the *metfias* through earthen feeder canals, so is liable to become polluted and loaded with silt. Facilities for cleaning or flushing are limited and water treatment is restricted to the irregular application of chlorine tablets from the health centre, or the use of ordinary household liquid chlorine (12 per cent hypochloride concentration, used for household cleaning and readily available in small shops) — people use between 0.5 and 1 litre for a full *metfia*, regardless of its size, or around one spoonful per bucket.

Irrigation system

The present water distribution practices result in an almost continuous flow of water in the secondary canals; tertiary canals convey water periodically for a few days every two weeks or less in summer, though with longer intervals in winter. As a result, for settlements distant from secondary canals, the only permanent water source (during the period between irrigation turns) is found in the 'U'-shaped siphons on tertiary canals. The tertiary siphon boxes have been identified as the main transmission sites for urinary schistosomiasis, because of frequent water contact and high densities of the intermediate snail host.[2] Many adults in Tessaout Amont realize that the drinking-water supplied to their *metfias*, as well as water taken directly from siphons and canals, is of poor quality. However, no other water source is near at hand.

Water-use

Collecting water for use at home is mostly done by children, who may miss school. The most common form of water transport is a donkey; wealthier families may have a donkey- or horse-drawn cart.

In addition to meeting drinking-water requirements, several other water-related

2. Khallaayoune, K. and H. Laamrani, 'Seasonal patterns in the transmission of Schistosoma haematobium in Attaouia, Morocco', *Journal of Helminthology* 66, 1992, pp.89-95.

* 'Drop structure' — drops, or falls, and chutes are control structures required at suitable intervals in canals or channels which must have a more gentle slope than that of the adjacent land, so as to reduce the water level downstream, and reduce the velocity or flow.

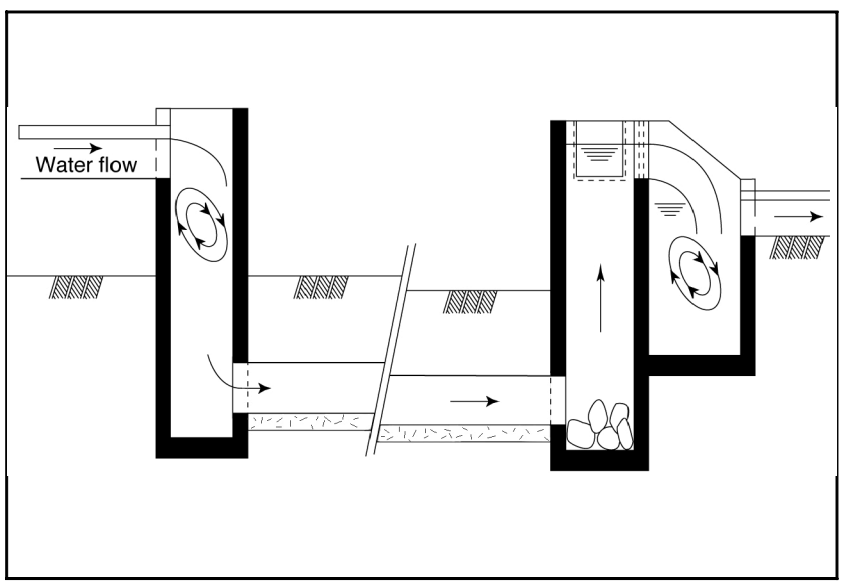

Figure 1. Typical tertiary siphon with drop structure*. The only permanent water source — and also the main transmission site for urinary schistosomiasis.

activities take place alongside irrigation structures such as clothes-washing — a large user of water. Even if they have a well, houses lack adequate drainage (there is no sewerage), and it is difficult to get rid of large amounts of water in a mud house or mud-walled courtyard. Besides, the canal structure serves as a convenient support for scrubbing and drying clothes. Because canals are so frequently used for washing, householders generally prefer to have their cooking and drinking-water fetched early in the morning, arguing that 'even cooking will not remove the taste of soap'.[3]

Drinking-water supply[4]

In 1990, when Morocco's Master Plan for the Development of the Drinking-Water Supply of Rural Populations was formulated, only 14.3 per cent of the rural population had access to drinking-water, i.e. had a functioning water supply within 1500m of the village. The other 85.7 per cent of the population had private wells or rainwater tanks, had to buy water, or were dependent on surface water. The Master Plan explicitly excludes supplies from surface water.

Level of service	*% of rural population*	
	1990 (actual)	*2010 (projected)*
Collective standposts	6.3	30
Public taps (network)	5.7	40
Individual connections	2.3	10
Total	14.3	80

Table 1. Actual and projected coverage of water supply in Morocco's rural areas.

In the study area, there seems to be no effective control over the pollution of water upstream. For example, a butcher regularly washes the intestines of slaughtered animals in the secondary canal next to his shop. Local people are aware of this threat to health but seem unable to take any action against the polluter. Another common cause of pollution is the washing of animal fodder. In this sheep-rearing region, wheat straw is commonly stored in mud-coated stacks and has to be washed to remove the dust, to make it digestible and/or to mix it with bran. Some of the children tie up the straw in woven bags and then shake them up and down in a siphon box, thus making the water unfit for human consumption. Apart from pollution, the quality of water that remains stagnant in the siphons for two weeks at a time may be very doubtful.

An integrated approach

Morocco's Master Plan for rural water supply does not consider surface water as a potential source for domestic use.[4] However, in a region like Tessaout Amont, especially where the water-table is deep, sub-surface water cannot realistically provide a reliable or low-cost drinking-water supply for the whole population.

The surface water flowing through the modern Tessaout Amont irrigation system could have been utilized if this source had been recognized from the first as the main permanent, safe water supply for domestic use. New community reservoirs, linked to the system by concrete canals, could have been incorporated into the irrigation infrastructure during the construction phase. As all the necessary equipment and staff would have been on site at that time, this would not have been very costly. The quantities of water needed for domestic purposes are very small compared to agricultural needs, and such a system would have also resulted in a more efficient use of water.

Many of the *metfias* in Tessaout Amont could still be improved if their shallow, earthen canals were replaced with direct, concrete-lined connections to the modern irrigation system. The water quality in the reservoirs could be improved by treatment such as slow sand filtration, or chlorination, and by providing opportunities for flushing or cleaning. Strategies for upgrading and maintaining the *metfias*, and for managing the water flow, would need to be developed in collaboration with the local users.

Improvements in domestic water supplies should form part of an integrated approach to water management, which considers the irrigation scheme as a whole, right from the planning phase. Such an approach involves taking into account existing water-use practices for *all* purposes, with water rights allocated not only to crops and fields, but to all domestic and agricultural uses. A locally adapted approach requires intersectoral collaboration between departments of irrigation, water, health, agriculture, rural development and local government, and should work with the local people. This strategy could go a long way towards solving problems of water shortage and poor water quality, improving the health of the local population, and making life easier for women and young people who now spend much of their time collecting water and washing clothes far from their houses. ■

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School's out when water is needed at home.

3. Houtstra, M., *The March of the Donkey: The daily search for domestic water in the irrigation scheme of Tessaout Amont, Morocco*, Stageverslag, Wageningen Agricultural University, Wageningen, 1995.
4. Benazzou, C., *Water, the On-going Challenge*, Publications Panorama, Rabat, 1994.

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