

Capitalization of Experiences «Water, Land and People»

Some data on water management in Tiquipaya

Bolivia, 2007



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Agency for Development
and Cooperation SDC

inter
cooperation

Natural Resource Management
Rural Economy
Local Governance and Civil Society

SOME DATA ON WATER MANAGEMENT IN TIQUIPAYA

The township of Tiquipaya is divided in six municipal districts, from which three belong to the mountain range and mountain foot, and the other three (districts 4, 5 and 6) are part of the Cochabamba central valley, these are the districts where the largest concentration of population and agricultural areas are located in the Township of Tiquipaya.

The characteristics for water supply in the Township of Tiquipaya are a subject that at present is known only superficially; even with the apparent diversity and range of information available. Most of the quantitative data that explains the issue of water in Tiquipaya has been obtained through specific research initiatives, or from perceptions resulting from participatory events associated to activities related to water. However, in spite of the limitations for data gathering, these data allows for input from contexts that are representative of this municipality's reality.

The data below comes from prior sources and interviews; it is related to the districts with a higher concentration of urban and rural population in the Township of Tiquipaya, 4, 5 and 6 accordingly. For an initial context in terms of water, population growth in these areas went from 3,000 inhabitants in 1992 to over 27 thousand inhabitants in 2001, and over 30 thousand in 2004; said process was not homogeneous within the city, the largest demographic concentration is in the traditional inner city (district 4). The agricultural areas, which early during the past decade exceeded 2,500 hectares, and as a result of changes on the use of soil and the growth of housing subdivisions, these cultivation areas have decreased, particularly during the last years.

Regarding drinking water...

At present drinking water service supply is operated by several drinking water systems managed by Community Based Organizations (OTBs, Spanish acronym), committees and cooperatives or associations of drinking water users. These systems provide drinking water service in one community, a part of a community or in several communities, and the number of users varies tremendously. The Township of Tiquipaya, districts 4, 5 and 6 have over 37 systems.

Regarding the water sources, almost half the systems (47%) have two water sources; while another part of the systems (43% only have one water source); only 10% have more than two water sources. More than three quarters (79%) of these sources are wells, and only a small part of the systems (7%) use springs, and 18% have river water outlets, and one-quarter of the systems have one or more cutwaters; this clearly shows a prevailing use of underground water as opposed to superficial water for the supply of drinking water.

One fourth of the systems share water. These systems share water with other drinking water systems, given that they make a joint investment for the construction of water catchments at the source. For example, in COAPAT's (Cooperativa de Agua Potable de Tiquipaya, linked to the Municipality) case, the water from Khora River is shared with Machu Mit'a's irrigation system since 1884, that is to say one-sixth of the drinking water available; although, the existing agreement was legally amended only a few years ago.

The number of users served by each system varies quite a bit, the largest system has 1360 users and the smallest system has 18 users.

In terms of the scope of the systems' services, three-quarters of the systems supply all of the community where they are located. At the communities where the systems do not supply the whole population, the inhabitants that do not have drinking water have, as alternative sources, the water from their neighbors, public faucets or a private well.



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Agency for Development
and Cooperation SDC

inter
cooperation
Natural Resource Management
Rural Economy
Local Governance and Civil Society

The condition that new users must meet in order to enter the system, in all of the communities, is to pay a contribution. The contribution from the new users implies that they must buy accessories for the installation, and that they also pay the work related to the connection of their household to the network, and in some systems new users are accepted only if there is consensus in a user's assembly. In terms of the contribution to be paid by new users in order to get connected to the network, the amount is between US\$. 600 and US\$. 77 (in COAPAT), and the average payment is approximately US\$ 375. In some cases there is a difference in the contribution for a new connection for area inhabitants and the inhabitants of other areas. The new users that live in the area pay a contribution of US\$ 400, whereas, the users that do not live in the area must pay US\$. 500.

The systems have a wide range of rates, services hours, and quantity and quality of the water provided. Approximately one-third of the employees in charge of the systems believe that the quality of water provided by their systems is good, while 57% believe that the quality of the water is regular.

Regarding the rates for the use of water, 36 % of the systems charge a fixed monthly rate, while 38 % charge a fixed rate for m3. Eleven per cent of the systems charge a variable rate per m3 according to consumption levels. Also, there are systems, 11%, that charge a fixed monthly rate plus a rate per m3 above a certain consumption level. Within the systems that charge a fixed monthly rate almost all obtain their water from sources other than wells (springs, rivers or cutwaters). Following are some examples of the different rates on the use of water:

Community	Rate System	Hours of Service
Callajchullpa	< 10 m3: 1 Bs./m3 > 10 m3: 1,50 Bs./m3	24
Barrio Morococala	1-10 m3: 0,70 Bs./m3 10-15 m3: 1,50 Bs./m3 > 15 m3: 2 Bs./m3	24
Urbanización Martín Cárdenas	< 12 m3: 10 Bs./month 13-15 m3: 10 Bs./month + 1 Bs./m3 > 15 m3: 10 Bs./month + 1 Bs./m3	7
Barrio Paraíso	< 5 m3: 5 Bs./ month > 5 m3: 5 Bs./ month + 1 Bs./m3	24
Encanto Pampa	8 Bs./ month	24
Villa Oruro	2 Bs./m3	24
Juventud Chilimarca	1,40 Bs./m3	12
Villa 26 de Febrero	12 m3: 12 Bs./ month > 12 m3: 12 Bs./ month + 1 Bs./m3 Part 24 hours	12
Molle Molle Sud	15 Bs./ month	4
Rumi Mayu	1,50 Bs/m3	24
Sirpita	10 Bs./ month	4

The criteria to establish the rate is normally 'custom and usage', or similar to the closest system or that with a similar level of sources; also, maintenance requirements are used as a basis, exclusively those of the infrastructure's physical nature (private replacements, cleaning, etc.). In those cases where water collection requires energy, this is a basic cost to set the rate; gravitation systems are less strict in terms of the system's funds liquidity.

In terms of the hours of service, more than half, 54%, provide the service 24 hours a day. There is a difference between the drinking water systems that have wells and those that do



not, almost half of the systems that provide services for less than 24 hours, gather (part) of their water from springs, rivers or cutwaters.

Another important issue is the average consumption of the systems users, in 14% of the systems; the average use of drinking water is 10 or less cubic meters per month. An average consumption per month between 11 and cubic meters is shown in over half the systems, 57%. Only in 11% of the systems the consumption is between 16 and 20 cubic meters per user, per month. The same percentage of systems has an average use of over 20 cubic meters per user, per month.

If we make a relation of the above with the rates established in each system, the average costs can be calculated for the use of water per family, per month. In 11% of the systems the users pay 5 Bs. or less per month for consumption purposes. In 36% of the systems the costs per family, per month are between 6 and 10 Bs. while in one-fourth of the systems this cost is between 11 and 15 Bs. The families that pay between 16 and 20 Bs. per month are found in 14% of the systems, and in another 14% of the systems the users pay more than 20 Bs. per month. Some drinking water systems have regulations in place to regulate the amount of water that the users of these systems can use.

Water rights are discussed in terms of the systems ownership, the rights on the water sources and the infrastructure. Seventy per cent of the water systems have proprietary documents for their sources, but only 28% of these documents are legalized. This means that 21% of the sources do not have proprietary documents, and that 64% of the sources have proprietary documents that are not legalized. In some sources case the representatives of the drinking water system do not know if the proprietary document has legal value.

All system representatives mention that the community has proprietary rights over the system's infrastructure (in some cases the Municipality is the owner). However, less than 10% have a document that supports the infrastructure's ownership, but very few are legalized.

The above information regarding the drinking water systems shows the wide range of organization, methodology and characteristics of drinking water supply within the Municipality of Tiquipaya. This is also reflected in the wide range of water sources exploited by these systems, although with an evident predominance for the exploitation of underground sources over superficial sources. All these shows that these drinking water systems are the result of local development strategies (at community level) for the service provision to an urban population that has developed at a very fast pace during the last years, given the Municipality's lack of capacity to respond to these needs.

Regarding Water for Irrigation...

Water for irrigation in the Municipality of Tiquipaya is linked to watersheds from the Tunari Mountain Range, and its irrigation areas are part of the Cochabamba Central Valley; districts (4,5 and 6) are where most agricultural areas with irrigation systems, arable land and settlement of most of the urban and rural population are located.

In Tiquipaya there are a wide range of superficial and underground water sources, which are managed by the farmers themselves. Among the water sources that are considered as safe water and that provide water for irrigation we have: mountain range superficial waters, comprised mainly by the waters from River Khora Tiquipaya, these water flows permanently; there are others that are seasonal and are also used, occasionally, as a source of water for irrigation; water from lagoons in the mountain range, which are natural lagoons improved by hydraulic work (dams) in order to increase storage volume, these are



owned by the valley farmers, who exploit the water for irrigation purposes under a rotating distribution system; there are also private and community wells (the latter are more common), although its use is more important for household water supply; there are also springs used for irrigation purposes, although their flow has reduced considerably and in some cases they have even dried due to the over-exploitation of underground water sources.

Tiquipaya's irrigation perimeter is comprised by several irrigation systems, each one with different water sources, which use the same channel networks for flow and distribution purposes. These systems overlap in space and time, that is to say that they irrigate the same perimeter and many times they operate simultaneously. However, in spite of overlapping and the complexity of its operations, each irrigation system has a different historical background, they operate independently, with their own water rights, with a specific and defined area of influence, and with their own and autonomous organization.

In the area of Tiquipaya there are around 17 communities that carry out agricultural activities linked to ten irrigation systems, of which five are the most important ones and are members of the Tiquipaya and Colcapirhua Association of Irrigation Systems (*Asociación de Sistemas de Riego de Tiquipaya y Colcapirhua*, ASIRITIC – Spanish acronym), these are: Machu Mit'a, Lagum Mayu, Sayt'u Khocha, Chankas Montecillo and Chakas Sirpita; these systems use the same infrastructure in the irrigation area.

At a source level, only the one of the Machu Mit'a system exploits the excess irrigation water and springs from the river basins, and their share one-sixth part (custom and usage) of their flow with the town through the Tiquipaya Drinking Water Cooperative (*Cooperativa de Agua Potable de Tiquipaya* -COAPAT); the others have their sources in some natural lagoons improved with reservoirs and are only used for irrigation. However, almost all are complementary systems given that they cover the same irrigation perimeter, and also given the similarity in their water distribution and rights components. Water availability by farmer is based on forms of access to these systems through their rights ("allocation") or purchase, time for that right or purchase (hours or minutes), frequency (days) and flow with which it has rights with each of these systems.

The origin and rights on water allocation, in some cases, go back to the period before colonial times, and which somehow were the basis for the current system of "custom and usage". In the five systems mentioned there are around 1500 users with approximately 1600 hectares and with different distribution forms.

The users, denominated wholesalers and retailers, receive their water turns in groups called "allocations" or "releases" (rights and number of times that the water is released from the sources), according to the rights established in the past. Access implies all or part of the allocations or releases, sometimes for all or for part of the water flow available, during the number of days in the year, to a frequency and in accordance with the distribution shift for the allocation among the users, also in accordance with the rights acquired. In general, the wholesalers have better water access conditions than the retailers. These allocations as well as the types of owners make up autonomous organizations that respond to a coordination instance among the users. These groups have representatives that are elected by the users themselves and whose task is to coordinate among them the surveillance and proper distribution of water.

To obtain these rights (allocations) by user group there are also different ways in each system, but in general terms these are associated to cash contributions, number of days worked or to enable or re-enable areas, improvements, etc. The difference in the quantity has caused the differentiation of "allocation" groups, in wholesalers and retailers. In some



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Agency for Development
and Cooperation SDC



cases the water rights at a system level are linked to the proprietary unit denominated “suyus”, and within the *suyus* there are lots, which are expressed in time (fixed hours). Within the *suyus* the right is linked to the extension of the surface of each user, for example, 8 minutes of water per each @ (arroba) of land (one @ represents 3625 m2).

The operation is basically a reflection of the water rights, which is expressed by a whole round among all of the “allocations” or “releases” that receive the total flow during a defined time and in a sequence that lasts a number of days; this is a system rotation round. Distribution comprises the distribution of irrigation time of an allocation between all of the users, within the allocations there are two methodologies for distribution that depend on the number of users, and which can occur in two ways: In allocations with few users the allocation turn is distributed among all users in agreement with the existing water rights. The second case is for allocations with many users, which set up subgroups for distribution, in order to have a better exploitation of their water rights.

The price of water is set autonomously by each system and in an assembly summoned for that purpose, and this is related to what the users require to cover what they call the “operation” of their system, which are basically personnel and administrative expenses of the systems (irrigation ditch foreman, secretary, ASIRITIC services, inspections, etc.). The cost is established per hour of access to the flow released, which is fix in each system. Following is a list of referential prices in some of the systems:

System	Price at “irrigation ditch” (Bs./hour)	Approx. Flow (lt/sec)	Source
Machu Mit’a(*)	3	70	River, excess irrigation water
Lagum Mayu	8	250	Lagoon with dam
Sayt`u Khocha	20 - 25	150	Lagoon with dam
Chankas Montecillo and Chakas Sirpita	15 - 20	250 - 300	Lagoon with dam

(*) Allocates 1/6 of the flow to the drinking water cooperative

The cost is at the “irrigation ditch” and is paid for at the system’s office; this cost is increased for the user and is covered directly by him, with additional expenses for payment to the distributor, persons for the service round and others, these can reach up to an additional 50 % depending on the irrigation site, etc. On the other hand, in the event a user does not need the water and another needs to access at a time outside his turn, the price is increased considerably up to Bs. 12/hr, for example in the case of Machu Mit’a. The price of water in general is higher for the systems that have sources in lagoons at the mountain range that have been improved with reservoirs. Normally, the amount collected covers the needs of the “operation”, there is a deficit during the rainy season, when given the availability of water some users do not use their turns, and therefore do not generate an income for the system, on the other hand when they do access the service some extra funds are generated. Price increases are defined autonomously by each system together with the users, except for one of the systems that increased 20% the past year; the other systems have not increased rates for the past several years.

Maintenance activities are regular and this is the obligation of all users in all systems existing in the area, given that they use the same infrastructure. Forms of maintenance and timing have been established by the users of the different irrigation systems as per



customs and usage. Maintenance is carried out with different contributions, such as the direct participation of the users, the obligation of having a person work on the basis of his “allocation”, etc., all of these under the supervision of the users and the leaders. Maintenance costs of the systems, or the additional payments for maintenance, or counterpart funds for investments together with the municipality, prefecture office and others are based on the allocation and are not linked to the price charged in each system.

From the above one can infer that water management for irrigation in Tiquipaya is very complex, but as well very sound in terms of its organization and the mechanisms established by the users, where the basis is tradition due to “customs and usage”, which are expressed in each of the components of management for irrigation water. The dominant sector approach reflects this, partly, in terms of complementarities with other uses and linked to a lineal relation in terms of rights and sources between the water from the mountain range basins and the irrigation users in the valleys, which are shown in each of the systems. This relation remains almost static in the area and time, in spite of the dynamic changes on soil use resulting from the population growth and to settlements in the area.

