WatSave Award 2000 : Innovative Water Management Award

MODERNIZATION PLAN OF MULA TRADITIONAL IRRIGATIONS

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I Location

The region of Murcia located in the South East of Spain, having more than 200 km of Mediterranean coast, an average rainfall of 280 mm/yr, and an ample sunshine causing a significant regional water deficit, is characterized by a diversity of micro-climates ranging from the wide frost-free area, influenced by the sea, suitable for citrus trees and vegetable crops, both outdoors and in greenhouses, to areas with cooler and rainy weather, best suited for stone and pip fruit trees cultivation.

Water resources for irrigation are based on the Segura river water which is inadequate to cover the agricultural and population needs. The river water is complemented with underground water from overexploited acquifers, (most of them of salty nature) and with waters from the Tagus – Segura Transfer.

Despite of that, water resources are still scarce, which is the cause of great concern to Murcian politicians and farmers and the reason why this region has pioneered, at a national level, the expansion of micro-irrigation in Spain.

Panoramic view of the Mula irrigated area

Mula county is located approximately in the middle of this Region there is having little more than 13,000 inhabitants, Mediterranean semiarid climate of high evaporating demand (1600 mm/year), and an average annual rainfall of 280 mm, crossed by the Mula river and its low water periods. Its ample sunshine, average temperature of 17º C, almost no frost periods and its brown-limestone and brown-colluvial fertile lands, are very suitable for the agricultural production, especially for stone fruit trees and citrus.

II Historical record

The traditional basin irrigation, of Muslim origin, dates back to the 9^{th}-10^{th} centuries. Until few years ago, it was basically characterized by an old and deteriorated irrigation network which caused high water losses; the use of rudimentary methods to control water volumes, the excessive power consumption in peak hours; poor road network; excessive land fragmentation where 68% of the fields were less than one hectare; and old fruit plantations due to the frequent dry periods and the low efficiency of the irrigation system.

III Water resources

Water availability was scarce and constituted by the following resources:

- Waters from Mula river, of private property and subject to auction amongst irrigators.

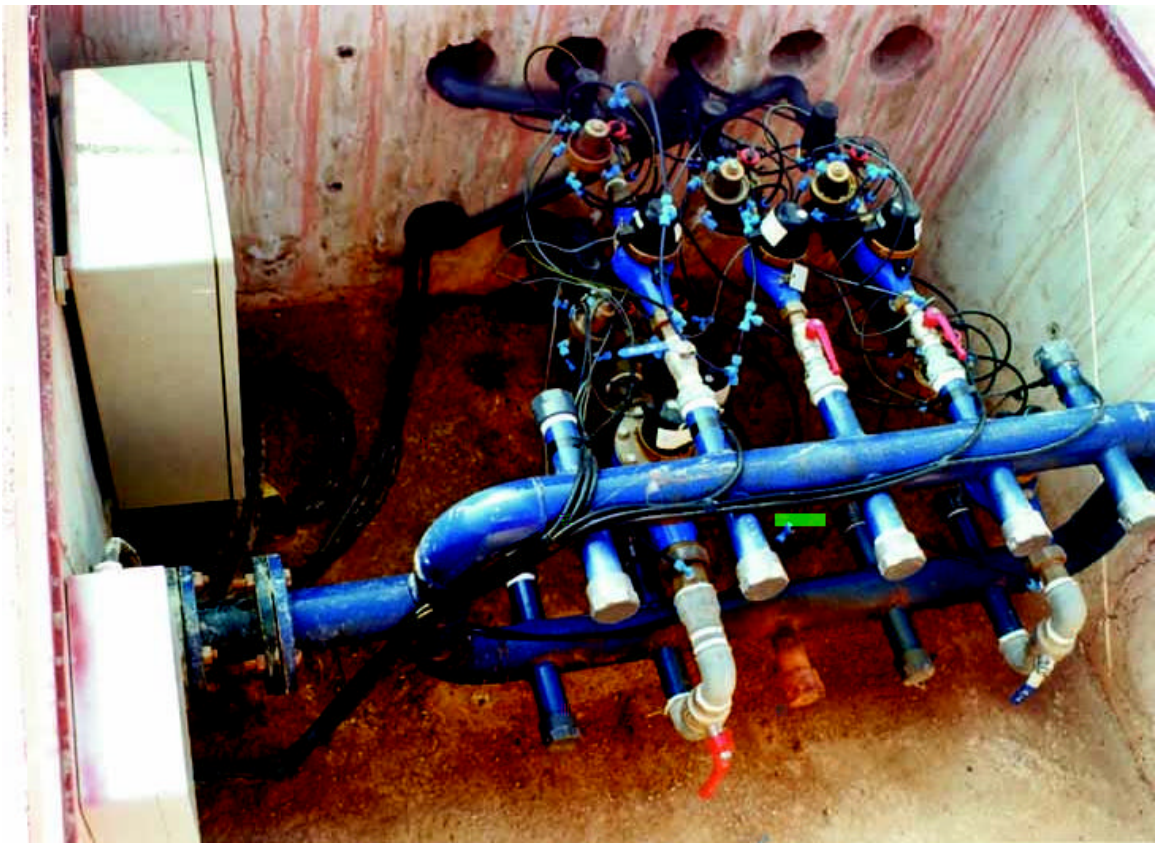
Reservoirs : "El Camarote" (in the foreground) and "La Luz"

- Concession of 4 Millions cubic meters/year (Mm^3 /yr) from the Segura river Basin.
- Concession of another 4 Mm^3 /yr from the Tagus-Segura Transfer for Mula and its surrounding area, a part of which does not belong to the Irrigators Community.
- These concessions were complemented with the water extracted from the wells “El Pradillo”, and the most recent “Corral de Comba”, which altogether may contribute with another 4 Mm^3/yr, which when added to the previous volumes became a total of 12 Mm^3/yr (only under optimal conditions and thus difficult to achieve).

IV System Improvement and modernization

With the aforesaid irrigation situation, which led to the abandonment of land and to the desertification of an area with a high erosion risk, the Irrigators Community, the Department of Agriculture, Livestock and Fisheries of Murcia Regional Government, in cooperation with the Irrigation Advisory Programme, created by agreement between the Department of Agriculture and the Center for Edaphology and Applied Biology of Segura (CEBAS) of the High Board of Scientific Research (CSIC), suggested to elaborate the Plan for the Modernization of Traditional Irrigations in Mula, as a Pilot project that could show the possibilities of transforming a traditional irrigation into a modern micro-irrigation installation, computerized, with an efficient management and a level of automation adapted to the needs or requirements of each Community, as it is presently happening, since these facilities are being used as a model both in Spain and in other countries.

The works, financed with public funds, with a small contribution from farmers to automate fertilization, not envisaged in the project, did consider the execution and exploitation of a series of common works, such as wells, reservoirs, pumping plants, filtering and automation stations, all of them leading to a collective benefit and to increase the investment profitability, since these would have been impossible to be implemented, economically speaking, in a personal scale, if each irrigator would have had to pay for his own reservoir, as small as it might be, as well as his irrigation and filtering head, as it usually happens in the installations made on a private basis.



Collectors and fixtures in an irrigation small chest.

Filtering head, with Mula Castle in the background

One of the important aspects of this work has been that of putting together the needs and wills of all farmers involved and of achieving agreements among them and the Irrigators Community for the expropriation and valuation of grounds of their property which have been used for extending the roads network and for common works, as well as the granting of authorisations for the laying of water pipelines and electricity installations through their own farms.

V Environmental impact

Once the preliminary Plan had been finalized a study on the environmental impact was carried out. This study focused on the impact that the works could cause on the action area emphasizing aspects such as: the landscape conservation and recreational use of Mula river; the sustainable exploitation of the acquifer; the maintenance of water quality and the ecosystem conservation. For that purpose the relevant correction measures were put into practice, amongst which we can assure the guarantee of an ecological flow of 30 l/s in one river stretch with waters from “El Pradillo” well.

Other measures were, those aimed to respect the existing plant masses and reafforesting the areas surrounding the reservoirs, pools and pipelines with autochtonous species and to make a sustainable exploitation of the acquifer.

VI Regulation and distribution of water

The regulation of flows was carried out with the construction of nine artificial interconnected reservoirs, with a total capacity of 500,000 m^3, strategically distributed to dominate from their elevation the irrigated area and to supply water for the localized irrigation of the relevant sector, without any additional pressure. The capacity of each reservoir was determined according to the sector, or sectors, demand, to the necessary regulation and to the energy saving, which could be achieved in the pumping plants, adjusting their operation hours to the different electricity tariffs and their bonifications.

VII Characteristics of the installation

The installation has three pumping plants to feed regulation reservoirs and seven filter stations in the head of each of the seven irrigation sectors whose cleaning is made using a differential pressure, with a working flow of 150 m^3/hour, each.

Control Panel at the Community Office

The whole control of the irrigation network is centralized in the Irrigators Community headquarters, where two computers are connected to a local network, another computer is used to manage the databases and the information which is managed in the control system, (consumptions, water account settlements, water price, invoicing, incidences, irrigation management, etc). There is also a computer to control the irrigation network (opening and closing of valves, engines, gates, filter stations), according to the programmes sent by the management computer or to the instructions manually given by the operator.

Old water partitioning device

The change from traditional to localized irrigation was carried out in a progressive way, keeping the traditional irrigation working while a pressure irrigation network was being built with a useful flow of 17 l/sec in each irrigation hydrant provided for each of 9 ha. The irrigators belonging to the Community have the right to irrigate a during sixteen hours a day, distributed in two turns; the remaining 8 hours are used to recharge the reservoirs by gravity.

In the Community headquarters, there is a control panel showing the installation elements, their situation and if they are working properly or not. This panel also shows the measure of different parameters, as the reservoirs volume, instant flows, pressures, opening or closing of valves, breakdown alarms, etc.

VIII Technological Innovations

The farmers/irrigators have a Water Account, similar to a Saving Account in which every detail regarding their annual water share is reflected in m^3 from the 1st of September, date when the hydrological year starts. This annual share is effective in partial notes, as well as every incidence: water allocations increases, water transfers and consumption withdrawals. At the end of the year, the water surplusses in the reservoir which have not been used return to the Community.

Water Teller

Another innovation is the Water Teller, which is similar to the automatic account tellers and cash dispensers in Banks and Saving Banks. It is located outside the Community headquarters and in permanent service, it works with a codified magnetic key and a personal password. In it, each user may verify his water consumption and how his installation is working; he can also programme the irrigation opening or closing and the fertilization of his fields, according with the irrigation and fertilization programmes developed by the above mentioned Irrigation Advisory Programme (IAP) or, according to his own criterion; suspend or activate the programme.

IX Improvements achieved

In short, it can be said that the following improvements were achieved through the Modernization Plan :

- Reduction of water losses in the distribution network, from 1.2 Mm^3 in 1987 to 0.14 Mm^3 in 1998.

- A 14% water saving, for those farmers using micro-irrigation, against those who still use traditional irrigation methods (checked in Sector 1).
- An additional 7% saving, for those farmers who perform their irrigation according to the IAP, as compared with those who irrigate at their free will.
- Sustainable exploitation of the aquifer, as studied and demonstrated in a PhD Thesis.
- Fully computerized management.
- Energy savings: variable, depending on the groundwater extractions.
- Lower water cost for irrigators: variable, as the previous one.
- Significant increase in the plantations productivity, (not yet evaluated).
- Improvement of the road network.
- Farmers' training.
- Improved living quality of farmers/irrigators.