NEW AND OLD IRRIGATED LANDS IN QUINTO VERSUS DESERT AGRICULTURE

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1. INTRODUCTION

The climate in the center of the Ebro Valley, with marked yearly oscillations, average yearly precipitation of less than 350 mm, and persistent dry winds, produces a water deficit over 1000 mm. The agricultural potentiality is low, and irrigation is needed to have acceptable and stable yields.

The surface of the entire Ebro basin is around 85000 Km², with an irrigable surface of 7835 Km² after the Ebro Water Authority (C.H.E., 1995). Most of the traditional irrigated lands were developed in the stream terraces of the rivers. From the end of the XIX century, big channels and dams have been built allowing to irrigate new lands outside of the lower terraces. Now, the new irrigation are broader than the traditional irrigated lands. The irrigation is the 88% of the consumptive uses of water in this basin (M.O.P.U., 1988), and more irrigation works are in progress.

The irrigation needs a careful evaluation in the context of a strong competence for water between industry and agriculture. Quinto provides an example of new and old irrigated lands showing the strong contrast with the surrounding desertic drylands, and gypsum plays a role in the behaviour of irrigated soils. The aim of this article is to provide some data for such evaluation.

2. AGRICULTURE IN QUINTO UNTIL 1989: DRY FARMING AND OLD IRRIGATED LANDS

About 80% of the Quinto lands have an agricultural use according to the official statistics. A half of this surface is 'secano rabioso', a local expression for non irrigated lands with a dryland farming similar to a 'desert agriculture'; the other half comprises the old and the new irrigated lands.

Most farming is done by familiar enterprises. These farmers are landowners and are associated in a Cooperative that furnish them seeds, chemicals and machinery, and also centralizes the selling of the products. Most of the owners of big farms are not associated in the Cooperative. In the last years part-time agriculture has increased in importance. A job in the industry is more comfortable and sure, and agriculture is a complementary resource.

Traditional agriculture in Quinto comprises the old irrigated lands and the non-irrigated lands or 'secano' (secano stands for dry lands in Spanish) where barley is the only feasible crop. In the secano of Quinto, crop failure happens in many years and the stunted barley is grazed
by sheep. The plots in secano are greater than in the old irrigated lands, and are often
cultivated according to the occasional availability of machinery and manpower. This fact
results in non cultivated plots, and in cultivated units that are not coincident with the plots.
Moreover, the plots with irregular crop growth are common because the farmers try to keep
at minimum the cultural practices in order to reduce costs. Aridity plus part-time agriculture
can explain this kind of land use, that now is also affected by the rules of the common
agricultural policy.

Sheep are an important revenue source in the secano lands. Sheep graze fallow, stubble and
stunted barley. The right to graze is paid by the shepherds to the landowner.

The traditional agriculture of Quinto includes the old irrigated lands in the stream terrace of
the Ebro. The average size of the parcels is about 1 ha. The irrigation method is flood or
furrows, and the water comes by natural gravity from the Ebro throughout the Canal
Imparal de Aragón and Acequia de Quinto, or is taken directly from the river by a small
derivation dam. Main crops are barley, wheat, maize, alfalfa, forage, vegetables, and fruit
trees.

3. A TECHNOLOGICAL ALTERNATIVE: THE NEW IRRIGATED LANDS

In 1985 started the irrigation works of a new irrigation district of 2500 ha. in Quinto, and
the first irrigation to the entire district happen in 1989. Waters are pumped directly from the
Ebro river using six electrical engines of 1350 KVA. Two twin pipes of 1.6 m diameter and
4.6 km length can transport a flow of 3600 l/s, with 132 m of delivery head and 142 m of
total dynamic head. Water is stocked during the hours of cheaper electricity in a reservoir
of 105000m³ capacity built on the Cornero hill that is on the platform. The reservoir was
built by piling clays from the footslope of this hills, compaction, and coverage with
im pervious materials.

All water is distributed by pipes, and arrives to the parcels with natural pressure of 2 Kg/cm²
to 4 Kg/cm². Those parcels where pressure is < 3 Kg/cm² have an auxiliary pressure engine.
Water is metered at the inlet of every parcel, and paid to the Sindicato de Regantes (the
association of irrigator farmers), that manages the irrigation system.

Surface drip is used only in less than 100 ha for fruit trees like apple, pear, almond,
peaches. Some of these plantation are now uprooted to earn subsides. Most parcels are
irrigated by central machines (pivots) or lateral machines equipped with water nozzle. Total
coverage with sprinkling from a subsurface net is also common. Mobile pipes systems are
less common because the manpower shortage.

The total volume of water applied by hectare is lower than in other close irrigation districts,
and very close or lower than the volumes calculated from agrometeorological data (Faci,
1988). The reasons are the high cost of the water pumping (around 400 U.S. dollars by
hectare) and the irrigation system. This systems has few leaks if compared with the open
watercourses of old irrigation systems, and allows for high frequency irrigation. Table 1
gives the volume of water applied to the main crops, after consultations with local experts.
Farmers adapted the management practices of the old irrigation lands to the new irrigated area. Table 1 provides some orientative data. Maize was the most common crop in the first years of irrigation. The surface of this cereal has gradually reduced, whereas alfalfa and forage crops have increased. The common agricultural policy plus the price of the energy needed to pump water are the main factors for this kind of changes, which have also resulted in the incorporation of sunflower. A frequent crop rotation is alfalfa-maize or sunflower-barley or wheat-alfalfa. Peas need low water amount, but this crop is controlled by the freezing and canning industries that rent the parcel to the farmer. The common crop rotation was peas-maize-wheat or barley.

Table 1.-Some features of the common crops management in the new irrigated district of Quinto, after personal interview with farmers and extensionists.

<table>
<thead>
<tr>
<th>Crop</th>
<th>Sowing date</th>
<th>Harvesting date</th>
<th>Yield Kg ha⁻¹</th>
<th>Applied irrigation water m³ha⁻¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alfalfa</td>
<td>September</td>
<td>1st cut by the end of March or begin April.</td>
<td>4000 by cut (hay)</td>
<td>8000-10000</td>
</tr>
<tr>
<td></td>
<td>March in some cases</td>
<td>5 cuts by year.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barley</td>
<td>November</td>
<td>End of June</td>
<td>5000-6000</td>
<td>2500-3500</td>
</tr>
<tr>
<td>Maize</td>
<td>End of April</td>
<td>October, to first of May</td>
<td>11500 good year</td>
<td>6000-8000</td>
</tr>
<tr>
<td></td>
<td>first of May</td>
<td>November</td>
<td>6000 bad year</td>
<td></td>
</tr>
<tr>
<td>Peas</td>
<td>November</td>
<td>May</td>
<td>3000</td>
<td>2000-3000</td>
</tr>
<tr>
<td></td>
<td>December</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sunflower</td>
<td>May</td>
<td>End of September</td>
<td>2000-2500</td>
<td>4000-6000</td>
</tr>
<tr>
<td>Wheat</td>
<td>December</td>
<td>First July</td>
<td>4000</td>
<td>2500-3500</td>
</tr>
</tbody>
</table>

Soil salinity and irrigation water salinity were studied by Herrero and Bercero (1991). The weighed average of the monthly electrical conductivity of the Ebro was 1.35 dS/m in the year 1988, and some salination risk happens in summer, when the Ebro water has the higher electrical conductivity in the year. The main ions in these waters are sulfate and calcium. Some localized ponding and salinity were detected in the first year of irrigation, and a subsurface plastic pipes drainage network was installed. The geomorphic position of the irrigated area make very convenient the evacuation of effluents. The high magnesium content in the soil solution plus the abundance of gypsum in these soils can be aggressive for some materials used in the irrigation and drainage systems. On the other hand, soil structure degradation has not been observed in these soils, due to the high amount of gypsum in these soils, and its ubiquity in rocks and soils.

Wind is a problem in sprinkler irrigation in Quinto because the evaporation and the transport of water outside the parcel, and even overturn accidents of sprinkling machines happen. Faci and Bercero (1989) have evaluated the effects of wind in the efficiency of several sprinkling systems. They stress the need of having wind in mind in the design of these systems, and to sprinkler during the night because both wind speed and run are lower than during the diurnal hours.
4. CONCLUSION

The presence of high amounts of gypsum plus an adequate drainage and careful water application are the causes to be Quinto a technically sustainable irrigation district. In the present circumstances, this district is also economically sustainable.

This article depicts some of the potential restraints. However, the production success of the irrigation is undeniable if compared with the neighbouring lands. The farmers’ conclusion is that they wish to start new pumping works to double the irrigated surface.

5. REFERENCES


