

EURO-MEDITERRANEAN REGIONAL PROGRAMME
for Local Water Management ME8/AIDCO/2001/0515/59763-P 016

ISIIMM project:

Case studies synthesis

Spain



Institutional and Social Innovations in Irrigation Mediterranean Management

ISIIMM

“Promoting an integrated and balanced management of water resources by reconciling respect for the environment with economically viable irrigated agriculture» is the objective of a local dialogue operation between farmers, development professionals, scientists and various stakeholders. This concept has served as a reference for the Institutional and Social Innovations in Irrigation Mediterranean Management project (ISIIMM) led by Agropolis International (France).

ISIIMM is a Euro-Mediterranean regional project funded by the European Commission “EU-MEDA Water” involving six countries: Egypt, France, Italy, Lebanon, Morocco and Spain. The aim of the ISIIMM project was to share experiences, knowledge and build new perspectives for sustainable water management in Mediterranean agriculture, based on a common understanding of six key mechanisms: Social, Institutional, Historical, Agricultural, Territorial, Hydrological/Hydraulic.

A comparative, progressive and participatory approach was adopted between different stakeholders coming from the eleven selected study areas where water is a central topic issue to social and economic life.

The ambitious and challenging activities of the ISIIMM project were built upon a framework of regional network co-operation systems. Many multi-national and multi-sectoral teams worked together with the support and organisational efforts of project partners.

With a primary objective to help local rural communities adapt to the emerging problems resulting from pressures on water resources, two priorities guide the project: a) working with local irrigation organisations; and b) working with the development professionals.

Three main activities were developed with the participation of the target groups.

Diagnosics for action in each of the 11 river basins (national and local case studies) leading to new water-sharing behaviours and institutional innovations. This was focused on a statement of conditions and aims for each river basin and country using a participatory approach and based on existing documentation plus the scientific assessment of the ISIIMM experts.

Social and institutional innovations have been approached through the **concrete actions** on the ground and a wide series of **training workshops and exchange seminars** complemented by field visits with farmers, managers of public organisations and canal managers. In total, 19 international workshops and seminars and around 35 local and national meetings and trainings

were organised with participation of more than 1500 persons to enable the target groups to gain a wider vision of the problems in Mediterranean irrigation management and more references to solve them in more suitable ways. Concrete actions (SWaMMA (Solid Waste Management in Mostafa Agha) micro-project in Egypt, AIRMF (*Association des Irrigants des Régions Méditerranéennes Françaises*) in France, Irrigators association in Lebanon, wider stakeholder participation in decision making in Morocco, pluri-stakeholders involvement at regional and local level in Italy and Spain) have been initiated with local stakeholders and will be continued thanks to the strong relations developed.

An **extensive information and data base system called OSIRIS** has been developed to enable target groups to access information about the ISIIMM case studies and compare this with their own situations (www.isiimm.agropolis.fr).

In addition, a concerted effort was being coordinated to distribute this information through books, films, newsletters, guides and other media. ISIIMM has been contributed to mutual learning and knowledge transfer at local, national and regional scales.

The EU Partners are:

- In France: Chambre Régionale d’Agriculture du Languedoc-Roussillon (CRALR), VERSeau Développement
- In Italy: Autorità di Bacino dei fiumi Isonzo, Tagliamento, Livenza, Piave, Brenta-Bacchiglione (ABAA), Fondazione Eni Enrico Mattei (FEEM)
- In Spain: Universidad Politecnica de Valencia (UPV), Unidad Sindical de Usuarios del Júcar (USUJ)

The MEDA Partners are:


- In Egypt: Center for Rural Development Researches and Studies (CRDRS), Egyptian Association for Sustainable Rural Development (EARSUD)
- In Lebanon: Chambre de Commerce, d’Industrie et d’Agriculture de Zahle et de la Bekaa (CCIAZ)
- In Morocco: University Cadi ayyad (UCAM), Association Al Majal

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Case studies synthesis

Spain

*Institutional framework for local
irrigation management in Spain:
the case of upper genil
and low jucar valleys*

Final Report by

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INDEX

1. INTRODUCTION	1
2. MANAGEMENT OF IRRIGATION IN SPAIN.....	3
2.1. HISTORICAL BACKGROUND.....	3
2.1.1. Irrigation in the Islamic period	
2.1.2. The feudal period	
2.1.3. The modern liberal State: a new framework for water	
2.1.4. The 20 th Century: public promotion of irrigation	
2.2. THE LEGAL FRAMEWORK FOR WATER.....	5
2.2.1. The Public Hydrological Domain	
2.2.2. Legislative framework for irrigation water	
2.2.3. Economic and financial framework for irrigation water	
2.3. THE PUBLIC ADMINISTRATION OF WATER.....	14
2.3.1. Administrative organisation: the <i>Confederaciones Hidrográficas</i>	
2.3.2. Hydrological planning	
2.4. LOCAL MANAGEMENT OF WATER FOR IRRIGATION.....	21
2.4.1. The irrigation communities (<i>comunidades de regantes</i>)	
2.4.2. General Communities and Central User Unions	
2.4.3. Other societies	
3. THE JUCAR RIVER BASIN AND USUJ.....	25
3.1. THE JUCAR RIVER BASIN: TERRITORY AND SOCIETY.....	25
3.1.1. Administrative organization	
3.1.2. Physical framework	
3.1.3. Social and economical framework	
3.1.4. Water resources and infrastructures	
3.1.5. Water demands and uses	
3.2. THE HISTORICAL COMMUNITIES OF JÚCAR RIVER: USUJ.....	33
3.2.1. The Comunidad de Regantes of the Royal Canal of the Júcar	
3.2.2. The Local Councils of the Royal Canal of the Júcar: the Example of the <i>Junta Local d'Almussafes</i>	
3.2.3. The Comunidad de Regantes of the City of Sueca	
4. THE UPPER GENIL BASIN AND THE CANAL CACÍN.....	49
4.1. THE UPPER GENIL BASIN	50
4.1.1. The Physical Environment	
4.1.2. Water Resources and Infrastructures	
4.1.3. Administration	
4.1.4. Social and Economical Framework	
4.1.5. Agriculture and Irrigation	
4.2. THE CACÍN CANAL.....	56
4.2.1. The <i>Junta Central de Usuarios del Canal Cacín</i>	
4.2.2. The <i>Comunidad de Regantes de la Ciudad y Tierras de Santa Fe</i>	
4.2.3. <i>Comunidad de Regantes del Señor de la Salud de Santa Fe del Canal Cacín</i>	
5. CONCLUSIONS.....	70

1. INTRODUCTION

The aim of the ISIIMM project is to share experiences, knowledge and build new perspectives for sustainable water management in Mediterranean irrigation systems. In order to achieve this objective, several works have been developed in Spain during the last 4 years, consisting on the collection and analysis of information and the exchange of mutual knowledge and experiences between the participating countries.

During the initial stage of the project several methodological criteria specifically related to the particular features of Spanish case studies were defined so as to establish the coherence of incoherence of water management in case study basins in relation to present model of sustainable use of water. This methodology was based on the study of three main topics: local organizations and territory, structure and management of local organizations and adaptation of local organizations to changes.

According to these methodological guidelines, several actions were developed in Genil and Júcar basins, aimed at collecting and organizing relevant knowledge throughout the organization of local meetings, the analysis of bibliographic information and several work fields. With this information, technical reports were produced with the information collected.

These reports and the mobilization of irrigators and water management experts were the basis of the Spanish participation in several exchange seminars and technical seminars with other ISIIMM groups along the years 2004, 2005 and 2006, achieving the objectives defined at the beginning of the project. During this stage, new requirements of collection and analysis of information were identified in order to boost the comparativeness of the 12 cases of study and the global coherence of the project.

From a political and institutional point of view, the general context of the project experimented in Spain important alterations along this period, related to the abolition of the National Hydraulic Plan –due to last year change of government–, which involved the implementation of new measures (Plan AGUA) to replace Ebro River Transfer Project and changes introduced in Júcar-Vinalopó Transfer Project.

The present document summarizes the Spanish participation in the project, synthesizing the main contents of previous reports in order to describe the institutional experience on irrigation management in our country, according to the requirements of comparability of this project. For this reason, this Final Report has been structured in three levels: National, Regional/Basin and Local.

At the National level, the report makes a particular effort in the explanation of the principles of water administration and the legal framework for water and its historical, social, hydraulic and environmental context; and also to describe the principles, relationships, participatory regimes and functions of the institutions dealing with management of water for irrigation in Spain, from the top level to the local level.

At the regional or basin level, the stress is put on the territorial aspects, due to the fact that the basin use to be the scenery of conflicts between upstream/downstream users and also between different regional administrations. This fact requires the assessment and geographical balance of water resources and uses, the social, environmental and economical context and impacts of water management. Moreover, the capability of previously defined institutions to deal with these problems is tested here.

Finally, at the local level, the report presents as an example, selected cases from our study of 16 water users' associations --detailed in previous reports--, dealing with the development, objectives, management and operational procedures of several water users' associations, based in the work fields and the direct participation of farmers.

2. MANAGEMENT OF IRRIGATION IN SPAIN

2.1. HISTORICAL BACKGROUND

The present institutional framework of Spanish irrigation is the result of a long process of configuration, whose legal bases, inspired in the structure of the Valencian medieval irrigation communities, are placed in the reformations introduced by the liberal state in the 19th Century -- Water Laws of 1866 and 1879. This chapter summarizes the main stages of this process, specially referred to our two case study areas in Valencia and Granada.

2.1.1. Irrigation in the Islamic period

The starting point to analyze the institutional evolution of the Spanish irrigation systems is the Islamic period (8th-15th centuries). During this period the core area of the great Spanish *huertas* (market gardens) were developed, as long as many hydraulic microsystems, in a process linked to the Arab and Berber colonization. This hydraulic culture survived until the year 1238 in Valencia and 1492 in Granada, but after that, much of their knowledge was preserved by the Christian settlers.

Immediately after the Muslims arrival, a tribal-clanish society organized hydraulic systems linked to rural tribal settlements (*al-qarya; alquerias*). Water was considered a common wealth and its appropriation was defined by several *fatwa*, inspired in the Malikite tradition. The *albama* or local council organized the management of water for irrigation and other uses, as any other common tribal or clannish property. Several types of municipal officers (*amin-al-ma, mostassaf, sabib-al saqiya*) were the responsible of water management at the local scale and a specific judge, the *qadi-al-miyah* or *juez sobrecequero* administrated the justice. Despite this local and communal management structures, cities and castles controlled the resource at the regional scale, constituting a superior stage of power.

2.1.2. The feudal period

In 1238 the city of Valencia was conquered by the Aragon-Catalan crown, creating the new kingdom of Valencia. Irrigation played a key role in the organization of the new state. The king, Jaume I, decided to preserve all the Islamic *huertas* and their management structures, uses and principles, and extended irrigation to new areas so as to settle new colonists in the most fertile lands of the new Kingdom. The Catholic Kings followed the same politics three centuries later, when conquering Granada, maintaining infrastructures and local management traditions.

For this reason, the Christian municipalities kept the control of the hydraulic systems, as it happened during the Islamic period, with a certain level of tutelage from the crown, the feudal lords or the capital cities. When the irrigated area was shared by several villages, the municipal structure took precedence over the hydraulic structure, and each village governed its own part of the system, according common ordinances or *concord*s with its neighbours. This municipal model of management was also adopted by the new canals developed during this long period, trough which irrigation was extended over dry areas and wetlands to meet the demand of a growing demographic pressure, particularly during the 18th century.

The only exception of this model of management was the Huerta of Valencia, where the basis of irrigation administration was the *comuna*, an institution made up by all the irrigations of the same

main canal or fluvial water intake, despite their place of residence. The irrigators, gathered in a general assembly, chose a board of governors *síndics, diputats* o *elets*, which contracted and directed the canal officers. The officer leader, the *sequier*, was the responsible of water distribution and conflict resolution, whereas the *ordinances* book, approved by the general assembly, registered all the regulations and operational procedures.

This model of irrigation community, an exception in the Iberian Peninsula, was also adopted by the farmers of the *Reial Séquia d'Escalona* due to the financial crisis of the municipality in the 18th Century, and also imitated by the *Séquia Reial del Xúquer* at the first half of the 19th Century.

2.1.3. The modern liberal State: a new framework for water

During the first part of the 19th Century, the Ancient Regime was abolished, in a context of great political instability. Water was dissociated from the Royal Heritage and the State search for a new legal framework for irrigation, according to the liberal ideology.

As a result of that, the Water Law of 1866 established a new regulatory framework and defined the structure of the *Sindicatos de Riego*, an entity created for the local management of irrigation based on the Valencian model and independent from the municipal structures. This model, was consolidated some years later by the Water Law of 1879, where this local structures of management received their present name of *comunidades de regantes*. Along the 19th and 20th centuries, all the new water users' associations will adopt this model, whereas the traditional ones will slowly reform their structures to cut their links with the municipality, although still today there are local historical communities that preserve some formal links with them.

The new legal framework also dissociated surface water from groundwater, giving a public nature to the first, regulated through a public allocational system, and a private nature to the second, which became property of the owners of each well.

The liberal framework stimulated private and collective initiatives to extend irrigation to new areas, particularly after the generalization of pumping technologies. However this irrigation extension was accelerated during the 20th Century, when the State abandoned the straight liberal behaviour and become involved in agriculture development.

2.1.4. The 20th Century: public promotion of irrigation

This interventionism was the expression of the *Regeneracionismo* ideology, created by Joaquín Costa, which promoted irrigation as the central politic to transform the Spanish economy. This ideology was expressed through the National Plan of Hydraulic Works of 1902, through which the State assumed the promotion and financing of waterworks, as a spearhead of an interventionism culminated by the Law of Waterworks of 1911.

The spirit of Costa's *Regeneracionismo* also feed the republican National Plan of Hydraulic Works of 1933, designed by Manuel Lorenzo Pardo. This Plan was not a simple catalogue of isolated hydraulic works, it was the first initiative of integrated water management and planning at the National scale. This change to a modern conception of water management is also expressed in the creation of the *Confederación Hidrográfica del Ebro*, which establishes the hydrographical basin as a territorial unit for water management in Spain.

After the Spanish Civil war, the Franco's regime assumed these plans and principles and promoted the extension of irrigation through the *Law of Big Irrigable Areas*, among other initiatives, executing the regulation of the main basins and starting the construction of the Tajo-Segura Transfer project.

As a result of this politic, continued by the first democratic governments, the 20th century is closed with a balance of 1'4 millions of hectares promoted by the State and 2 millions by the private initiative. It is the success of the model of offer, based in two principles: the consideration of water as a production factor which is on the basis of the economic growth, and the verification, with certain actions, that water is not scarce with regard to the necessities of the system.

There is no doubt that the effects of the persistent application of this model have been positive. Actually, some of the foreseen objectives were reached: security of the urban supplies --in a context of intensive urbanization--, increasing of alimentary security or improvement of social conditions in rural areas, mainly caused by population establishment and expansion of irrigation.

But from some time ago, this model is in crisis, and the negative effects of its long period of permanency are increasing. Water is scarce in several regions; the obtaining of new resources --in the time and place desired-- is becoming more complex and it has growing marginal costs, what hinders public financing of hydraulic works; the permanence of old water rights generates, with an increasing frequency, new and growing conflicts between old and new users; agrarian and urban distribution systems become inefficient and squanderers in a context of scarcity and there's a growing deterioration of freshwater quality with severe impacts on wetlands and riparian ecosystems.

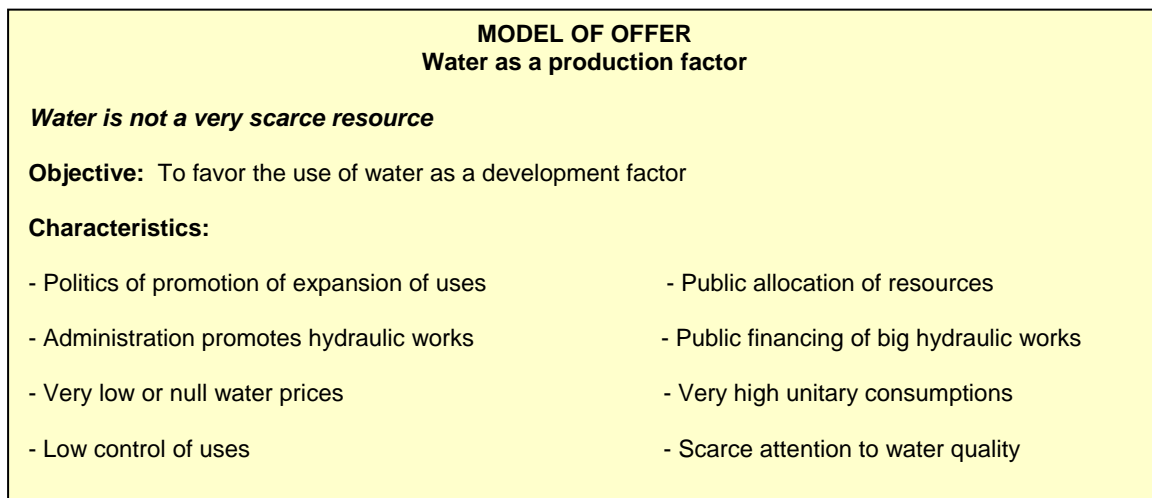


Figure 1. Model of offer management

2.2. THE LEGAL FRAMEWORK FOR WATER

The current legislation on the use of water is based on the *Ley 24/85 de Aguas*¹ of August 2nd, which in turn repealed the 1879. The objective of the new law was to provide a response to the important political, economic and technological changes that had taken place in Spain during the long period over which the previous law had been in force, and especially given the social and economical changes which had taken place since the 1960s and the new configuration of the State

¹ Water Law

expressed in the Constitution of 1978, which led to a highly decentralized structure with the creation of the regional governments (*comunidades autónomas*).



Figure 2. Regional Governments (*Comunidades autónomas*).

This new legal framework was also linked to the necessity to advance to a model of demand management, due to the critical situation generated by the persistent application of the model of the offer along the 20th Century. For this reason, the spirit of this new legal framework and part of the hydraulic politics developed by the democratic governments, search for a more efficient use of water, because of the scarcity, degradation and overexploitation of the resource in several basins.

MODEL OF DEMAND
Water as a production factor

Water is a very scarce resource

Objective: Improvement of technical and economic efficiency of use of water

Characteristics:

- Politics of demand management
- Prices reflect scarcity
- Attention on water quality
- Implementation of mechanisms of control of uses and wastewater
- Public administration promotes and stimulates development of saving technologies
- Demand of reduction of unitary consumptions
- Flexibilization of public or private allocation procedures. Water markets

Figure 3. Regional Governments (*Comunidades autónomas*).

In order to build a legal corpus coherent with this administrative and political context several principles were established:

- Principle of the unity of the hydrological cycle and consequentially the consideration of surface and ground water to be integral parts of the whole, with the inclusion of ground water in the public water domain.

- Adaptation of the public administration of water to the new regional configuration of

government, so that the exercising of competencies by the various administrations takes place within an ambit of collaboration for the rational use and adequate protection of the resource.

- Subjection to hydrological planning of all public and private activities that have a relationship with the hydrological cycle.

- Establishment of an economic and financial framework that aims to transfer the costs of water to its users.

- Consideration of water quality and the hydrological environment as fundamental elements of the hydrological cycle.

Since the *Ley de Aguas* came into effect in January 1986 a series of ordinances have been enacted that make up its regulatory development. The following should be highlighted:

Reglamento del dominio público hidráulico² (Royal Decree 849/1986) in which the use and protection of the public hydrological domain is regulated, establishing the conditions for authorisations and concessions; the quality standards of continental and run-off water; the development of an economic and financial framework for the use of water; as well as the frameworks for administrative infractions, sanctions and the jurisdictions of the tribunals.

Reglamento de la Administración Pública del agua y de la planificación hidrológica³ (Royal Decree 927/1988) in which the administrative organisation for the exercising of government competencies is established, the National Council for Water is created, the new basin organisms (*Confederaciones Hidrográficas*⁴) are configured, the mechanisms for user participation in the public administration of water are set down, as well as the regulatory scheme for the writing and approval of basin hydrological plans and the national hydrological plan. Subsequently, some modifications have been made to the *Ley de Aguas* of 1985 and regulations⁵.

2.2.1. The Public Hydrological Domain

For the purposes of actions affecting hydrological resources, the law defines the government's hydrological domain assets as continental water, whether surface or renewable ground water (regardless of how long is needed for renewal), continuous and interrupted natural rivers, lake and lagoon beds and the beds of surface reservoirs in public rivers and subterranean aquifers. Therefore because all water, whether surface or renewable ground water, forms part of the public government domain, it acquires public domain characteristics; that are to say that its use is subject to control,

² Public Hydrological Domain Regulation

³ Public Water Administration and Hydrological Planning Regulation

⁴ Hydrographical Confederations

⁵ The most important are: Law 42/1994 of December 30th regarding fiscal, administrative and social order measures, under which certain articles of the “*Reglamento del dominio público hidráulico*” are modified. Law 9/1996 of January 15th under which extraordinary, exceptional and urgent measures regarding hydrological supplies are adopted as a result of the persistence of the drought period. Law 13/1996 of December 30th regarding fiscal and administrative measures for the regulation of the direct management of construction and/or operation of certain public works. Law 11/1999 of December 13th by which certain articles of the *Ley de Aguas* were modified. Law 46/1999 in modification of the Ley 24/85 de Aguas of August 2nd. Modified text of Law 29/85 that, without substantially altering the previous legislation, seeks to redress its deficiencies and the new challenges demanded of water administration in compliance with the European Union and with the need to grant the greatest level of protection to this natural resource as an environmental asset of the highest order.

authorisation and regulation by the government, remaining outside of the commercial influence of the private sector.

In this way the law responds to an important problem brought about in the Constitution that, in dividing the competencies for hydrological resources between central and regional governments, introduced undetermined issues and ambiguities that are difficult to resolve.

According to Article 149.1 of the Constitution, the government has exclusive jurisdiction over the legislation, organisation and concession of resources and hydrological developments when the water flows over the territory of more than one regional government. But it is also set down in Article 148.1 that the regional governments are able to assume competencies in the following matters: projects, construction and operation of water utilities, channels and irrigation that are of general interest to the regional government. As a result of this a good proportion of the autonomy statutes of the Spanish regions claim surface and ground water and its uses as their own exclusive competency whenever the water circulates entirely within their own territories.

The competencies that the law attributes to the government are Hydrological Planning; assignment of concessions and authorisations in inter-regional basins; the guardianship, administration and control of the hydrological public domain in inter-regional basins; the administration and control of usage that is of general interest or affects more than one regional government; the realisation of national plan works for hydrological infrastructures and the application of contracts and international agreements regarding water.

The regional governments have competency over the administration and control of the resource and its use in the intra-regional basins, that is to say that keeping in mind the unity of the hydrological cycle, the water flows entirely within the region. They also have competency over non-renewable ground water, as well as the realisation of hydraulic works of general interest to the community that do not affect other territories.

Even though all renewable continental water is under central government control, Spanish legislation differentiates between intra-regional basins whose surface and ground water flows within a single regional government and inter-regional basins whose surface and ground water flows over more than one region.

Each one of the large intra-regional basins is administered by a *Confederación Hidrográfica* which, in the case of the coastal regions, also administers a series of smaller basins and aquifers that are administered by the government even when they flow entirely within one region. This is because the respective regions have not taken up their competencies – this is the case of Valencia, Murcia, Andalusia, Asturias, Cantabria and the Basque Country.

2.2.2. Legislative framework for irrigation water

For the analysis of the legal framework for water, and especially that of irrigation water, it is necessary to point out that the Law respected rights that existed prior to it coming into effect, and as a result it is necessary to differentiate between the legal systems for public water developments and private water developments. As we have seen, diverse situations coexist at the present time for the exclusive use of water in general and for irrigation in particular, and these can be summarised as:

a) *The traditional situation of public water use limited to surface water by the previous legislation* and extended to new ground water developments by the current legislation. The right to the exclusive use –that is

to say to use by individuals or public or private entities for their own benefit– can only be acquired now by legal stipulation or administrative concession. A single exception to this form of obtaining exclusive usage rights for public water is for the use of water present within one's own property, which has an important limitation that we will comment on later.

For water concessions, the administrative body sets the purpose, expiration period, the equivalent continuous flow average allowed, the municipality and province in which the water is taken, regardless of whether the water is from a surface riverbed, spring etc., or whether it be from wells, underground chambers, etc. for the extraction of ground water.

In the case of water concessions for irrigation the following are also set: the surface area that may be irrigated, the municipal areas in which the irrigated zone is located, and the maximum volume of water to be used per hectare and year in order to calculate the instantaneous volume of the concession.

The concession can be obtained in the name of the owner of properties, by *comunidades de regantes*⁶ made up of the owners of the irrigated area, or by service-providing companies or individuals. In the first two cases the rights of ownership of the land and of the use of the water are inseparable. When the ownership of the use corresponds to a *comunidad de regantes*, each and every one of the community members has a participation quota for his exclusive use of the water and this participation quota is completely bound to the land with irrigation rights, so that any individual may not separately dispose of his exclusive rights over his property and his water usage rights as a result of his belonging to the community.

When the concession is obtained by individuals or public service companies, the holders of the concession for irrigation do not have to be the owners of all the properties that could benefit from the concession, but they should have the prior agreement of the holders of at least fifty percent of the irrigable surface area. The holders of the beneficiary properties of the concession have rights to the use of the water that limit those of the holder of the concession who may not sell outside of the surface area determined in the concession, but in this case the assignment of the water to land is different to the two previous cases. The administrative body shall in any case set the maximum and minimum rates to apply for the concession holder.

All modifications to essential characteristics of concessions that affect titleholders require administrative authorisation from the body that granted them. A change to just the titleholder when the development does not represent a public service is treated as just a complete or partial transfer of the development, and it is only necessary to accredit the transfer at the time and in the manner established. Any other modification and even that of a change in titleholder when the development represents a public service shall require the processing of the specifications modification documentation required by the administrative authority.

According to the *Ley de Aguas* of 1985, the concessions may also be revised in cases of Force Majeure, at the request of the concession holder; when it is required for compliance with the hydrological plans and when it is proved that assumptions that determined the concessions at the time that they were made have been modified, understanding thereby a change in circumstances such that it is not possible to substantially achieve the purpose of the concession.

Moreover, the modifications introduced in the *Ley de Aguas* by the Law 9/1996 of January 15th also allow the revision of the concession in the case of irrigation and of town uses when it is proved

⁶Irrigation Communities

that the object of the concession can be fulfilled with a smaller supply or technical improvement in the resource usage that contributes to an economising of its use. In this scenario, the revision of the concession will be carried out by the hydrological administration without the concession holder being entitled to any compensation and the technical improvements necessary to save this water are to be made at the expense of the concession holder.

The concessions expire at the end of the term of the concession, for non-fulfilment of the essential conditions that are indicated within it, or for the continuous failure of the holder to carry out the stated activity for three consecutive years. The Law 9/1996 added to these reasons for the expiration of the concessions the committing of a second very serious infraction in areas and periods in which the government has declared the application of extraordinary measures due to drought, or other extraordinary circumstances.

b) *The use of rain water that flows on a property or water that is held on it*, or water coming from springs located within it, or from ground water when the annual volume doesn't exceed 7,000 m³.

Administrative concession is not required. The water is able to be used with the only requirement being notification to the basin organism that will record the use in the Water Registry. The only exception is when located in an aquifer that is over-exploited or in risk of becoming so, in which case administrative authorisation is required.

This water may not be used in a different property to that in which it originates, flows or is held, and neither can it of course be the object of transfer away from the property. Should a transfer away from the land of its usage take place, this must be communicated to the Basin Organism, as if it is a new development, for its inscription in the Water Registry.

c) *The temporary development of private water* that private water proprietors had prior to the *Ley de Aguas* having opted for this régime and inscription in the Water Registry. This is a transitory situation because at the end of the fifty year term – currently thirty years – they are due to become part of the public domain and will become public water concessions.

The rights of these developments are placed on the same level as concessions, especially regarding the administrative protection that entry in the registry provides, and the possibility of participating in the administration and management of the basin organisms through their representative organs.

The holder of this right may sell the right to third parties, but the transfer of the development must include the transfer of the land that uses the water, because otherwise it would suppose a change in the essential characteristics of the development which, as we have seen, requires administrative concession and its conversion into public water.

The *Ley de Aguas* imposes, however, additional limitations for the use of the water that affects the ability to sell private water uses in three cases:

- In the case that aquifers are declared to be over exploited or at risk of becoming so, the administration should regulate all extractions in order to achieve a more rational use of the resource. In this instance the constitution of an aquifer user society is also required.

- When resource availability demands it, the administrative body may set in place the usage regime for subterranean aquifers that all existing uses of it must adapt to. In this way it is able to

determine or limit usages, in a temporary manner, so that in the case that it causes a modification of flows causing losses to some developments to the benefit of others, the beneficiary holders must provide due compensation.

- In the circumstances of extraordinary droughts, situations of need, emergency or the simultaneous occurrence of anomalous or exceptional situations, the administration may adopt necessary measures in relation to the use of the public water domain in order to overcome the situation, even when these are the object of a concession. These measures may, and indeed have affected subsequent regulations to confront the droughts of recent years, to empower the use of private water.

4. - *Private property water* that is held by those who had this right under the prior legislation without having opted for inscription in the registry.

As observed earlier, a large proportion of Spanish irrigation is based on the use of water – springs, wells and chambers – that was private property under the previous legislation. After the appearance of this law and with it the mechanisms established for the respect of these rights as indicated previously, it can be inferred that in parallel with the legal framework for public water the private property framework for water coexists in all of those cases in which the option for inscription in the Water Registry was not exercised before January 1st, 1989, and which the *Confederaciones* had to inscribe in the List of Private Water Developments for the Basin.

The legislation of water imposes however some constraints over the exercise of these private water property rights, limiting the owners powers of development and disposal. The owner of private water may only dispose of the flows that he used or took advantage of when the Law came into effect and under the same conditions that were applied, having the ability to transfer (sell, etc.) the right but always with the same limitations.

Any increase of flows to above that which was in reality used previously; any modification to the facilities apart from maintenance and preservation (change in intake, re-deepening, etc.); or any change to the purpose of the usage or operation to which it is dedicated (change of irrigated land, etc.); these represent a “change of flows, conditions or framework of use” that is contemplated in the *Ley de Aguas*, and as a result requires the appropriate administrative concession that governs the entire development and its inscription in the Water Registry, thereby becoming public water from this point in time on.

The private water owner's ability to dispose of his rights is in the same manner limited by the law in the case of over-exploited aquifers, when the availability of the resource requires it, or in times of droughts or other extraordinary circumstances, under the same conditions as those that were commented upon for the temporary use of private water inscribed in the Registry.

d) *Waste water and its direct reuse*. The *Ley de Aguas* determines that all activity and in particular the discharge of waste water that is susceptible to causing contamination or degradation of the public domain requires administrative authorisation that will determine the flows and quality conditions that the authorised discharge must comply with. In this manner, any urban or industrial discharge of waste water into natural water courses or irrigation channels requires authorisation from the basin organism.

Direct reuse of treated water is understood as referring to water that, having already been used for the purposes of the concession, is applied to other uses before being returned to the public domain. This is the case, for example, of the reuse of waste water from treatment plants that flows

directly to certain irrigated areas. The legislation prohibits the direct reuse of treated waste water for human consumption.

The law distinguishes between water that is reused by the first user that produces it and water that is reused by a person or people different to the first user. In the first case the original concession must be modified if this did not anticipate its reuse, whereas in the second case both usages shall be considered separate, and the reuse must be the object of a concession.

The private use of water is considered to have concluded with the return of waste water to the public domain, at which time this again becomes public domain water, and its reuse shall be subject to administrative concession.

The implementation of systems for the reuse of waste water may be able to benefit from technical and financial assistance that could be established by the government, and in any instance from the assistance provided for the improvement of irrigation set down in the *Ley de Auxilios del Estado de 1911*⁷.

e) *Assignment of Rights and Public Water Banks*

The modification of Article 56 of the *Ley de Aguas* allows any water concession holder or private rights holder, with the exception of non-consuming uses, to temporarily assign their rights to another concession holder or rights owner of the same rank. The assigning or assigned community of users must be notified of such an assignment. The *Confederación Hidrográfica* must also be notified, and is entitled to not authorise it if it negatively affects the basin's resources, third party rights or the environmental flows. Likewise, the *Confederación Hidrográfica* is allowed to exercise its overriding right of acquisition.

In the case of irrigation, the transferor must state the properties that he will no longer irrigate or will use less water for, and the transferee must specify the land that he will irrigate. The assignments shall be inscribed in the Water Registry. Also, the *Confederaciones Hidrográficas*, in agreement with the Council of Ministers is able to create water banks by means of the realisation of offers for the acquisition of usage rights and the assignment for a price of these rights to other users. This new framework seeks to speed up the temporary reassignment of resources in periods of drought, or to assist in temporary deficit situations.

2.2.3. Economic and financial framework for irrigation water

Title VI of the *Ley de Aguas* establishes the economic and financial framework for the use of the public water domain, based in the establishment of four types of levies: the levy for the occupation or use of the public domain, the regulation levy, the levy for water use, and lastly the levy for discharges.

The first of these applies to the occupation or private use of the hydraulic domain that requires authorisation and is direct in nature, that is to say that funds collected coming from its application are dedicated to the protection and improvement of said domain. The levy is established with criteria that are strictly territorial or spatial, for the occupation or use of the domain space or territory such as for example grain developments, forestry operations, pastures, recreational uses, etc., but the private use of water is excluded.

⁷ State Assistance Law of 1911.

By expressly stating that the users of water shall be exempt from the payment of the levy for the occupation or use of the necessary land to carry out the concession, any irrigation use or other development inscribed in the Water Registry is exonerated from any obligations.

The regulation levy and the water use levy are justified by a double objective: on the one hand to recover the expenses incurred by the government in investment, maintenance and exploitation of the hydraulic works that benefit particular developments, and on the other hand to transfer to users the necessary costs of having the water in a usable condition.

The holders of water rights that benefit from surface and ground regulation works paid fully or partially by the state are required to pay the regulation levy. Those who use the regulated water directly and have intakes in reservoirs, or downstream, or in aquifers that are refilled artificially are considered to be beneficiaries, as are those who benefit indirectly due to the right to the use of the water being based on the existence of a regulation that allows the redirection of the flows obtained, no matter where the intake is.

The holders of water usage rights who use specific hydraulic works realised completely by the government are required to pay the usage levy. The use of specific works realised partially by the government with a contribution from the users is not subject to the levy, unlike the case of the regulation levy.

The levies are annual and must cover all expenses incurred for the conservation and operation of the works, the administrative expenses of the public organism that manages them, and four percent of the total investment expenses made by the government, updated by means of a formula that takes into account the technical amortisation of the works and facilities as well as inflation. For the calculation of the amortisation a period of fifty years has been set down for the regulation levy and twenty-five years for the specific works.

The dividing up of the regulation levy and water use levy amongst the different users of each system is carried out based on the share of the benefits produced by the works, and is established in unitary terms, that is in euros per hectare, cubic meter, etc., or, in the case of tariffs that are in binomic form, part of the cost is calculated in euros per hectare and a part in euros per cubic meter consumed.

Even though the economic framework set down in the new law seeks, at least in theory, to transfer collection and transport costs to users, and to generate resources in the confederations to offer a larger degree of financial autonomy and to meet future investments, it is for sure that that neither of these two objectives has been achieved with the established system.

The transfer of the cost to the user should be the mechanism for information about the resource shortage as a result of the increasing costs as the use of the resource is intensified in a basin. It is apparent, and reflected in numerous studies, that the economic framework created from the *Ley de Aguas* has not achieved this objective, although as we will see later on, this statement should be qualified by differentiating between traditional users, users who benefit from government works, and users of ground water.

The non-fulfilment of the second of the stated objectives is also very evident. The amount of money charged for these matters is insignificant in comparison with government investment in regulation and transport works – less than fifteen percent – and the amount actually collected barely reaches seventy percent of the total charged, so that the resources generated by this channel end up not even covering the personnel costs assigned to these functions.

With respect to usage rights of private water prior to the law, the majority are not subject to any levy or tariff, whether they are in a temporary régime or private property. The occupation levy or the levy for the use of the domain for occupation of springs, wells or chambers are not applicable to these irrigation developments, due to the rights vested by the previous legislation being maintained, and the regulation levies or water use levies are also not applicable if the right holders are not direct or indirect beneficiaries of works carried out by the government, as is the case for most irrigation developments of this nature.

The wells and facilities that were built in the past by the Ministry of Agriculture or those that were or are built by the regional governments are not subject to the economic framework of the *Ley de Aguas* but instead the conditions were established in each case at the time of delivery of the works to the users.

2.3. THE PUBLIC ADMINISTRATION OF WATER

As we have just seen, the *Ley de Aguas* of 1985 and its regulatory development creates a new scenario for the public administration of water, under which the structure and functions of the *Confederaciones Hidrográficas* are redefined as public organisms dedicated to the administration of water in the country's main basins, and hydrological planning is established as the main administrative tool to which all public and private activities affecting the public hydraulic domain are subjected.

2.3.1. Administrative organisation: the *Confederaciones Hidrográficas*

Each one of the large inter-regional basins, that can include one or more undivided basins and the internal aquifers of the territory, is administered by a *Confederación Hidrográfica*, entities under public law with their own legal status, with full functional autonomy and belonging to the Ministry of the Environment.

The functions vested to the *Confederaciones* are the elaboration of hydrological plans for basins included in their territory, their monitoring and revision; the administration and control of the public hydraulic domain and developments of general interest or those that effect more than one regional government; and the projection, construction of works carried out with their own funds and those vested in them by the government.

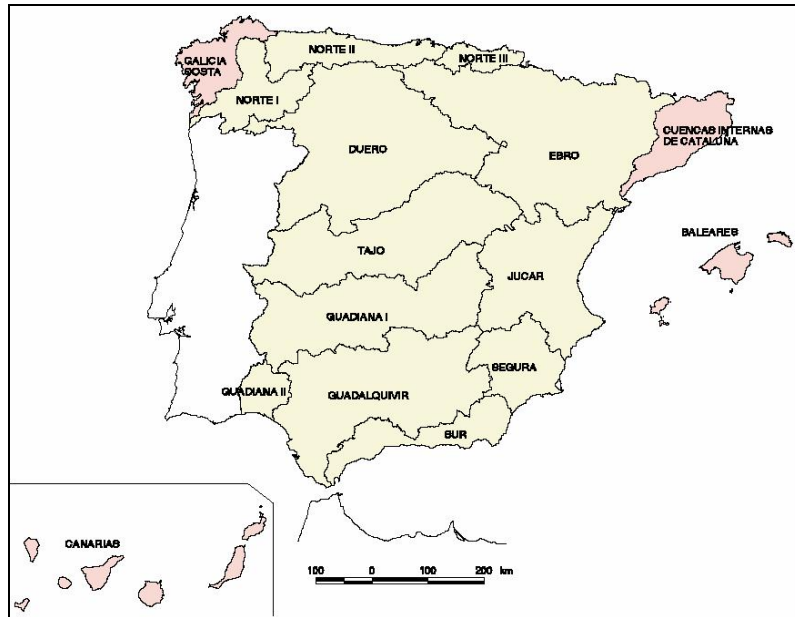


Figure 4. Basin Organisms

For the performance of these functions these entities have a series of tasks, of which the following are worth highlighting:

- The granting of authorisations and concessions relating to the public hydraulic domain, with the exception of those concerning works and activities of general government interest that correspond to the Ministry of Environment. In this case the confederations are responsible for processing the files.
- The definition of the objectives and quality programmes in agreement with planning.
- The exercise of control and guardianship over the public domain by means of the inspection and surveillance of compliance with authorisations and concessions related to it, realisation of appraisal wells, hydrology studies, water quality control and flood information.
- The study, projection, construction, conservation, exploitation and improvement of hydraulic works included in their own plans or those vested in them.

For the exercise of these functions and powers in a participatory framework, the following structure is created:

- Government and Administrative Bodies: the President and Government Council (*Junta de Gobierno*).
- Planning Body: Basin Water Council.
- Management Body: User Assembly (*Asamblea de Usuarios*), the Reservoir Committee (*Comisión de Desembalse*); Operations Councils (*Junta de Explotación*) and Works Councils (*Junta de Obras*).

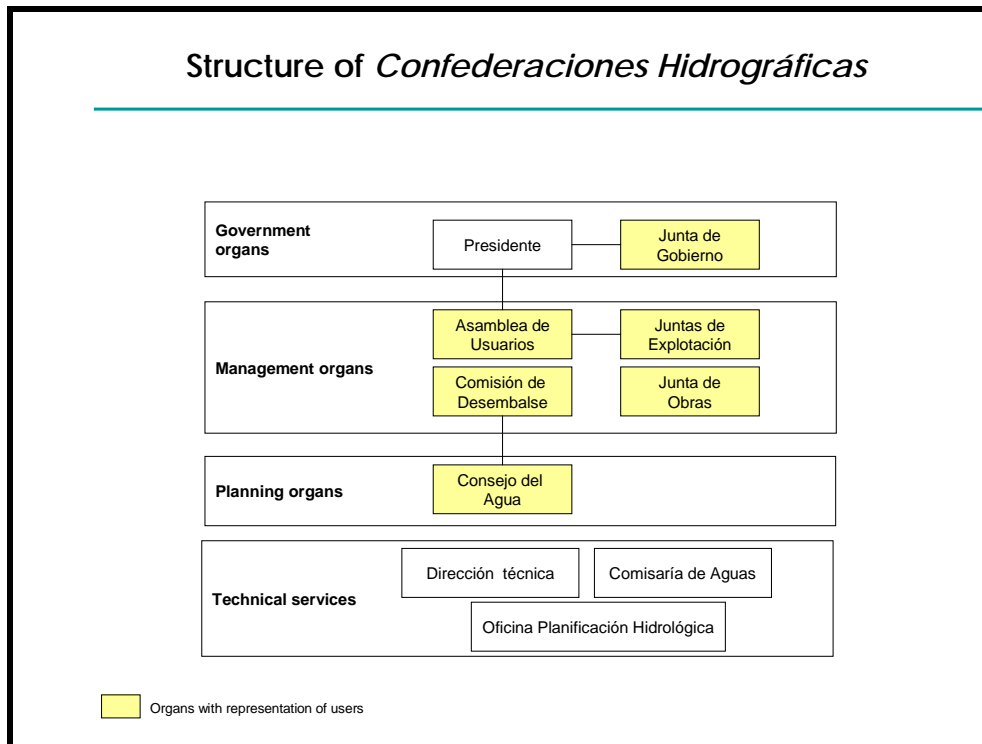


Figure 5. Structure of the Basin Organisms

The President represents the organism and carries out its management and executive function, presides over the government council, user assembly, the reservoir committee and the water council, and is endowed with some very broad functions, amongst which it is especially worth mentioning those of granting concessions and authorisations for the public hydraulic domain, and application of its fiscal regulations. Resolving administrative remedies derived from the activities of the user communities and of the basin organism itself are also functions of the president, with the exception of those that are derived from the activities of the Government Council.

The Government Council is assigned, amongst other tasks, the role of formulating budgets for the organism, activity plan proposal, the declaration of aquifers as overly exploited, the preparation of matters that must be subjected to the Basin Water Council, etc.

The Government Council acts in a participatory framework for the central and regional governments, and users. As representatives of the central government there is a spokesperson for for each of the Environment, Agriculture, Industry, Economy and Inland Revenue, Defense and Interior Ministries. The regional governments are represented by a variable number of spokespeople depending on the number of regions that the confederation is made up of, and of the surface area and population applicable for their region. There is to be at least one spokesperson per regional government.

At least a third of its members are there in representation of the users of the different types of developments: water supply, the *comunidades de regantes*⁸, hydroelectric producers, industrial uses and other uses, which may include users representing irrigation developments that aren't members of the *comunidades de regantes* as long as they are the owners of some concession registered or in the process

⁸Irrigation Communities

of being registered in the Water Registry. The user representatives in the Government Council are elected from amongst the members of the user assembly, by its representatives from each of the different water uses.

The *Basin Water Council* is the participatory body for the basin's hydrological planning. It is responsible for raising the hydrological plan(s) and their subsequent revisions to the Government level via the Ministry for the Environment. In this way it is able to communicate issues of general interest to the basin and issues relative to the improvement of regulations, exploitation and guardianship of the public hydraulic domain.

It may act in plenary session and in committees of which at least one Hydrological Planning Committee shall exist for each of the hydrological plans that are envisaged in the territorial environment of the basin organism.

In the Water Council there is an extensive representation from the central government – 14 ministry spokespeople; from the regional governments – variable according to surface area and population; and from the users – at least a third of the total of the Council's spokespeople. The user representatives are chosen from amongst the members of the user assembly, by its representatives for each of the different usage classes, respecting the proportions that exist in the assembly itself.

The *User Assembly* is made up of all of the users that are members of all of the operations councils and has the purpose of coordinating the operation of all systems, hydraulic works and resources for the entire basin. The user representatives in the government council, the reservoir committee and the water council are chosen from amongst the members of the assembly.

The *Operations Councils* have the purpose of coordinating the operation of works and hydraulic resources of a particular river, group of rivers, river tract or hydrological unit whose uses are especially related, respecting at the same time the vested rights of the relevant concessions and authorisations. The scope of the operations councils is set by the president of the organism, presented at the government council.

The operations councils are presided over by the Technical Director of the confederation, and are made up of the representatives of users with registered rights or rights pending inscription in the Water Registry in accordance with their interests:

- the suppliers, municipalities, unions, consortia or public or private corporations, holders of administrative concessions, depending on the municipality supplied, and with direct representation starting from one hundred thousand inhabitants.
- the *comunidades de regantes* individually or grouped depending on the irrigable surface area, and with direct representation for surface areas greater than three thousand hectares.
- the central councils and the general communities.
- future irrigation developments with works in progress represented by the organs of the administration responsible for the government plans.
- companies that produce hydroelectric energy, depending on the installed surface area.
- other industrial users depending on the concessional flows.

- other users grouped or not grouped within user communities, amongst which the temporary developments of private water that aren't members of *comunidades de regantes* may be included should they so desire.

All members of all operations meetings combined make up the user assembly, from which the user representatives for the Government Council, Reservoir Committee and Water Council are elected.

The *Reservoir Committee* is assigned the role of formulating proposals to the organism's President regarding the filling and emptying framework of the basin's reservoirs and aquifers that will be binding when the proposal is unanimously agreed upon, technically possible and respecting the concessionary rights of the different users. It may act in plenary session or in sections corresponding to the different operation systems.

It is made up of the president of the organism that presides over it, the confederation's technical director and head of operations, the water commissary, three representatives of the administration, and the user representatives elected by the assembly in such a way that there is representation from all users that have some rights over the reservoirs.

The *Works Councils* may be constituted at the request of future beneficiaries of hydraulic works approved by and to be carried out by the confederation, in order to receive information regarding their development. The councils shall have representation from the users that make up the interests of the various present and planned developments. The representation will be determined in each case by the Government Council.

With the new organisation of public water administration it can be concluded that the principles of unity of the hydrological cycle and unity of basin and complete water administration have been maintained, and in this sense the problems regarding competing jurisdictions for the administration of the public hydraulic domain have been solved in a satisfactory manner. Also, the principles of integral treatment of the basin and user participation have been developed satisfactorily.

The maintenance of the legal framework for autonomous organisms of a commercial nature within the new confederations produces important limitations for the autonomy of the administration – there is a noteworthy paradox – and the difficulties in the application of the economic and financial framework foreseen by the Law and regulations – levies for discharges, regulation, tariffs, etc., hinder the achievement of the necessary and envisaged autonomy in the administration of the new confederations with a strong functional and financial dependency on the hydraulic administration of the Ministry, such that the solutions established for the decentralisation principles foreseen by the legislation can hardly be considered satisfactory.

It is also appropriate to emphasise that the necessary changes have not taken place in the administrative, technical and management organs that would allow for an effective approach to the new tasks required by the new legislation.

On the other hand, the traditional duality between commissaries and confederations has only been overcome formally – in practice there is still a long way to go before achieving an authentic integration. What has really taken place up until now has been a grouping of the previous services under the dependency of a President with extensive formal powers.

2.3.2. Hydrological planning

Hydrological planning, as foreseen by the *Reglamento de la Administración Pública del agua y de la planificación hidrológica* (Royal Decree 927/1988), has materialised by means of the *Planes Hidrológicos de Cuenca*⁹ (from now on referred to as PHC) and the National Hydrological Plan (PHN). Also however, over the course of the preparation of these plans, Parliament requested the national government to present a *Plan Nacional de Regadíos*¹⁰ (PNR) in conjunction with the national plans for presentation and approval jointly with the PHN.

The PHC can be inter-regional (affecting more than one regional government) and intra-regional (affecting a single regional government). The first are to be prepared by the basin organisms – *Confederaciones Hidrográficas*– and the second by the administrations of the corresponding regional governments. In both cases approval is the responsibility of the national government. All of the PHCs have now been approved by means of the corresponding Royal Decrees.

The PHN is prepared by the Ministry of the Environment and the PNR by the Ministry of Agriculture, Fisheries and Nutrition. The PHN, whose preparation was initiated after the publication of the Royal Decree 927/1988, was approved much later as a law, on July 5th 2001. It generated an intense social debate and after the change in government (March of 2004) the Plan has been subjected to revision. The PNR was also approved in the year 2001 and has also been the object of a recent revision. It also seems probable that some basin plans will be reformed in the coming years, as in the case of Júcar and Segura.

a) The PHC

In accordance with the stated Regulations, the general objectives of the PHC are those of satisfying demands, the balancing and harmonisation of regional and productive sector development, increasing resource availability, quality protection, economisation of use and harmonisation with the environment and other natural resources.

The content of the PHCs is very wide as can be seen by the breadth and generality of the objectives. We will highlight here only the contents that are more directly related to the use of water for irrigation. In this respect, the basin hydrological plans include: the Inventory of hydraulic resources, the evaluation of existing and predicted uses, the assessment of irrigation requirements, the priority and use compatibility criteria, and the assignment and reservation of resources for current and future uses and demands. It states also the protected zones --including aquifers-- and the measures for the conservation and recovery of the resource and the effected environment.

b) The PHN

According to the cited regulation the PHN should, as a minimum, have considered the measures necessary for the coordination of the basin plans and solutions to the diverse alternatives that these raise. This coordination measures include public hydraulic works that are of general interest or whose realisation affects more than one regional government, and whose project, construction and exploitation jurisdiction belongs to the central government. The Plan also considers the forecast and conditions of hydraulic resource transfers between the territories of different hydrological basin plans is considered in the PHN, specifying the annual volume of each of them and the conditions by which they may be modified.

⁹Basin Hydrological Plans

¹⁰National Irrigation Plan

And this is the way in which it is set down in Law 10/2001 (by which the national hydrological plan was approved), whose Chapter 3 is dedicated completely to presenting specific solutions for transfers between the Ebro (donor) and Júcar, Segura, Sur e Internals of Catalonia (receptor) basins. Nevertheless, on June 18th, 2004, the Spanish Government approved a Royal Decree, in modification of the National Hydrological Plan laws, which includes actions aimed at providing 1,063 Hm³ to the Mediterranean basins, by means of desalinisation, infrastructure improvement activities, etc.

Moreover the PHN may introduce modifications in water allotments affecting current water supply and irrigation uses. The *Ley de Aguas* allowed for compensation to current users whose concessions are revised as a consequence of hydrological planning requirements, but as have already seen, following the modification made by Law 9/1996, there shall be no entitlement to compensation when these revisions take place because it is proved that the objective of the concession can be fulfilled using a smaller allotment or when a technical improvement contributes to the saving of water¹¹.

c) The PNR

The PNR establishes, as a general and overriding objective, the improvement, modernisation and consolidation of existing irrigation, although the possibility of restructuring and reconversion of some of the traditional areas of irrigation is foreseen, and potential demand from the expansion of crops traditionally carried out on non-irrigated land such as olive groves and vineyards is considered. These are items that were not contemplated by PHCs' or PHN documentation.

New developments are limited to the commitments inherited in areas declared to be of general national interest that would imply the irrigation of approximately 300/400 thousand hectares. A profound revision is proposed of all declared areas, of the regional governments' proposals, and of the PHC that will allow the determination of their viability given current technical, economic and environmental conditions.

The consolidation of irrigated agriculture in the Mediterranean regions and the South of Spain is considered to be urgent, for which measures are proposed for the diversion of water between basins necessary for the deficit basins, and at the same time the need to substantially modify water management systems for irrigation.

The establishment of a new economic and financial water framework for irrigation is proposed that would simultaneously guarantee the viability of agriculture and the efficient use of water, but without however setting in place any specific proposal for this important modification.

And finally, it is established that irrigation policy should not be considered to be the only tool for rural development, which would suppose a radical change in this policy's traditional strategy¹². It is thought that the development expectations sustained in many territories almost exclusively by the development of irrigation cannot be justified due to its technical, social, economic or environmental unfeasibility.

¹¹ On the other hand, Law 10/2002 (by which the PHN was approved) established that in the termination proceedings for municipal water supply and irrigation, holders may request a new concession with the same use and application without competitive proceedings. Likewise, when a reduction of the concessional volume takes place for a supply as a result of improvements or modernisation, the reduced proportion shall be held as a reserve for the same use.

¹² In these cases other sustainable rural development plans may be more suitable that, whether or not they include small-scale irrigation developments, basically attend to the diversification of rural activities.

In conclusion, we are dealing with a plan that places priority on the modernisation and consolidation of existing irrigation whilst limiting the growth of the irrigated surface area with respect to the proposals in the PHCs and PHN. Certain measures are proposed for economising the use of water, and sustainable rural development plans are favoured over the traditional thinking of irrigation being the only solution.

2.4. LOCAL MANAGEMENT OF WATER FOR IRRIGATION

The organisation type of Spanish farmers for irrigation tasks depends, to a large degree, on the nature of water rights. Although the current *Ley de Aguas* establishes that all water is public regardless of its source, and that the right to the private use of water can only be obtained by administrative concession, at the present time a mixed framework of public and private water continues as a consequence of the previous legislation that considered public water to include only surface water and therefore subject to administrative concession, whilst ground water was for private appropriation.

Keeping in mind that the previous legislation was in effect for almost a century, and that during this period, and especially since the 1950s, a great expansion took place in the use of irrigation using both surface and ground water, and that under the new law previous derivative users were given the option of continuing within a private usage framework, it is clear that although all water in Spain is public, there is a mixed system of water rights that generally determines the manner in which irrigation is organised.

At the risk of generalisation, we can propose a summary of the types of irrigation organisations in function of the nature of their rights:

- **Traditional Irrigation:** These are the organisations whose rights are prior to the large activities of modern government. A good proportion of them have their origins in the Muslim period and most of them developed their rights and organisation by means of privileges from the successive Christian kings that have been respected with small modifications by modern legislation and which as a result have been maintained to the present time.

The old general irrigation organisations progressively adopted the form of *comunidades de regantes* as set down by the legislation of 1876 and 1985, although most of them maintained fundamental aspects of their historical articles of association.

The fundamental characteristic of these organisations is that they irrigate with surface water, that they are property owners and that they operate the majority of irrigation infrastructures and even some large regulating reservoirs. The hydraulic administration supplies them with water and the distribution and transport between the farmers is carried out by the *comunidades de regantes* themselves.

- **New Irrigation:** This is irrigation predominantly using surface water, most of which were created since the 1950s at the initiative of the government. These were constituted as *comunidades de regantes* since their creation.

The regulatory and transport infrastructures are the property of the government that built them and now maintains and operates them, charging certain irrigation levies that in theory should cover all of the collection and transport costs for the water. The organisation of irrigation between its members is carried out by the *comunidades* as in the previous case,

although certain cases exist in which this is carried out by the hydraulic administration itself (*confederaciones hidrográficas*) in the cases in which the administration has not handed over the transport and distribution infrastructure.

- **Private Irrigation:** This is irrigation with ground or mixed water carried out by private initiative in accordance with the legislation that was in effect prior to the current legislation.

In the territories in which agricultural activity is of a larger scale - Andalusia and both Castilian regions - the use of individual wells prevails, however in the Mediterranean area-Valencia and Murcia - as a result of the reduced scale of the agricultural operations - an overwhelming majority of wells are used collectively in different types of societies: Irrigation cooperatives, Agricultural Development Societies, Civil Well Societies, etc.

The members normally acquire irrigation rights by means of the purchase of titles – which are generically referred to as shares. On some occasions these shares are bound to the land property and are not transferable independently of this, and in others this relationship doesn't exist, with the shares being able to be sold independently of the land. The shares may confer the right to a holding in the society's water flows, that is to say a certain period of use of certain flows, or in other cases to the irrigation of a certain surface area without flow limitations.

In all of these societies it is common for the members to be proprietors of all irrigation infrastructures, operating them themselves and organising the irrigation together, from the decision on withdrawals through to the application in the fields without any intervention from the public hydraulic administration.

2.4.1. The irrigation communities (*comunidades de regantes*)

The structure of the *comunidades de regantes* is subject to what is set out in the *Ley de Aguas* and the Public Hydraulic Domain Regulation for user communities. All water users that, in a collective manner, share the use of the same concession or use the same intake of water coming from springs, wells, natural currents or channels constructed by the Government must be constituted as *comunidades*. These communities receive the name of *comunidades de regantes* when the use of the water is fundamentally for irrigation.

The *comunidades de regantes* (from now on referred to as CR) have the status of public law corporations subject to the basin organism which oversees the execution of its articles of association or ordinances, and is required to carry out policy, distribution and administration functions for the water granted to it. As public law corporations they are beneficiaries of mandatory expropriation and of the imposition of easements that their use requires and which they may carry out for themselves and with a charge to users for agreements not fulfilled by them. The costs of the subsidiary execution and the community's debts are able to be demanded by court order.

For the application of legal orders, the CR has the ability to designate its own collectors whose appointment only requires its communication to the Ministry of Economy or by requesting this Ministry to carry out the collection.

Their organisation is regulated by means of their own articles of association or ordinances, which also establish operating standards, in a régime of internal autonomy, of the hydraulic assets inherent to the use. The CRs elaborate their own articles of association, ordinances and regulations

that must be approved by the General Council of all the users of the same intake or concession and sent to the basin organism for its approval, which shall not refuse the application provided it does not infringe upon the legislation that is in force.

The articles of association or ordinances of the CRs always include the purpose and territorial scope of the development, regulate the participation and representation of the community members in government bodies that should be in proportion to the surface area with irrigation rights, and establish the legally binding standards in relation to the framework for the use of the water and of the maintenance and exploitation of the infrastructures, amongst which should be that of the allotment among all community members of the communal expenses for operations, conservation, repairs, facility improvement and any other community obligations.

All of the proprietors of assets subscribed to the development who are, in the case of irrigation, all of the proprietors of the irrigated territory's lands established in the concession are entitled to participate in the constitution and operation of the CR and to be elected to carry out any position within it.

All land owners have a right to vote in the general meeting. Voting can be direct; if the minimum required for it is reached in agreement with that established in the ordinances; or indirect; by means of the voluntary grouping of proprietors until reaching the demanded minimum for the direct vote. Even when representation is proportional to the rights of the community members, a series of limitations applies to the exercising of majorities. No proprietor may have a number of votes that reaches 50 percent of the total of all community members, no matter what his participation may be in the community's rights and, consequently, in the expenses of the community.

On the other hand, no community member may be entirely relieved of the obligations and charges derived from his holding in the community; and neither pacts nor statutory clauses are allowed to be established that prevent the realisation of the assessment necessary to satisfy the expenses of the community; or those that allow exemption from responsibility for their payment.

Every CR has – as a legal requirement – a General Council or Assembly, a Board of Governors and one or more irrigation juries. The General Council is the sovereign organ of the community and is made up of all its users. The functions of the general council include:

- the election of the community's President and Vice-President, the members of the Board of Governors and the Irrigation Jury, and its representatives in other organisms.
- the preparation and modification of ordinances and regulations.
- the approval of budgets and imposition of shared costs on community members.
- the acquisition and disposal of property and the approval of projects and works.
- the application for concessions or authorisations or the benefits of mandatory expropriation from the basin organism, etc.

The Board of Governors takes charge of the execution of ordinances and agreements adopted by the General Council. The board members are named by the General Council and the users that are the last to receive water due to the situation of their land must be represented. Its president does not necessarily have to be the person who is the president of the community. His functions are executive: he is responsible for achieving compliance with the agreements reached at the General Council, of establishing the mechanisms for the distribution of water and for maintaining the systems for the modulation and distribution of water.

The Irrigation Jury is the jurisdictional organ of the *Comunidad de Regantes*. The jury is composed of a President named by the General Council, several members named by the General Council, and a Secretary. This Jury oversees the compliance of the irrigation regulations, imposes sanctions for infractions and stipulates indemnity payments. When conflicts between irrigators arise, the Jury search for an agreement among them, and if it's not possible, pronounces sentence.

2.4.2. General Communities and Central User Unions

The user communities for water whose use effects communal interests may constitute themselves as a *Comunidad General de Usuarios*¹³ for the defence of their rights and for the conservation of interests common to them.

The most frequent case is that of the large channels built by the government, with different intakes, and for which there are various *comunidades de regantes* that each negotiate their own particular interests, and a general community for the channel that negotiates the common interests of all existing uses.

When there are individual uses, the individual users and the *comunidades de regantes* with common interests can form a *Junta Central de Usuarios*¹⁴, for the defense of these interests.

The representatives of the different communities in the general community, or of these and the individual users in the central council are established in proportion with the theoretical concessionary water flows. The ordinances shall be prepared by the general council and be approved by the basin organism. They should cover, amongst other things, the manner in which shifts are established for the use of the water by each member community, the conservation and maintenance framework of community works, general community charges and procedure for setting them, and the penalty framework for registrations. In other matters the same regulations as for the communities of ordinary users shall govern.

2.4.3. Other societies

The majority of the management of ground water is carried out as indicated previously by private initiative both from the supply side – decisions on the withdrawal volumes – as well as from the demand side – management of transport and distribution. These operations are carried out directly by the proprietors of the wells, whether they are individuals or societies.

The well societies, whose number has grown considerably since the 1960s, adopt a range of very diverse structures, such as cooperatives, agricultural development societies, corporations, etc., and their organisation and operation conforms to the existing legislation for the different types of organisation. There isn't any provision that regulates the specifics of societies which have as their objective the operation of wells or chambers.

¹³ General Community of Users

¹⁴ Central Council of Users

3. THE JÚCAR RIVER BASIN AND USUJ

3.1. THE JÚCAR RIVER BASIN: TERRITORY AND SOCIETY

The basin of the river Júcar is made up of 21,578 km² distributed between the autonomous regions of Castilla-La Mancha (the provinces of Albacete and Cuenca) and the Valencian Community (the province of Valencia). The river is 671 km in length and collects a large proportion of the water from the south-east sector of the Iberian mountain ranges. The Júcar –called Xúquer in the Catalan-speaking area–, flows tightly bound between these mountain ranges throughout the majority of its course, over which it only supplies surface water to traditional irrigated areas of modest dimensions. It is from below the Tous reservoir that the river abandons its confinement and has created an alluvial plain, known as La Ribera del Xúquer, where a large traditional irrigation area has been developed since the Islamic period.

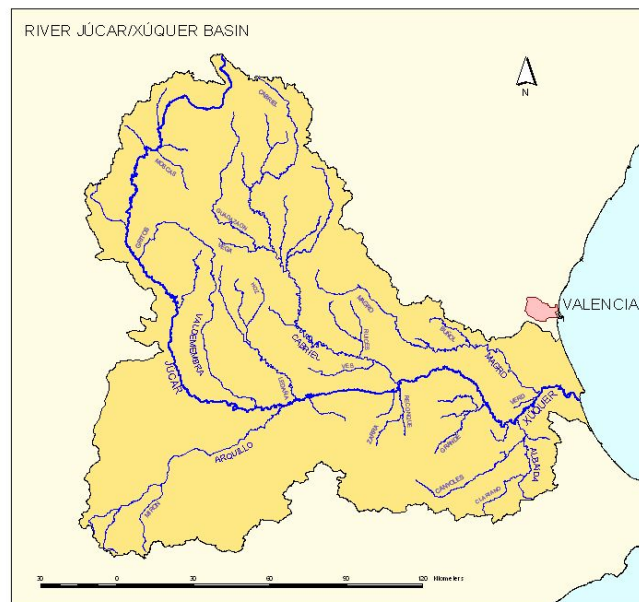


Figure 6. The Júcar River. Tributaries and basin

As it is shown in figure 3.1., most of Júcar tributaries come from its left side. Cabriel river (277 km long), drains a mountainous basin of 4.755 km², providing an important part of the water resources of Júcar basin. On the contrary, Magro (155 km long and 1.545 km² of basin surface) or Valdemembra (105 km long and 952 km²) arrive exhausted to the confluence. On the right side, resources from Arquillo river (125 km long and 2.700 km², including several endorheic areas) are also scarce, but Albaida (only 47 km long and 1.314 km²) provide significant run-off for the coastal floodplain.

3.1.1. Administrative organization

Since 1934, management of Júcar River by the Spanish State is executed by the *Confederación Hidrográfica del Júcar*. This hydraulic authority stretches an area wider than the Júcar basin, including also Millars, Turia, Vinalopó, Serpis and many other minor coastal waterways between the Ebro basin –to the North– and the Segura River basin –to the South. Thus, the total extension of the Júcar River Basin District (42.989 km²), doubles the real river basin surface.

Júcar River Basin District is divided into nine Operation Councils (*Juntas de Explotación*). Some of them coincide with the main river basins of the District and many others gather small waterways. Those are: Júcar, Turia, Palancia y losValles, Mijares-Plana de Castellón, Serpis, Vinalopó-Alacantí, Marina Alta, Marina Baja and Cenia-Maestrazgo.

This hydraulic district encompasses lands of four Spanish regions: Valencia, Castilla-La Mancha, Aragón and also a very small part of Catalunya. The administrative division of the Júcar River Basin District has jurisdictional consequences, due to the fact that the four regional governments regulate issues such as agriculture, cattle, forestry, fishery, wastewater treatment, protection of natural areas, industry, infrastructures and territorial planning. Far from being a drawback for water resources management, this matter is perceived as a positive factor that has allowed the adaptation of legislation to regional identities.



Figure 7. Territorial Scope of the Júcar Confederación Hidrográfica.

However, as long as basin management interests of water users of low and high Júcar do not coincide and due to the fact that they are politically represented by different regional governments, conflicts among water users usually involve clashes between both administrations. Political sign of central government –similar or different from one or two of the regional governments— could also strength or weaken one regional government’s position, stimulating the interpretation of each conflict as a vote-catching affaire.

3.1.2. Physical framework

The Iberian System, a chain of mountains that runs from the Cantabric System to the coastal plain of Valencia dividing the Mediterranean and Atlantic Spanish basins, occupies most of Júcar River Basin. The southern slopes of this mountain range are drained by Júcar left tributaries, whereas only a few of them, coming from its right side, collect run-off from the Plateau of La Mancha and the northern mountains of the Betic System.

Given these geological conditions, Júcar basin could be divided in four sectors, which present different physical conditions. First one, the Serranía de Cuenca, encompasses the northern

mountainous area, where headwaters sub-basins of Cabriel and Júcar tributaries are placed. This area is a rugged forested slope, descending from the 1.800 meters peaks of the Montes Universales to the 600 meters of La Mancha Plateau. Secondary limestone and calcarenite cover most of the mountains –strongly karstified–, sometimes with slate outcrops; whereas marls appear in plains and tabular sectors and Quaternary alluvial material fill narrow valleys.

To the South, the second sector, The Plateau of La Mancha, is the western part of the Castilian Meseta, and ancient eroded base plate with an average height of 650 m. It is a plain or tabular relief, badly drained, which presents several endorheic and semi-endorheic areas over marl or alluvial substrate, sometimes occupied by salt pans and marshes. In the southern border, calcareous mountains of Betic System establish the watershed that divides Júcar, Segura and Guadalquivir basins.

The eastern part of Júcar basin presents two different sectors: the alluvial plain –La Ribera– and the arc of mountains which mark the confluence between the Iberian and Betic System, and the transition between the highlands of La Mancha and the Mediterranean coast.

These mountain ranges present alignments of different predominant orientations –NW-SE for the Iberian System and SW-NE for the Betic System–, which condition tributaries hydrography. The Caroig Massif establishes the border between those geological domains. It's a tabular relief, also karstified, which acts as a groundwater reservoir for the Low Júcar, a role also played by the rest of the secondary calcareous mountains of the Iberian and Betic System placed beside the alluvial plain. These lands are not so forested as those in La Serranía de Cuenca, mainly due to recurrent fires happened during the last three decades, which has caused an important lose of soils. This erosive process has been particularly intensive in Magro marly basin, causing the silting of the Forata dam.

The coastal plane of La Ribera del Xúquer is a concave-convex alluvial plain fundamentally made up of quaternary sediment –silt, clay and sand– upon which deep and well structured soils have been developed. In the Ribera Alta (upstream), the plain is defined by secondary calcareous reliefs, whilst in the Ribera Baixa (lowland) the river gives place to a wider sedimentary build-up, an interior delta from the Pleistocene age covered by more recent alluvium materials and flanked by two wetlands, the Marjal de Corbera-Estany de Cullera to the south and l'Albufera of Valencia to the north. The situation of these wetlands at the end of the hydraulic system –particularly the Albufera, considered Ramsar Site and protected by UE Birds and Habitat directives–, is a key feature on the basin management, due to its environmental requirements.

Such in many other Mediterranean areas, climatic conditions of Júcar basin vary enormously in a few tens of kilometers of distance. Thermal contrast between the cold higher sub-basins of Cabriel and Júcar and the warm coastal floodplain reaches 8 degrees on the mean annual temperature (9° in the Serranía de Cuenca and 17 in the Ribera).

The western highlands of La Mancha and la Serranía have severe climatic conditions, because of their altitude and continentality. Winter mean temperature is below 1° in both areas, and there's more than 63 days of frost per year in Albacete and more than 73 in Cuenca, frequently below -5°. Mean annual temperature is also lower in Cuenca mountains' –between 9° and 12–than in the Plateau of La Mancha –between 12° and 15°.

There's also a clear contrast between the annual rainfall of La Serranía and La Mancha. Whilst Cuenca reaches 560 mm per year (close to the basin average of 550 mm) and the summits of Montes Universales have values higher than 800 mm, an important proportion of the plateau never get up 400 mm per year –366 mm in Albacete area. Rainfall distribution along the year is very regular in

Cuenca –about 40 mm per month, with small picks in April and November-- , where there's only a dry season during the summer; while in the plateau, there's a clear spring pick –52 mm in April-- , with a secondary one in autumn. These meteorological conditions limit crop productions and restrict orientation to a narrow range of plants.

On the contrary, La Ribera has climatic conditions characterized by gentle winters, with a median temperature in the coldest month of between 11° in Cullera and 9° in Sumacàrcer, and hot summers, with 24°-26° median temperature in the warmest month. Frosts are scarce and rarely below -3°.

Annual rainfall exceeds 500 mm in almost the entire district, reaching 700 mm in the upper part of the coastal reliefs – the Corbera and La Murta mountain ranges. Rainfall is heaviest in autumn, followed by a second spring peak and low summer rainfall. These climatic conditions have favoured the development of citriculture in most of the district, to the point of near exclusivity in La Ribera Alta, whilst in La Ribera Baixa a large surface area is dedicated to the cultivation of rice, fundamentally on land reclaimed from former wetlands.

3.1.3. Social and economical framework

There is also a great contrast, from a socio-economical point of view, between the High and the Low Júcar. Whilst La Ribera del Júcar is a densely populated area, highly urbanized and industrialized, the high lands of this basin are a rural depressed area, where only the functional axis Albacete-Almansa presents an important economic dynamism.

Population density reflects this contrast. It reaches values extremely higher in the Xúquer floodplain –210 hab/km in the Ribera Alta and 250 hab/km in the Ribera Baixa– if we compare them with the rest of the basin: 10 hab/km in the mountain ranges (Province of Cuenca or Caroig Massif) an 27 hab/km in Albacete plain. In fact, during the last decades, this rural area has been the origin point of a migratory current towards the urban regions of Valencia, Madrid and Barcelona, and although this movement has decreased, most of these depressed rural areas are still losing population.

Cuenca is the only province in Castilla-La Mancha region that has lost population during the period 1981-2001. The only town bigger than 10.000 habitants in Júcar basin in the province is the capital, with 47.000 habitants. More than the 80% of the population live in villages smaller than 2.000 residents, which has lost population during the last 20 years and where almost the 60% of people are older than 60 years. Income per capita in most of these rural areas, despite recent increases, is still around 10.000 €, far from regional values that reach 15.000 € per capita, or from Valencian average (18.000 € per capita).

Thus, the mountainous region of Cuenca, isolated from the main economic axis of the country, presents scarce dynamism. As many other deprived rural regions of southern Europe, there's no relevant industrial activity, only some firms dedicated to forest and extensive farming products transformation and mainly around the capital city, where tertiary sector is overrepresented, because of the importance of bureaucratic functions.

La Mancha Plateau presents slightly better demographic and economic conditions. The town of Albacete, the provincial capital, is reaching 150.000 habitants and Almansa is over 23.000. They have benefited from their intermediate position in the Madrid-Valencia-Alicante communication corridor, experiencing a recent process of industrialization, based on traditional metal industry; but most of the rural areas of the province are still losing population and present a strong economic dependence from subsidized extensive agriculture.

The situation of the western mountainous areas of Valencia province (Caroig Massif) is similar to those in Cuenca. In both areas several Leader projects are developing to improve their social and economical status. However, high Magro basin, crossed by the Valencia-Madrid highway, is experiencing similar growing processes as those related for Albacete case.

On the contrary, River Xúquer floodplain is part of the industrial and urban area of Valencia. A well structured urban system has constituted around Alzira (40.000 hab.), Carcaixent (20.000 hab.), Algemés (25.000 hab.), Sueca (24.000 hab.) and Cullera (20.000 hab.), based on an endogenous process of industrialization and commerce development, partially stimulated by the location of the Ford factory 30 years ago and by their position in the Mediterranean development axis. Historical presence of irrigation appears to be another factor that has boosted economy of La Ribera, although today only represent 3% of total gross added value of the region. Most of the agricultural actives are part-time farmers, whose main occupation is not linked to agriculture, and there's an important proportion older than 60 years.

3.1.4. Water resources and infrastructures

The *Confederación Hidrográfica* estimates a mean annual runoff about 80 mm, which represents approximately 15% of yearly rainfall in the hydraulic district. Thus, the mean renewable resources of Júcar District are 3.251hm³/year, according to 1940-2003 data; nevertheless, this value has decreased to 2.700hm³/year if we consider the last ten years period. Numbers from Acequia Real del Júcar gauges confirm this trend: a mean of 745 hm³ were registered during the period 1964-1980, whereas the years 1992-2002 present an average of 245 hm³.

Interpretation of this phenomenon differs depending on the source used. Whilst Estrela (2003) defends that most of this fall is due to climatic fluctuations –a dry period 1980-2000, after a wet one 1960-1980–, authors such as Estevan (2002) put the accent on human actions: recent development of irrigation in La Mancha as the principal cause of resources decreasing in Júcar River. Both factors seem to act synergically.

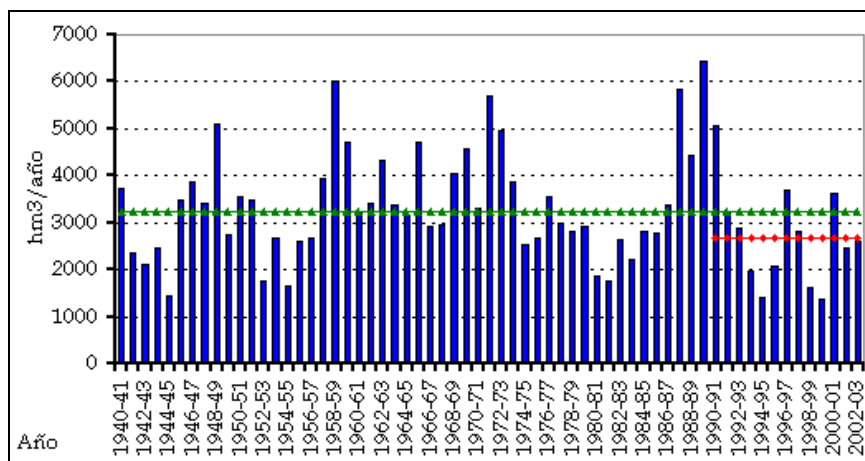


Figure 8. Basin available resources 1940-2003

During the 20th century, great investment effort was done to increase storage capacity up to 2.732 hm³ in the whole basin. Initially, investments were done mainly to increase resources regulation, with works such as Alarcón (1955), Contreras (1975), Forata (1969) or first Tous dam. After 1982 flood, which destroyed old Tous reservoir and devastated great part of the Ribera del Xúquer, several dams were build to reduce risks, such us new Tous reservoir (1996), Escalona (1995) or Bellús (1995). At

the same time, after 1983, an important power complex –hydraulic and nuclear-- has been developed in the Muela de Cortes area (Caroig Massif), with the recent addition of La Muela, El Naranjero and Cortes II dams to the reservoir of Embarcaderos (1952) and the old Cortes dam (replaced).

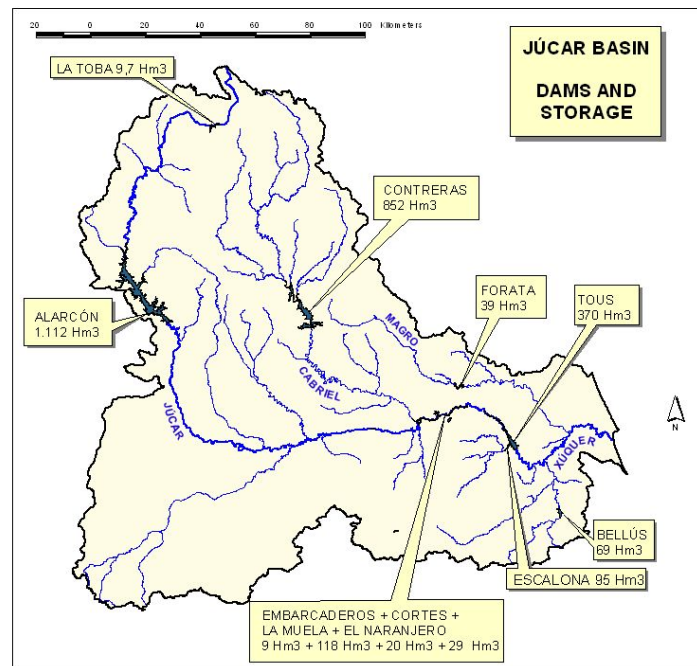


Figure 9. Main basin dams.

Although most of the hydraulic works were executed by the central government, private initiative has played a prominent role in this process. In fact, Alarcón dam –the biggest reservoir in this basin-, was financed by traditional irrigators of low Júcar.

The importance of Alarcón dam goes beyond Júcar basin: it is the key element of water management in southeastern Spain, due to the fact that the reservoir is used to regulate the Tajo-Segura transfer project. Thus, Alarcón reservoir connects three water districts (Tajo-Segura-Júcar), just on the eye of the hurricane of Spanish water politics.

Júcar basin groundwater has been used since the Islamic period to supplement surface resources. Most of the groundwater bodies' present carbonated nature, except those (detritic) placed on the coastal floodplain. Western ones are multilayer or mixed aquifers, whereas the eastern ones use to be unconfined. Many of them are strongly dependent from aquatic ecosystems, which limit water abstractions. Diffuse pollution affects aquifers situated underneath intensive agriculture areas, such as Valencian floodplain, where nitrates proportion exceeds prescribed limits for human use.

Despite their low use in the traditional irrigation systems of La Ribera, groundwater represents the 73% of the total water resources of Júcar River District (2.361 Hm³/year). In fact, although groundwater is scarcely used in USUJ area, conjunctive use is quite common to adjacent systems of low Júcar. Moreover, irrigation of La Mancha is only based on groundwater, which has lead to the overexploitation of the hydrogeological unit of La Mancha Oriental (29 in figure 3.11). This is not the only aquifer affected by pressure on resources, 31 and 33 hydrogeological units also use to present abstractions that exceed recharge, whereas in 23, 34 and 36 abstraction and recharge are very close.

3.1.5. Water demands and uses

According to the estimations of the *Plan Hidrológico del Júcar*, yearly consumptive uses in Júcar basin reach 1.403 hm³ (see figure 3.12), including the 60 hm³ which are reserved to maintain an ecologic flow downstream Alarcón dam.

Urban uses in the basin have been increasing during last decades due to demographic growing and economic development. Most of the urban supply systems of Júcar basin are provided by groundwater, but three large urban areas receive surface water from Júcar, consuming the 15% of total basin resources. Only one of these areas, Albacete, to which 31 hm³/year have been allocated, is physically inside de basin. Outside the basin, Valencia urban area and Sagunt receive water from the river through the Xúquer-Túria Canal, which provide 189 hm³/year to Valencia and its metropolitan area (where traditional groundwater supply of many villages have been replaced due to nitrates pollution), which are used to supplement Túria resources. Meanwhile, Sagunt receives 31 hm³/year, since Palancia river hasn't got enough resources and groundwater presents problems of nitrates and marine intrusion.

Table 1. Demands allocated by the Plan Hidrológico del Júcar

Subsystems	Demand (Hm ³)	Return (%)
Urb. Sup. Valencia	189	
Urb. Supply Sagunt	31	
Urb. Supply Albacete	31	
Irrig. Acequia Real	300	23
Irrig. Fscalona-Carcaixent	54	48
Irrig. Ribera Baixa	279	
Irrig. Canal Júcar-Turia	125	
Irrig. High Júcar	8	
Irrig. High Cabriel	6	
Abstracc. Aquif. Mancha Or.	185	
Consolidation Irrig. La Mancha		105
Substitution Pumping Albacete		80
Nuclear P.S. Cofrentes	35	42
Ecologic Flow (From Alarcón)	60	50
L'Albufera (Eco. Flow)	100	
TOTAL	1.403	

Some industrial uses are not considered in these amounts because, although most part of factories is connected to urban networks, many of them manage their own well to exploit groundwater. However, 35 hm³ are reserved for the nuclear power station of Cofrentes (1.025 MW), which return 42% of theses resources to the river, in the silted dam of Embarcaderos, where Júcar and Cabriel converge. This dam is the first one of the Júcar River power complex, devoted to electrical production with a non-consumptive use of water. Managed by the firm Iberdrola, these power plants of Cortes and La Muela, provide a power of 910 MW which will be increased up to 1.540 MW in the following years.

Thus, irrigation is main destination of Júcar River resources, almost the 80% of them. Demands in the high lands of Júcar and Cabriel, La Serranía de Cuenca, are very low. There are only small riverside *vegas*, without winter consumption and with a total uses of 14 hm³/year (see figures 3.12 and 3.13). However, recent development of irrigation of La Mancha Oriental, initially using only groundwater, has increased the demands on the western part of the basin. Today, the fields of La Mancha Plateau, where 90.000 has are irrigated, require 185 hm³/year. Some of these water (105 hm³) comes from the aquifer, whereas part of them (80 hm³/year) are pumped from the river to restore groundwater levels, seriously damaged by overexploitation.

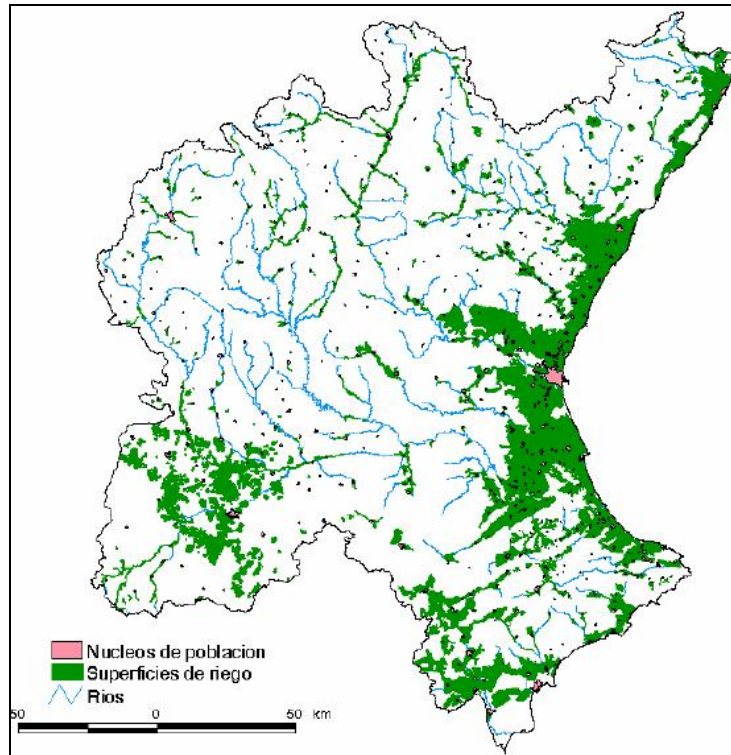


Figure 10. Irrigated areas in Júcar Basin District

The biggest proportion of irrigated lands of Júcar Basin are placed downstream Tous. The Acequia Real del Júcar, the Escalona and Carcaixent canals, Sueca, Quatre Pobles and Cullera in the Ribera Baixa, and the Xúquer-Túria canal own allocations that add up to 758 Hm³/year, to water vegetables, citrics and rice fields. Transformation projects to dripping irrigation are being developed in this area to reduce consumption and to release resources to provide water for the Júcar-Vinalopó Transfer Project, devoted to reduce water deficit in Alicante Province.

Finally, 100 hm³ were allocated to guarantee l'Albufera Natural Park wetland conservation, supplementing irrigation runoff that arrives to the wetland. This resources drained to the coastal freshwater lagoon have been decreasing considerably during the last three decades, limiting ecosystem recovery. The arrival of pollutants from industrial and urban areas that surround the wetland, through irrigation and drainage canals –due to the lack of sewer networks and sewage treatment–, caused the eutrophization of the lagoon during the 70', reducing biodiversity and landscape degradation. In the 90', the improvement on wastewater treatment reduced the entrance of pollutants and increased water quality and environmental conservation, but recently, fall of

resources provided by irrigation is again generating crisis of anoxia and hinders macrophytes recovery (figure 3.14).

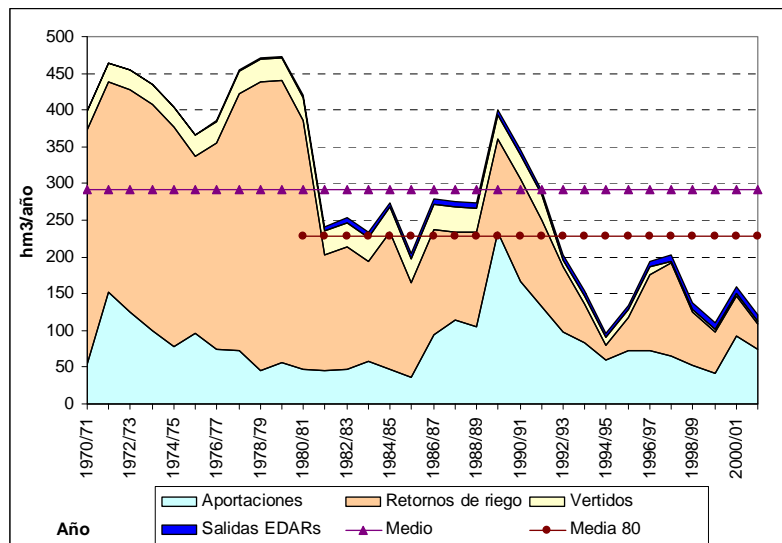


Chart 1. Water inputs of the Albufera (1970-2000)

3.2. THE HISTORICAL COMMUNITIES OF JÚCAR RIVER: USUJ

The case study area of Júcar Basin is focused in the irrigation societies of the Ribera del Xúquer that make up the *Unidad Sindical de Usuarios del Júcar*¹⁵ (USUJ). The constitution of this institution is closely linked to the construction of the Alarcón reservoir, halfway through the 20th century, despite the fact that during a large part of the 19th century a Central Union of Júcar Irrigation Developments existed, made up of the bodies now belonging to USUJ and dedicated to reducing interregional conflict in La Ribera del Júcar and to defend the group's interests versus new users. This institution proved to be rather ineffective and was dissolved at the end of the 1800s.

A large part of this conflict had its origins in the excessive pressure on the available resources at the end of the 19th century. The regulation of the basin became, according to irrigation users, a pressing necessity and in 1903 their pressure led to the approval of the Royal Order of October 7th, 1903, by means of which the construction of the Alarcón Reservoir on the river Júcar was determined to be an emergency work, having previously been excluded from the 1902 Hydraulic Works Plan.

After the Civil War, the irrigation users mobilised themselves again to try and achieve the implementation of the work that had already been authorised by a law of August 30th, 1932 and included in the National Hydrological Plan of 1933, and which the new régime had authorised again in 1940. With this purpose, and after various meetings between the agricultural and industrial users of the river Júcar, an agreement was reached that offered a combined package of economic assistance for the construction of the Alarcón Reservoir.

¹⁵Union of Júcar Users

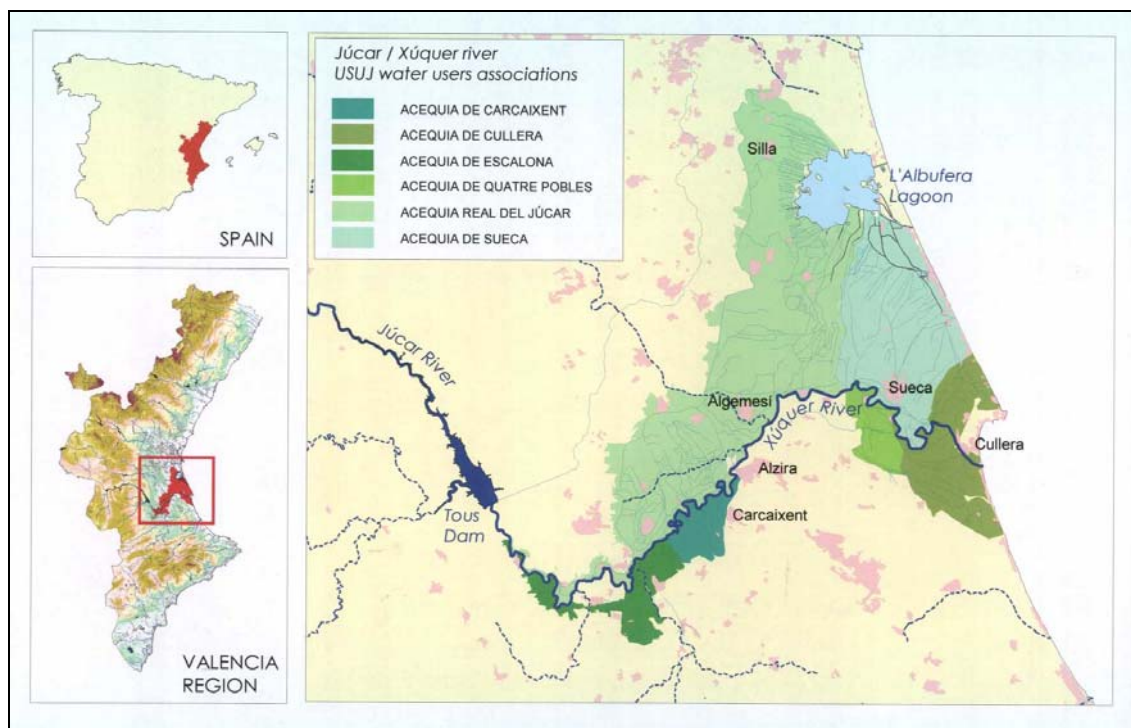


Figure 11. Area Watered by USUJ

Indeed, on the 19th of February, 1941, the Royal Canal of Escalona, the Royal Canal of Carcagente and the Royal Canal of The Júcar presented a statement, addressed to the Secretary of Public Works, offering to “assist the government with the economic expenses for the construction of the Alarcón Reservoir [...] with 50% of the total amount of the cost of the works” and maintaining that the industrial users of the section of the affected river promised “to cooperate in the cost of the works with the other 50% of the total amount.”

The government's response was positive and the payment commitment was formalised in the following manner: Payment of 20% of the amount during the execution of the works and of the 80% remaining in 25 annuities, with the interest set out in the legal provisions. As a result the non-profit organisation “*Unidad Sindical de Usuarios del Júcar*” (USUJ) was constituted on the 11th February, 1942 to carry out “all or part of the construction works for the Alarcón Reservoir and others on the Júcar river.”

Initially the *comunidades de regantes* of La Ribera Baixa didn't join in the financing, but the government required their membership in USUJ and this organisation was incorporated into the participation in ARJ, paying this community a symbolic quantity of money. In 1993 this ambiguity was resolved by means of the signature of a document setting down the participation of each community in the construction of the reservoir. This percentage – shown in Table 5.1 – represents 50% of the total contribution to the works, since the remainder is nowadays assumed by the hydroelectric company Iberdrola.

Nevertheless, for the normal operation of USUJ – everything that isn't strictly related to the reservoir property – the participation of the irrigation users is proportional to their irrigated surface area. However all decisions taken in the USUJ are made by consensus; a vote has never been required.

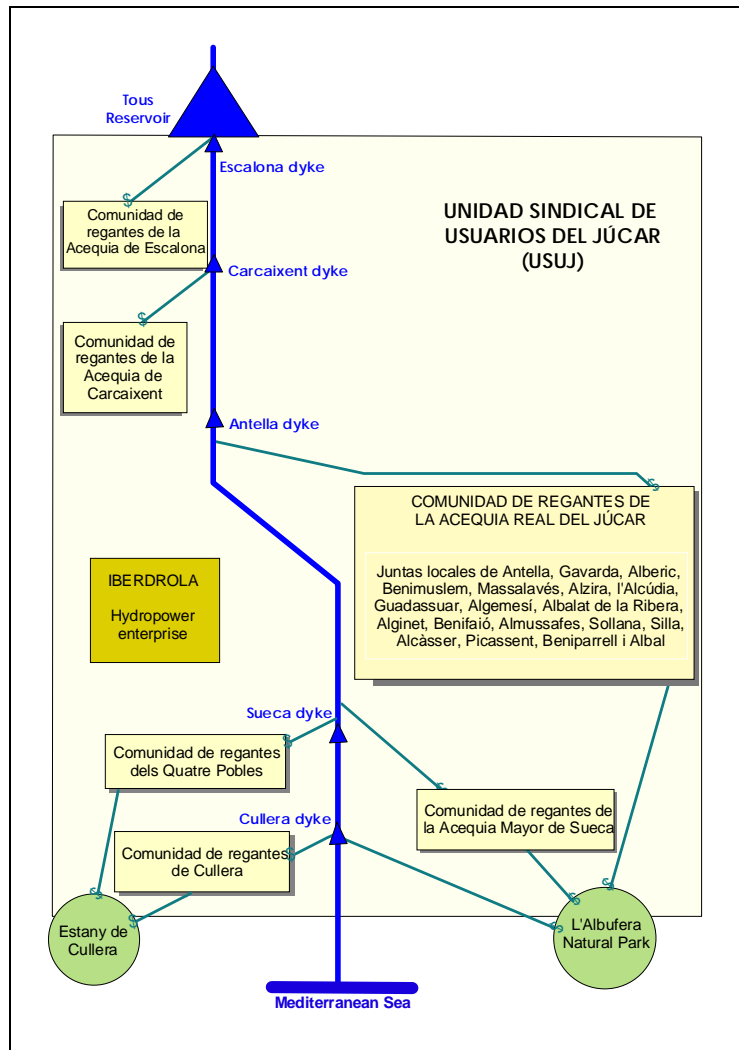


Figure 12. Outline of the Entities which make up the USUJ

Table 2. Percentage of Participation of each Comunidad de Regantes in the 50% Contribution to the Financing of the Reservoir

Comunidad de regantes	Participación %
Quatre Pobles	0'185639125
CR de Cullera	0'631321425
CR de Sueca	1'210879075
Reial Séquia de Carcaixent	2'75
Reial Séquia d'Escalona	4'5
Séquia Reial del Xúquer	90'72216038

Table 3. Representation Percentage of the Comunidades de Regantes in the USUJ

Comunidad de regantes	Participación %
Quatre Pobles	3'22
Ciudad de Cullera	11'21
Ciudad de Sueca	20'59
Real Acequia de Carcaixent	4'56
Reial Séquia d'Escalona	6'74
Séquia Reial del Xúquer	53,68

3.2.1. The Comunidad de Regantes de la Acequia Real del Júcar

a) Irrigated Surface Area and Agricultural Operations

The construction of the Royal Canal of the Júcar began in 1258, immediately after the Christian conquest. In the 18th century, the Royal Canal was extended to the Huerta de Valencia and the introduction of pumping systems during the 19th and 20th centuries extended the irrigation to the highest sectors (*alterons*) beside the canal and to the drainage of plots that were below the level of the l'Albufera lake (*tancats*)¹⁶. The total surface area with irrigation rights from canal concessions is nowadays 233,250 Valencian *banegadas*, equivalent to 19,437 hectares. This only includes the useful agricultural surface area in the following municipalities: Antella, Alzira, Gavarda Benimuslem, Alberic, Massalavés, Benimodo, Guadassuar, l'Alcúdia, Algemesí, Albalat de la Ribera, Sollana, Alginet, Benifaió, Almussafes, Picassent, Silla, Alcàsser, Beniparrell and Albal. That is to say, an area in a total of twenty municipal districts located between the river Júcar and the Turia basin (market gardens of Valencia).

New development of non-irrigated land isn't possible since the area irrigated by the *Comunidad de Regantes* is historically defined and coexists with other territories in the same municipalities that are also irrigated, with the water coming from other supply sources (Júcar-Turia Canal, ground water, water from the Turia river). The conversion of non-irrigated land to irrigation over the last fifty years, with a few exceptions that were due to shortages, has been carried out in adjacent areas and with resources different to those of the *comunidad*. There are no non-irrigated operations in the territory controlled by the *Comunidad de Regantes*.

The “*padrón*” –registry of irrigators– do not allow us to know the exact number of operations, much less their individual characteristics, as it is very common for the nominal registry of irrigators to not be modified when a change in ownership takes place. Because the right to the use of the water is bound to the land, and the objective of the registry is to supply and charge for the water, it is common for the registered title holder to not be the same as the titleholder of the operation. Water is not supplied to plots that aren't up to date with their payments, something that does not happen very often, and the effected farmer concerns himself with ordering water and paying the annual dues.

Different plots from the same operation can be in the name of different members of the same family (father, mother, wife, siblings, etc.) or in the name of individuals other than the holder of the operation such as previous owners, etc. making it very difficult to differentiate between property and operation.

¹⁶ The historical evolution of the Royal Canal has been described in chapter II.1.

The current number of holders (*regantes*) is 29,403 and the number of irrigated plots that appears in the census is 58,920. The average operation is 0.66 hectares in size, whilst the average plot size is 0.33 hectares. According to the data that currently appears in the irrigators registry, only 20 plots are larger than 100 *hanegadas* (8.3 hectares), with the median size of plots being around 2.5 hg (0.21 hectares). Most members have a main occupation that is not related to agriculture.

The dominant agricultural use is citriculture, with 11.650 hectares with a great diversity of varieties of oranges and mandarins, particularly predominant in the first section of the canal (Ribera Alta). But the rice is the only production around the Albufera lake, encompassing 3.893 hectares of old marshes. In the second section of the canal there's also an important surface of horticultural crops (2.442 hectares), with intensive use --between two and three crops per year-- and a great diversity of species and varieties of strawberries, melons, cucumbers, green beans, lettuces, escarole, tomatoes, onions, potatoes, eggplants, and almost a hundred species and varieties in total. Finally, there's also 1.484 hectares with fruit trees; mainly peaches, pears, apples, apricots and plums.

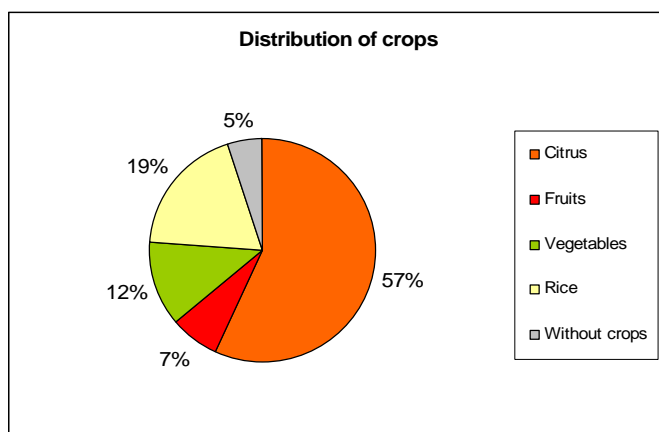


Chart 2. Distribution of crops

Lastly, a decrease has been observed in the surface area dedicated to horticultural crops due to the high labour costs associated with them. These crops are mainly being converted to fruit crops such as peaches and more recently, persimmons.

b) Organisation

The *Comunidad de Regantes* of the Júcar Royal Canal has a Board of Governors that has five full members and five alternate members. In reality the ten members take the same role and meet once a month to make decisions regarding the administration of the Royal Canal.

The operation of this *Comunidad de Regantes* is similar to that of a *Junta Central de usuarios* that includes *Comunidades de Regantes* which operate independently, but with some differences since in this case the concession is held by the Royal Canal and not the local Councils.

Each local council has its own users council and management council that takes the decisions about the organisation and handling of water in each area. As such, there isn't a users council in the Royal Channel in which all of the partners of the entity are represented. Once a year all of the representatives of the local councils meet in the central headquarters in a general meeting that has 30 representatives, from which the ten members of the Board of Governors are chosen. Each one of the local councils also has its own Irrigation Jury: there is no Jury for the Royal Canal.

The Royal Canal of the Júcar is represented in the governing organs of the *Confederación Hidrográfica* of the Júcar with a representative in the Board of Governors, a representative in the Reservoir Committee, four in the Operations Council and four in the Users Assembly.

c) Water Resources

The concessions for the Royal Canal of the Júcar have their origin in royal privileges to the city of Alzira in the 13th century and successive extensions up until the last century. In the years immediately after the civil war it participated as a shareholder in the Union of Júcar Users in the construction of the Alarcón reservoir, making it therefore a co-owner and user of its regulated water. The current concession is for 35,155 m³/second of water from the Júcar and from water regulated in the Alarcón reservoir.

In Table 1, the monthly consumption from the Royal Canal of the Júcar is shown for irrigation seasons since 1996. In Chart 1, annual consumption is shown for the same period as well as the Hydrological Plan's allotment for the Júcar Basin and the actual gross consumption of the *Comunidad de Regantes*.

In the years prior to the Basin Plan, consumption was much higher, having reached 800hm³ annually in the 1970s. A decrease in allotments took place from 1998, which has meant that in the most recent irrigation seasons, irrigators have had to resort to the use of water from subterranean origins. According to the irrigators this is due to the continuous pressure from new demands for water from farmers in the Manchegan autonomous region; the basin organism is favouring the irrigators of these Communities allowing withdrawals from the Manchegan aquifers, which is translated into a decrease in the volumes available in the Alarcón reservoir.

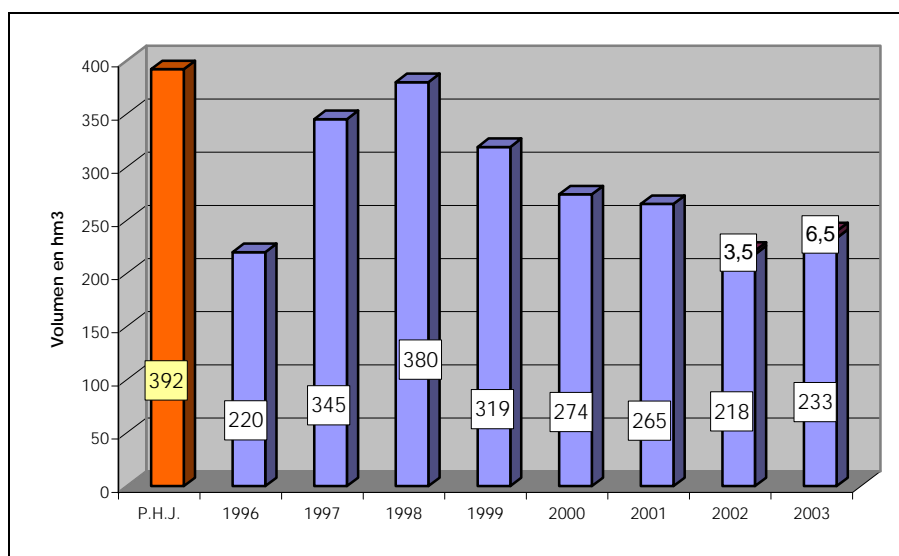


Chart 3. Júcar Hydrological Plan Allotment and Actual Consumption of the Royal Canal of the Júcar since 1996 (Hm³)

Those responsible for the Royal Canal fear that the modernisation of the Community's facilities will be translated into new pressures to reduce the volumes currently provided. So far, this hasn't had much repercussion for the irrigators, who haven't had to decrease their plot irrigation amounts,

although some local Councils have begun to extend their shifts to thirty or thirty five days. However the last years have not been particularly dry so the effect that these reductions in allotments could have in the case of drought is not yet known.

d) Irrigation Infrastructures

The *Comunidad de Regantes'* regulation takes place in the river Júcar via the Alarcón reservoir and with the management of the canal with sluices to obtain a quota sufficient to irrigate the different areas. The nocturnal irrigation surpluses are returned to the Magro river or to rice fields and Albufera, depending on the section.

There are practically no other forms of collective or individual regulation used by the farmers. The entire principal network and most of the secondary network is made of concrete. The infrastructure is being progressively improved by both the General Council and the Local Councils.

The new installations that have been carried out within the framework of the modernisation plan that is the objective of the *Comunidad de Regantes* are beginning to be used in the present season. This will allow for better irrigation management since the work on the main pipeline has already been completed. Of these works, the Royal Canal has only had to pay for the expenses caused by the projects, which has amounted to 2.4 million euros. The remainder of the expenses have been assumed by the Ministry of Agriculture.

e) Water Management

For the use of irrigation, shifts are established for the different outlets for each local Council, which in turn establishes shifts for each of its different branches. In times of rice field irrigation, from April to August, citrus and vegetables are watered during the day and the rice field is watered at night.

The system is based on meeting irrigation demand within shifts. Irrigation shifts are established and the farmer who wants to irrigate in each shift applies for it. The local Council irrigator meets demand and irrigates the plot himself and as he sees fit. If the farmer misses his shift, he is not able to irrigate until his next turn. The number of irrigation turns is only limited by the number of shifts themselves.

In recent years, the requirement for irrigators to make payments under the general Social Security framework has led to important changes in the management of the administration of water. This has meant that when a farmer wants to irrigate, he goes to the Local Council and pays for the irrigation in advance; the Local Council gives a turn to the farmer, with the direct relationship between the farmer and the irrigator having disappeared. There are some small Local Councils that have still not fulfilled this obligation, but they are in the process of doing so.

The irrigation of rice fields is collective: the preparation of the plots is carried out by each farmer and the filling up in April, “*eixugó*” in summer, and drainage at the end of summer is carried out by the local Council.

There is blanket irrigation in the entire irrigated area. The preparation of the fields by the farmers is very irregular, with the preparation of land for the irrigation of vegetables being much much more frequent than that of citrus.

The *Comunidad de Regantes* doesn't measure the consumption of water; it only measures the water that is taken from the river by the use of a flow meter that registers the incoming hydrogram in the main canal intake. The water that is not used, from the intake as far as the crossing with the Magro river, is returned to the river for the use of the downstream canals of the Júcar. The surplus water below the crossing with the Magro river flows into rice fields and the Albufera. There is no measurement of the water consumed by the irrigators. The water is provided by the irrigator until, in accordance with his experience, it is watered, without any objective measuring thereof.

There are no exact allocations by crop type. The farmers have the right to irrigate when they consider to it convenient to do so within the corresponding shift. In accordance with irrigation practices it is considered that, under normal climatological conditions, between 8 and 10 irrigation sessions per year should be completed for citric fruits. For vegetables; keeping in mind that two or three crops are planted each year, between 18 and 22 irrigation sessions per year are carried out.

The allotment for each irrigation session is very variable depending upon the nature of the soil, but an irrigation of 70mm is considered to be a normal allocation, which would give us an annual consumption in a plot of land of 6,300 m³/Ha for citrus and 14,000 m³/Ha for vegetables (multiplied by 2.4 harvests).

f) Tariffs and Prices

The *Comunidad de regantes* doesn't pay any regulation levy or irrigation levy to the *Confederación Hidrográfica* of the Júcar. Each year it pays the Government the repayment of the funds advanced for the construction of the Alarcón reservoir.

As far as the regulation levies are concerned, the *Comunidad de Regantes* only benefits from the regulation of the Alarcón reservoir built in the 1940s and 1950s for the agricultural and hydroelectric users of the Júcar, for which they contribute the complete cost of expropriations and works. The government granted the Union of Júcar Users a loan of 80% of the total cost, which they repay in corresponding annuities. Because the ownership of the reservoir has not yet been transferred to the users, the *Confederación Hidrográfica* of the Júcar incurs its operating expenses and charges an annual levy to cover the costs. The *Comunidad de Regantes* and other users of the Júcar however consider that the reservoir should have been transferred to them - in accordance with the Supreme Tribunal sentence for the case brought by them - and in consequence they believe that they are not required to pay the operating expenses. This situation is being decided in the tribunals.

The *Comunidad de Regantes* recharges its irrigators an annual fee (*cequiaje*) per *hanegada* that includes the share of the entity's general expenses. This fee is 6.16 euros per *hanegada*, regardless of water consumption, and includes the expenses corresponding to the payment for the Alarcón reservoir as well as other investment expenses.

The Local Councils that administer the secondary, tertiary networks, etc., also set a fee for their job of operating and managing these networks, resulting in differences in what farmers in different areas pay, justified by the larger costs associated with different territorial characteristics of their plots, different administration and the technical characteristics and condition of the local infrastructure.

According to the information provided by the *Comunidad de Regantes* of all the Local Councils, some Local Councils do not pay anything at all for *cequiaje* and the maximum is 13.5 euros per *hanegada*. The average *cequiajes* paid to the Local Councils is 4.44 euros per *hanegada*.

On the other hand, there are areas (2,962.7 Hectares) that by being at higher levels than the water network require engines for the elevation of water - small elevations - with a resulting increase in the cost of delivering water to the plots, which is reflected in additional and different fees for engine operation in each of the serviced areas.

The average cost paid to the *Comunidad de Regantes* of the Júcar and its Local Councils is 127 euros per hectare, a payment that is independent of water consumption, and with a minimum of 6.16 euros per hectare and a maximum of 19.66 euros per hectare, before taking into account the payments for the elevation of water.

At the present time the irrigator does not pay since its price is included in the payment that is made to the local council when it applies for irrigation and prior to its application. This can be considered to have meant a lowering of costs.

In the case of rice fields, certain areas of the *Comunidad de Regantes* near and draining into the Albufera, must likewise be associated to the Drainage Council of the Albufera with responsibility for discharges from the lake to the sea, as well as to other organisations called *Tancats* that are in charge of the conveyance of water in networks and surfaces very close to the lake.

3.2.2. The local councils of the Royal Canal of the Júcar: the example of the *Junta Local d'Almussafes*

As commented on earlier, the structure of the Royal Canal is similar to that of a *Junta Central de Usuarios*, since there are several organisations dedicated to managing irrigation at the municipal level: the Local Councils. The structure and functions of one of these organisations, the Almussafes Local Council, is described in this section.

a) Irrigated Area and Agricultural Operations

The Almussafes Local Council irrigated 8,729 hanegadas (727 hectares) in the year 2003. This area varies annually depending on membership cancellations that can take place for the creation of property lots, industrial zones, etc. Of this area a total of 2,639 hanegadas belongs to Ford Spain. There are other companies that also have land and which pay the Local Council fees even though they do not irrigate. In exchange the Local Council promises to keep the riverbanks inside the property of Ford clean.

In the Almussafes area there has been a remarkable decrease in the surface area watered due to there having been various phases of an industrial park under construction within the irrigated area. It is calculated that the two phases of the park have decreased the surface area by 1,500 hanegadas and there is a third phase planned due to which further reductions in the watered surface area are expected.

They are 1,366 members that are partners in the entity (including Ford and other companies) and entry to it is by means of the purchase or inheritance of lands that have right to the use of water. The number of members can vary slightly depending on the grouping together or separation of titles.

The entity has a registry, but updates to it are voluntary. That is to say, when the sale or inheritance of land takes place, the new owner usually goes to the entity with their deed of purchase to carry out the change of title, but this doesn't always happen.

According to the registry facilitated by the Local Council, without taking into account the area held by Ford Spain, the average is about 3.1 hanegadas per plot and 5.83 hanegadas per irrigator. Each irrigator has an average 1.76 plots, with the median being 2.25 hanegadas per plot. The biggest plot has 135 hanegadas and the smallest has 0.25. A total of 897 reside in Almussafes, 662 in Benifaió, 122 in Valencia and the rest in other municipalities.

The crops in this area are fruit trees, citrus and vegetables. There is a long tradition of vegetable cultivation. The farmers are organised in cooperatives that plan crops in such a way as that the farmers make several annual harvests that are usually profitable. This production is primarily oriented towards export.

b) Organisation

The articles of association of each Local Council are those of the Royal Canal of the Júcar. The entity's representative and government bodies are the General Council, the Management Council and the Irrigation Jury.

The General Council meets annually in the first week of December. All community members are included in this body. The positions that represent it are elected every four years.

The Management Council is formed by eleven members, of which four are local members, three are external members (no alternates) and four are alternate members. The eleven meet once a month to take decisions on the management of the Local Council. The president is elected every four years and besides the Management Council also presides over the Irrigation Jury.

The Irrigation Jury is formed by four regular members and four alternate members. It meets when charges are made, although in some years there are none. In times when there are no shortages, there are no conflicts. Since the current secretariat has been in charge (7-8 years) there have only been two charges, which were resolved with the minimum penalty.

Before the change of the articles of association, the penalties were so small (for example 25 pesetas to break a lock) that if a community member committed an infraction the jury didn't have sanctionary force. After the modification, the increase in penalties makes committing an infraction more serious.

Each Local Council has deputies that represent the municipality in the Royal Canal. At the moment in Almussafes, one Deputy is a member of the Management Council.

The Almussafes Local Council is an entity showing a clear downward trend in the irrigated area due to it being an area of industrial expansion. This means that at the current time there aren't problems for the use of water although there has been an increase in irrigation costs since there are less and less community members, with the same canals, increasing industrial discharges and there is a consequent increase in maintenance expenses. The industries pour their discharges into the municipal reception system (not into the canals), but this ends up in the Local Council's canals. There is an attempt to reach an agreement with the City Council such that they take responsibility for the maintenance and cleaning, or that a levy be charged for discharges (the City Council would be responsible for contact with industry).

On the other hand another conflict exists with the Royal Canal of the Júcar; a problem that is common to other Local Councils. According to the regulations, any asset or investment that the

local entity makes is to be registered in the name of the Royal Canal, so that if this asset is sold the returns would revert to the *Comunidad de Regantes*. However the payment for the investment is made by the farmers of the town. This leads to some reticence in making investments.

This also occurs when a town is urbanised when it had previously been used for agriculture. The canals are in the name of the Royal Canal of the Júcar and therefore the compensation that the city council gives for the expropriation of these canals goes to the Royal Canal of the Júcar. The community members of the Local Council say that those canals were made because at a certain point in time a farmer from the town gave up his land, and that it is not fair that the compensation is to the *Comunidad de Regantes*. Until recently, no compensation was requested from the City Council; just recently the Royal Canal of the Júcar organisation itself has started to request compensation.

As mentioned, Ford Spain is recorded in the registry as a community member and pays the quota due to the Local Council annually even though it does not irrigate. Currently a verbal pact exists with the management of the company such that they do not cede its proxy vote to any community member, since they have a large weighting due to the large surface area that they have been assigned.

The relationship between the Local Council and the Almussafes City Council is acceptable, although at the moment they have a minor disagreement. The City Council has urbanised an area of the town that had been used for agriculture previously. The Royal Canal is the landlord of canals that passed through the area and the City Council notified them that it would give them a plot of land of 118 m² in compensation. This compensation was made without any valuation process being carried out (or at least notified to the Local Council). When they went to measure the land to fence it, they realised that the plot actually measured 68 m². Now they are in negotiations to receive the compensation that the City Council had awarded to them. Another current negotiation with the City Council is regarding the already mentioned payment for the cleaning of the canals of industrial discharges.

c) Water Resources

Surface resources come from the Royal Canal. There is a former drinking water well that can be used if necessary. A verbal agreement exists between the Local Council and the City Council that facilitates the use of the well water for irrigation in the case that this is necessary. Neither the *Confederación* nor the *Generalitat* own wells.

d) Infrastructure and Employees

The entity has a Social Centre which, though paid for by the Local Council, is in the name of the *Comunidad de Regantes*. The people who work for the entity are a secretary, who carries out all the administrative tasks, and an inspector who is in charge of the organisation of shifts and of the relationship with the chief inspector (*Sequier Major*) of the Royal Canal. To save costs in this Local Council, he also carries out irrigation works whenever he can coordinate this with his own role as inspector. There are also three irrigators who also carry out the cleaning and maintenance work.

The maintenance work is carried out by the entity's own workers and, if necessary, the machinery of the Local Council of Sollana is requested. If this is not available a digger is rented.

The canals are made of earth and some are constructed, with most considered to be in a good state. The constructed canals were made by the City Council. When the City Council extends roads, it also constructs the adjacent canals: this is done without the Local Council even being notified.

e) Tariffs and Prices

The amounts that member irrigators of the Local Council of Almussafes currently pay are as follows:

- Royal Canal Fee which is the same for all community members.
- Local Council Fee. This quantity is approved by the General Council and in the year 2003 amounted to 10 euros per hanegada.

The community members don't pay any amount for irrigation, so it works out that they all pay the same quantity per surface area no matter how much they irrigate. Although they consider this system to not be very fair, the area's farmers prefer it because in this way they avoid having to go to the Local Council headquarters to pay every time they wish to irrigate, as the notification to the irrigator is currently made by telephone. The annual fee covers all of the entity's expenses.

Although the requirement of having the irrigators on their payroll has meant an increase in labour costs for the Local Council, for the farmers this system is more profitable, since although the annual fee is larger than what they paid before, they save on the payments to the irrigators.

On the other hand, there is an area in the municipality that requires elevation: the owners meet and pay the electricity and organise themselves independently of the Local Council. Approximately 10% of fixed fees are also unpaid, being from owners that are difficult to locate due to not appearing in the registry.

3.2.3. The *Comunidad de Regantes de la Ciudad de Sueca*

The irrigation of the municipal district of Sueca has its origin in the collection of ground water carried out during the period of Islamic rule. From the Muslim occupation on, and up until the 15th century, the sourcing of water from the Júcar river was forbidden, because the city of Alzira, which controlled all of the Ribera's water, imposed its right to keep the course way down the Júcar navigable, impeding the construction of flow-sourced waterwheels for irrigation. Therefore, it was the closeness to the water table that allowed the creation of diverse irrigation microsystems associated with the farms – units of settlement characteristic of the Islamic colonisation.

At the end of the 15th century, and after several attempts and disagreements with the city of Alzira, Sueca received a royal license to open a derivative canal from the Júcar – the Mayor Canal – a few years after Cullera had obtained the same privilege. The Mayor Canal allowed the integration and control of the old irrigation microsystems, creating an expansive area of horticulture around Sueca, where the population began to centre as the the old farmsteads were abandoned. Most of the land in the district remained dry, and only the areas bordering l'Albufera were devoted to the cultivation of rice.

By the middle of the 17th century, a privilege granted by the crown to the Military Order of Montesa –owner of Sueca– allowed the beginning of settlement on the l'Albufera lands, which had been protected until then by the Royal Patrimony. An expansive phase in the cultivation of rice began then that would extend to most of the district, towards l'Albufera and on the non-irrigated lands that remained between here and the horticultural area of Sueca. This expansion accelerated in the 13th century, taking advantage of a favourable socio-economic climate, as shown by the construction of the Múzquiz and Campanar canals that allowed the extension of irrigation to sectors that were not topographically controlled by the Mayor Canal. By the 19th century the introduction of pumping

systems – initially waterwheels and later by means of steam engines – enabled the creation of the *tancats* – rice fields below the water level of l'Albufera – and the transformation of the vineyards and olive groves next to the river into vegetable gardens – the sections of Vilella and la Raconada.

During most of this period, irrigation management was the responsibility of the municipality, whose Water Council administered the operation of the system as well as the municipal water supply. The creation of the *comunidad de regantes*, as an entity detached from the municipality, didn't take place until the beginning of the 20th century.

a) Irrigated Area and Agricultural Operations

Nowadays in the municipal district of Sueca there are 8,265 hectares of irrigation, of which only two properties (La Closa and Cardona) don't belong to the *comunidad de regantes* as they have their own ground water concession.

Irrigation in the town of Sueca is very much effected by the existence of the Nature Park of l'Albufera. This has caused the impact of urbanisation to have been very small due to the ban on building, although some legal constructions do exist. There has not been an impact on the rice fields, but in the market garden area it is calculated that some 400-500 hg of citrus have disappeared for this reason.

The *comunidad de regantes* has 5,500 members. Entry to the society is allowed by means of the purchase or inheritance of land. The registry is updated every year, but there are farmers who inherit land and don't update the name of the person belonging to the *comunidad de regantes*, for which reason there can be some differences between the registry and the actual farmers.

The farmers that have the biggest operations are professional and make up 50% of the members of the community. In recent years a concentration of operations has been taking place, increasing the average size of the operations in the hands of the professionals that rent their lands out to the non-professionals. The average property size is 2 hectares, with the largest having 4 hectares and the smallest 0.5 hectares.

The predominant crop is rice which occupies 75% of the watered area (6,166 hectares), citrus, decreasing at the present time, makes up 22% (1,799 hectares) and the rest of the surface (300 hectares) is used for a large variety of vegetables, lettuces, onions, melons, cabbages, tomatoes, peppers, radishes, cauliflowers and new Chinese vegetables, etc. At the current time, the vegetable that is increasing in area is the artichoke. The rice field area cannot change due to its being a Nature Park – in certain areas orange plantations may be converted to rice, but never the reverse.

The citrus production yield is usually about 200 *arrobas* per *hanegada* (30,000 kg/hectare) and the rice field yield is about 600 kg/hanegada (7,200 Kg/Hectare).

b) Organisation

The General Council assumes all the powers of the *comunidad de regantes*. A Union and an Irrigation Jury are set up for its government. The Community has a President and a Secretary that is also president and secretary of the Union and of the Irrigation Jury. Serious disagreements don't usually arise between community members - the Irrigation Jury hasn't convened for many years.

The *comunidad de regantes* has 21 office and field workers. It owns its social headquarters, one warehouse, as well as three scythe boats, five excavators, one tractor, two platforms, one truck and six pumps.

The *Comunidad de Regantes* of the City of Sueca has one representative in the Council of Government of the Júcar *Confederación Hidrográfica*; one in the Reservoir Committee; two in the Operations Council and four in the Users Assembly, although this last organ has not met for many years.

The relationship with the CHJ has historically been good. At the present time there is a difference of opinion with the CHJ over the interpretation of the reserve contours of the Alarcón reservoir. The irrigators say that the hydraulic administration currently tries to favour the interests of users from Castilla la Mancha, through a new interpretation of the Alarcón agreement.

Also, the irrigators are of the opinion that the modernisation of the ARJ could have serious consequences for the Albufera if a sufficient flow isn't maintained in the river. On the other hand they are concerned about the realisation of the Júcar-Vinalopó bypass and hope that the Administration keeps its promises and that this bypass is implemented respecting the reserve contour agreed with the Júcar users. The irrigators are not prepared to receive water from the Tajo in exchange for water from the Júcar.

On the other hand, the Sueca irrigation *Comunidad de Regantes* makes up part of the DELTA-MED association (see further information below) together with other irrigating entities that brings together water users located in deltas and estuaries. The partners involved in this association are from Greece, France (Camarga), Guadalquivir, Romania, Egypt. They have in common a lack of alternative crops. By means of a project included in the programme INTERREG 3¹⁷, they seek European financing for diverse projects and the declaration of rice as a “special interest crop”.

c) Water Resources

The *Comunidad de Regantes* is entitled to the use of water from the river Júcar taken via the Mayor Canal, the Campanar Canal, the Múzquiz Canal, a small part of the flow of the Cullera Canal and the surpluses of the Albalat district that discharge to the Regatxo run-off. The administrative concession is for 174 Hm³/year.

The allocation of ground water from the Júcar for the entire Ribera Baja is distributed as per the following percentages: 58.78% for Sueca, 32.02% for Cullera and the rest for the community of Quatre Pobles.

It is necessary to highlight the unique way that water is reused in the cultivation of the rice fields. The rice is watered from the top to the bottom and in years of drought in which there is not enough water, the water that reaches the lowest part is reused using pumps to raise it again to the top part of the cultivated land. In Sueca there are three areas where water is pumped, each one of them has two pumps, that have a total capacity of 7 m³/sec. In 1995 they operated during 120 complete days, with the total quantity of pumped water being 83 Hm³. In the year 1994 there wasn't such a shortage so it was necessary to raise only half the quantity of water as in 1995. In normal years there is no recirculation. This technique is only used in years of shortage because there is a danger of causing the salinisation of water with a resulting reduction of rice field yields. In summary, the total quantity of water applied during 1995 was 142 Hm³.

¹⁷INTERREG 3 is a community initiative related to trans-European cooperation for encouraging the harmonious development of the European Union.

d) Irrigation Infrastructure

The Sueca irrigation *Comunidad de Regantes* has in recent years modernised most of its irrigation network. Some of these works have been financed completely by various institutions (MAPA, Ministry of Agriculture and MMA) and others have been co-financed with the *comunidad de regantes* contributing 60% of the total investment.

The *comunidad de regantes* has a credit facility for farmers that wish to channel their own canals. The farmers carry out the works and the *comunidad de regantes* pays them a certain amount per meter. At the present time approximately 60% of farmers' canals have been channelled.

e) Water Management

In the case of citrus and vegetables, irrigation is by shift. In summer the shift is every week and watering takes place when requested by the farmer. The Community takes charge of delivering the water to the property. The irrigator accompanies the water and the owner waters his plots. There is no maximum amount of time for the irrigation, the farmer himself is the one that decides when it should end. The irrigation of the rice fields is carried out by the irrigators of the *comunidad de regantes*. The surplus water from the citrus and vegetables goes to the rice fields in summer and into l'Albufera in winter. There is no trade of water either between irrigators or with other entities.

Citrus irrigation is by flooding and 1995 was the first year that ridges were required to be made for the application of irrigation. In the case of vegetables, the soil is furrowed and the consumption for each irrigation is somewhat less. There is hardly any drip irrigation – because the water table is very high this technique is not advisable. There are 500-600 *hanegadas* of greenhouses that use blanket irrigation – there is hardly any drip irrigation.

The total allotment in a normal year for the district of Sueca is about 160 Hm³, divided into about 8,265 irrigated hectares gives an average allotment of 19,000-20,000 m³/Ha.

- Citrus: From September 15th to May, two irrigation sessions are carried out and from then until September, six or seven more sessions (every 21 days) – in total eight to nine annual irrigation sessions are completed. The average allocation is 60 l/m², so in a year the amount of water applied comes to 5,400 m³/Ha.
- Vegetables: From May to April a weekly irrigation session is applied. From April to September, once biweekly, and for the rest of the year every three weeks. In total 24 annual irrigations are applied. With a contribution per irrigation of 60 l/m², the annual allotment comes to about 14,400 m³/Ha.

Rice fields: these are flooded at the end of April and are dry by about August 28th. We estimate 29,192 m³/Ha. (180 Hm³/6166 hectare of rice fields).

f) Tariffs and Prices

The annual payment is € 9.32 per hectare, regardless of crop type. This price includes amortised repayments, projects, fees and all other expenses that the *comunidad de regantes* may have.

The *tancats* of la Albufera, due to their special rice field irrigation method, pay extra because they need to use engines to remove water. In Sueca there are 22,300 hg (1,858 hectares) of *tancats*, that is to say 22% of the total cultivated surface area and 30% of that of rice, for which an additional € 6.60

to € 7.20 euros per hanegada (€ 72 to € 144 per hectare) is paid. Some small *tancats* can end up paying as much as € 42 per hanegada, although this is unusual.

The Drainage Council takes charge of the maintenance of floodgates and ditch cleaning in 85,000 hanegadas of eight municipal districts, of which 36,000 belong to Sueca (2,916 hectares, 47% of the surface area of the rice fields). The farmers pay € 1.20 per hanegada (€ 14.42 per hectare) to the Council.

In summary, the annual payments that the partners of the *comunidad de regantes* make for irrigation are:

Table 4. Payments for irrigation in Sueca

	€/Ha	Farmers %
Payments		
Comunidad	9,32	100%
Drainage Council	14,42	35%
Tancat	108,18	22%

4. THE UPPER GENIL BASIN AND THE CANAL CACIN

The Genil River is the largest tributary of the Guadalquivir River, whose basin is placed at the South of the Iberian Peninsula, in the region of Andalucía. The Guadalquivir, called *Betas* by the Romans and *Uadi-Kevir* (Big River) by the Arabs, is 671 kilometers in length and drains a large valley surrounded by the mountains of Sierra Morena and the Betic System, from the Sierra de Cazorla to the Atlantic Sea. After its source, it flows tightly bound to the North between the mountains of Cazorla and turn to the West to enter in the Guadalquivir tectonic depression, a triangular valley that widens and makes deeper to the West. The river meanders along this wide corridor and receive tributaries from Sierra Morena and the Betic System. Downstream Sevilla the river is navigable and in its low course feeds the wetlands of the Marismas del Guadalquivir-Doñana, whose natural values has deserved international protection.

The Guadalquivir basin is structured into three physical units: the undulating plain of the Guadalquivir Depression and the surrounding mountain ranges of Sierra Morena and the Betic System. The structure of the relief and the different influence of the Atlantic and Mediterranean water masses generate an important spatial variety of climatic regimes in the region –and also of vegetation types--, always inside Mediterranean parameters.

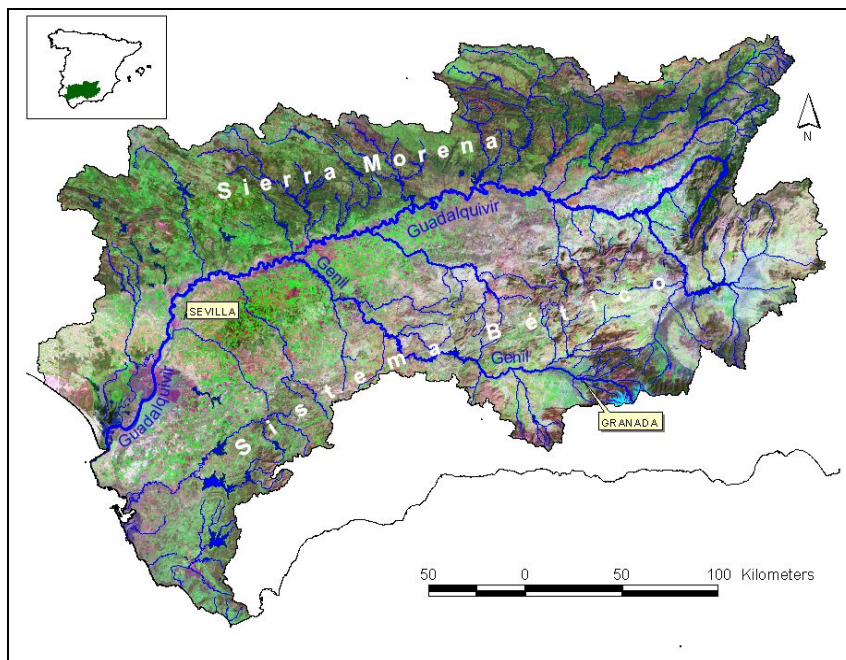


Figure 13. Territorial scope of the Guadalquivir River Basin District

The Genil River joins the Guadalquivir in its middle course. It's 338 kilometers long and drains 8.275 km² in the provinces of Granada and Córdoba. The basin is divided into two areas: the high lands of the Vega de Granada or Alto Genil, where is placed our study area of Canal del Cacán, and the Bajo Genil, in the Cordobese *Campiña* (Farmlands). The Iznájar Dam, establishes a physical and hydrological frontier between both areas. It collects all the return flows from the Vega de Granada and regulates resources for the Bajo Genil.

4.1. THE UPPER GENIL BASIN

4.1.1. The Physical Environment

The Upper Genil Depression, where is placed our local study area of Canal Cacín, is a tectonic basin placed in the Betic System. The river is the central axis of this scenery, surrounded by external (northern) Betic *sierras* of Chanzas, Parapanda or Campanario and internal Sierra Nevada and Almirajara mountain ranges. The river collects water from the western rivers of Sierra Nevada (Dílar, Darro, Beiro, Monachil), receives northern Cubillas contributions and resources from Alhama and Cacín rivers, which go down from the Sierra de Almirajara. From Granada to Láchar, Genil River has created a fertile quaternary alluvial plane where irrigation was extensively developed since the Islamic period. To the North, the contact between the mountain ranges and the alluvial plane is established by Pliocene pediments, where Cubillas tributaries (Colomera, Fraile, Bermejo) dig narrow valleys. To the South, the basin is wider and the geomorphologic sequence is more complex; beside the Almirajara mountains, Miocene deposits take up half the basin, where the Alhama River and mainly the Cacín River, have dig deep gorges. A Plio-quaternary pediment –where Cacín irrigation area is placed-- rests against these deposits and descends to the alluvial plane.

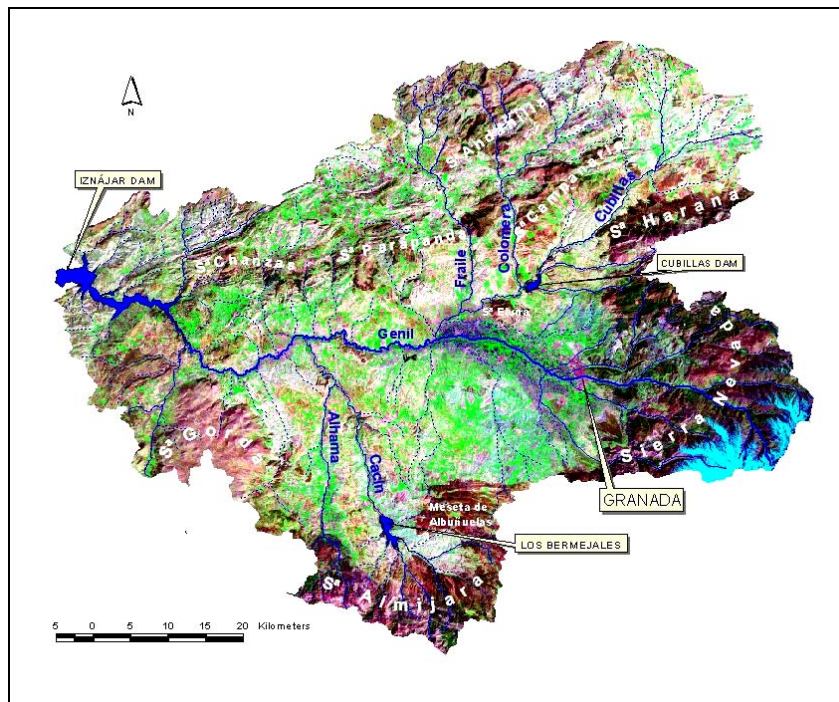


Figure 14. Upper Genil orthophotomap

Compared with other agricultural areas of the Spanish Mediterranean, the harshness of the climate represents a restrictive factor for agricultural production in the upper Genil, due to the continental nature of this intra-Andalusian basin. The existence of the mountain ranges that isolate the valley from the influence of the Atlantic and Mediterranean, as well as their average height of about 500 m, generates a climatic régime characterized by long winters and frequent frosts, but with high maximum summer temperatures, usually above the 30° mark and frequently above 40° in July and August. But overall, the main characteristic is the daily temperature range that usually exceeds 20°, hindering the development of the most sensitive agricultural crops. On the other hand, rainfall is moderate – with an average situated around 450 mm annually and a pronounced dry summer, although in the head of the sub-basin rainfall in excess of 1,000 mm per year is reached.

As a result, the Upper Genil receives important hydrological contributions (snow and rain) from the Betic reliefs surrounding it. The surface run-off is concentrated on diverse tributary beds of the Genil – the rivers Cacán and Alhama in the south west, Dílar, Monachil and Darro in the east, and Fraile, Colomera and Cubillas to the north – nowadays regulated by the reservoirs of Los Bermejales, Quéntar, Canales, Colomera and Cubillas. The alluvial silt constitutes a potent aquifer mass, with usable resources and reserves of 180 hm³/year and 1,000 hm³ respectively, and an electric conductivity that oscillates between 700 and 1,000 mhos/cm.

4.1.2. Water Resources and Infrastructures

Guadalquivir basin presents a 128 mm of yearly average run-off, a value superior to the Spanish Mediterranean basins. Guadalquivir total water resources reach 7.230 hm³, but the available volumes don't exceed 2.712 hm³/year; from which 2.296 hm³ come from surface regulation and 416 hm³ from direct groundwater exploitation. Most of the reservoirs were built during the second half of the 20th century and today the total regulation capacity is 8.758 hm³.

Genil River is the most important tributary. Basin storage capacity reaches 1.320 hm³, and most of them (981 hm³) come from Iznájar dam, downstream the Vega de Granada. The Alto Genil dams – Colomera, Cubillas, Quéntar, Canales y Los Bermejales--, which can store 249 hm³, have been essential to consolidate traditional irrigation and urban uses, and also to expand irrigation to new areas such as the Canal Cacán.

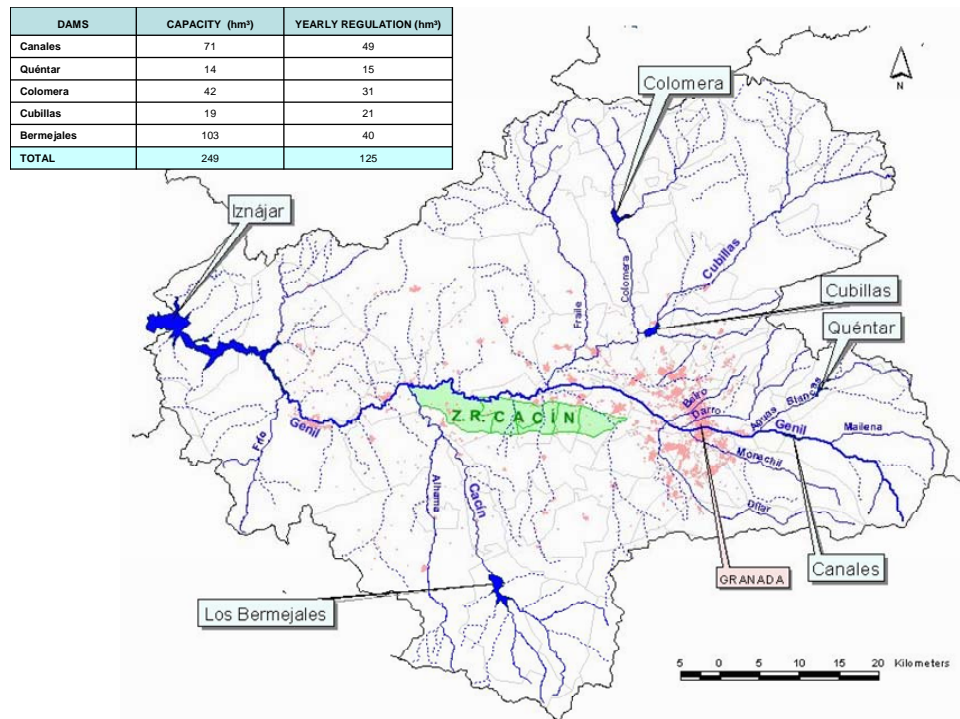


Figure 15. Upper Genil dams

The present Basin Hydrologic Plan envisages the construction of new dams to consolidate uses and continue irrigation expansion, two of them --Velillos and Darro-- will be placed in the Upper Genil area, increasing the basin storage capacity in 48 Hm³.

Guadalquivir basin groundwater reserves are still important and far from overexploitation in most of the aquifers. Only 8 of the 52 hydrogeological units present an exploitation superior to recharge, and 15 of them don't consume more than the 40% of yearly recharge. The real level of groundwater use, including the river flow proportion coming from the aquifers, reaches the 53%. For this reason, experts and authorities expect and promote a more intensive use in the future. In the Vega de Granada, the balance between uses and resources is also very positive (33%), and provide an important guarantee for future developments or to go beyond draught crisis.

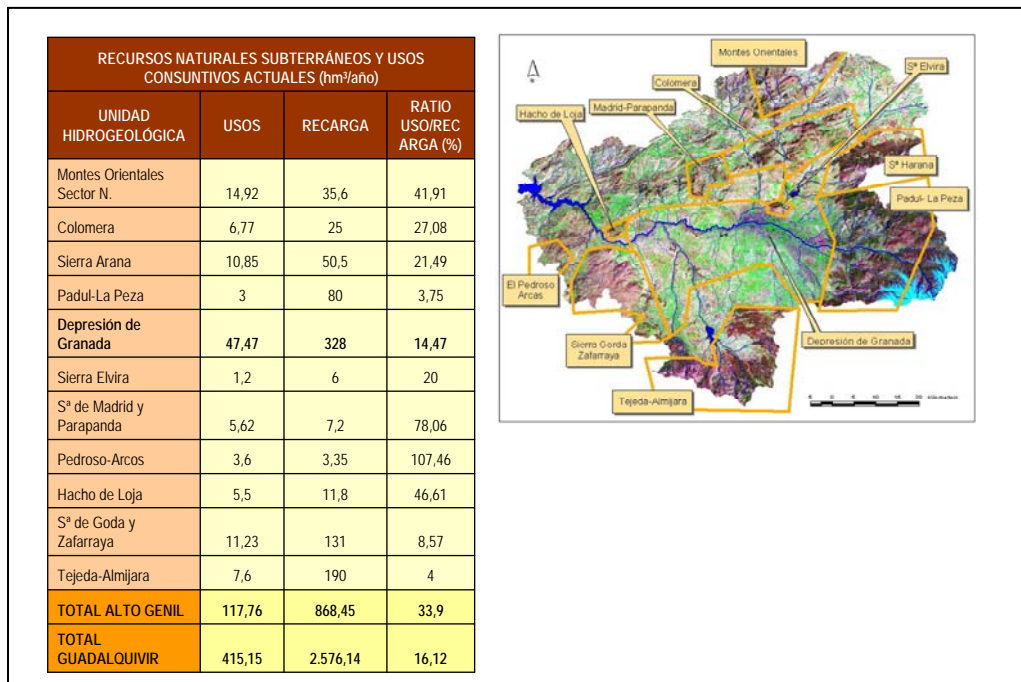


Figure 16. Groundwater resources and consumptive uses (hm³/year)

4.1.3. Administration

The management of the Guadalquivir basin is the responsibility of the *Confederación Hidrográfica del Guadalquivir*, created by the Royal Decree-Law Real of the 22nd of September of 1927. This hydraulic authority stretches an area wider than the Guadalquivir basin, including also the Barbate and Guadalope rivers basins (5.984 km²), placed in the province of Cadiz, towards the Atlantic slope. Thus, the total extension of the Guadalquivir River Basin District (63.193 km²), is slightly greater than the strict Guadalquivir basin (57.527 km²).

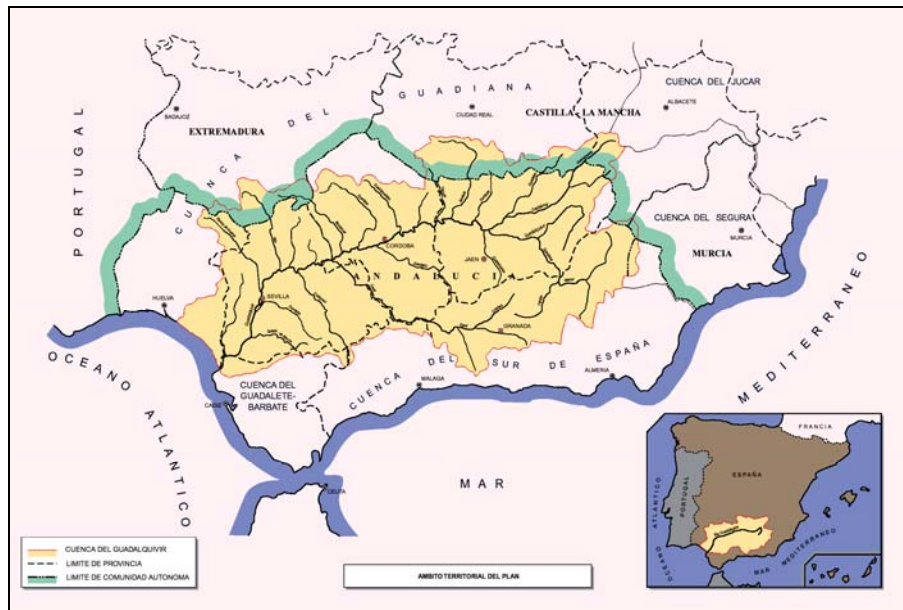


Figure 17. Administrative division of the Guadalquivir basin (From CHG)

The river basin encompasses four autonomous regions. The 90% of this area belongs to Andalucía region, whereas the rest is distributed between Castilla-La Mancha (provinces of Albacete and Ciudad Real), Extremadura (province of Badajoz) and Murcia (Figure 4.2.). The administrative division of the Guadalquivir River Basin District has jurisdictional consequences, due to the fact that the four regional governments regulate issues such as agriculture, cattle, forestry, fishery, wastewater treatment, protection of natural areas, industry, infrastructures and territorial planning. Nevertheless, due to the fact that Andalucía represents almost the 90% of the *Confederación*, no territorial conflicts or political tensions exists between the regional governments included in the area.

After the approval of the Spanish Water Law, the Junta de Andalucía (the regional government of Andalucía) applied to the Central Government for the competences of water management of the *Confederación Hidrográfica del Guadalquivir* and the *Confederación Hidrográfica del Sur*, where the region represents also more than the 90% of the area. However, negotiations between the regional and the central governments did not succeed, and both basin organisms remained controlled by the government of Madrid. Today, the Junta still demands these management competences.

4.1.4. Social and Economical Framework

Andalucía has remained, throughout the last decades, in a relative economic backwardness compared with the rest of Spain and the EU. Different parameters define this structural imbalance: low levels of production, productivity and income per capita; low occupation (53'3%) and highest unemployment in the EU (15,99%); scarce physical capital and low levels of formation of the human capital.

Nevertheless, since 1994 the economy of Andalucía shows a continuous and significant growth, reducing the distance to the Spanish and European averages. During the last decade the GDP has increased in 45%, going beyond the Spanish 36% and the European 24%. Moreover, 837.900 new employments have been created, reducing unemployment in a 50%.

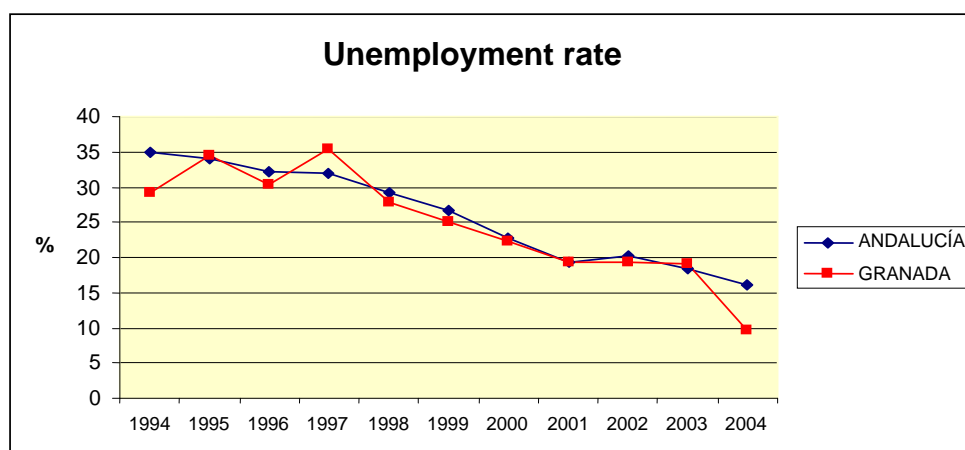


Chart 4. Evolution of Unemployment 1994-2004 (data from INE)

Despite this recent improvement, the productive structure presents a weak industrial sector and an important participation of services, whereas agriculture and construction are out of proportion compared to other Spanish or European regions.

Obviously these trends are not geographically homogeneous, and the dynamism of coastal spaces is in contrast with the backwardness of some mountain areas. The Vega de Granada or Alto Genil area remains in an intermediate position, but the municipalities of the Cacín area are some of the most dynamic populations of the Granada province, due to their position surrounding the capital city. Whilst Granada lost inhabitants, these small villages increase their population and their activity rate, receiving new workers from South America, Morocco and Eastern Europe.

Thus, unemployment rates has been reduced during the last 5 years from the 25% to the present 12% in Santa Fe and Chauchina, whereas Moraleda de Zafayona and Cijuela moved from the 30% and 40% to 8% and 10%, and Láchar, with a rate of 50% in 2001 has reached the 12% in 2005. The motorway A-92, parallel to Genil River and Cacín Canal is being consolidated as an important regional economic axis, spreading Granada suburbanization. As a result of that, the proportion of professional farmers is being reduced in Cacín area, whereas the number of part-time workers increases considerably.

Table 5. Population structure of Cacín area (Data from IEA)

Population & Society	SANTA FE	CHAUCHINA	CIJUELA	LÁCHAR	PINOS PUENTE	MORALEDA
Population. 2003	13.476	4.251	1.758	2.525	13.105	2.803
Population. Male. 2003	6.674	2.119	926	1.280	6.661	1.435
Population. Female. 2003	6.802	2.132	832	1.245	6.444	1.368
Emigrants. 2002	303	109	59	88	364	68
Immigrants. 2002	513	179	125	121	211	114
Population < 20 years. 2003 (%)	24,74	21	26	26	25	21
Population > 65 years. 2003 (%)	14	16	15	13	17	16
Foreigners. 2003	163	21	7	3	40	60
Principal procedence. 2003	S.America	S.America	UE	0	S.America	Morocco
Population Increase. 2003 (%)	9	7	18	8	-1	3

4.1.5. Agriculture and Irrigation

During the last years the most significant change of the agriculture of Andalucía is the expansion of irrigation, searching for a more productive and competitive agrarian model in an international context.

This process of growth has exceeded all the previsions established by the national and regional planning, as it is shown in the chart below.

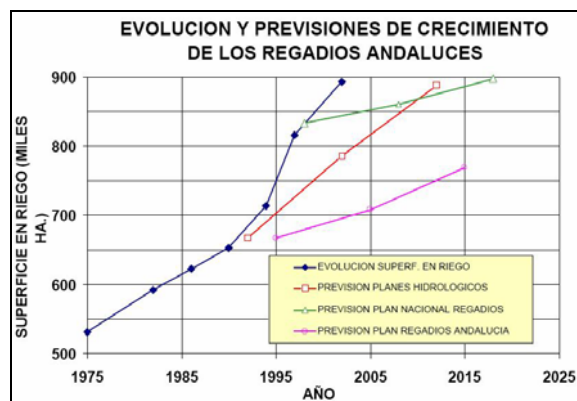


Chart 5. Evolution and forecast of irrigation development (Junta de Andalucía)

Today, irrigated lands occupy the 19% of the cultivated surface and the 52% of the agricultural production, generating the 55% of the agrarian employment, the 40% of UE subsidies and the 42% of the regional exportations. Irrigation is also linked to the most modern sectors of the regional agriculture and to an agro-food complex which represents the 14.5% of the GDP. Moreover, this sector has played a key role in the territorial organization, explaining part of the recent rural demographic growing processes.

Despite the relative abundance of water resources in the basin, the growing agrarian demand has generated an important deficit in Guadalquivir Basin. The National Water Plan has estimated this deficit in 1.049 Hm³. Attending to the Basin Hydrologic Plan, this deficit is due to “the spatial and temporal irregularity of precipitations and the imbalance spatial-temporal of the resource-use binomial” and there’s a need to “build infrastructures capable to convert natural resources I regulated resources”. This direction is also marked by the National Water Plan, which recommends the promotion of the conjunctive use of water --to take advantage of the resources from the highlands, including Upper Genil-- and generalizing water-saving technologies. However, the technicians of the Junta de Andalucía, put the accent in the overexploitation of the resources, that only could be overcome “reducing the demand, and only with a very limited growth of the offer in some particular areas”. It is, in short, the speeches of the model of the offer and the model of the demand, faced in this case by the basin organism and the regional government.

But in some way, this imbalance between resources and uses has been stimulated by the EU policies, whose subsidies have favoured the expansion of irrigation in the two last decades, promoting winter extensive crops. This fact, with the exceptional conjuncture of olive oil markets, explains this recent expansion of irrigation, that has went beyond all the previsions of the different public administrations.

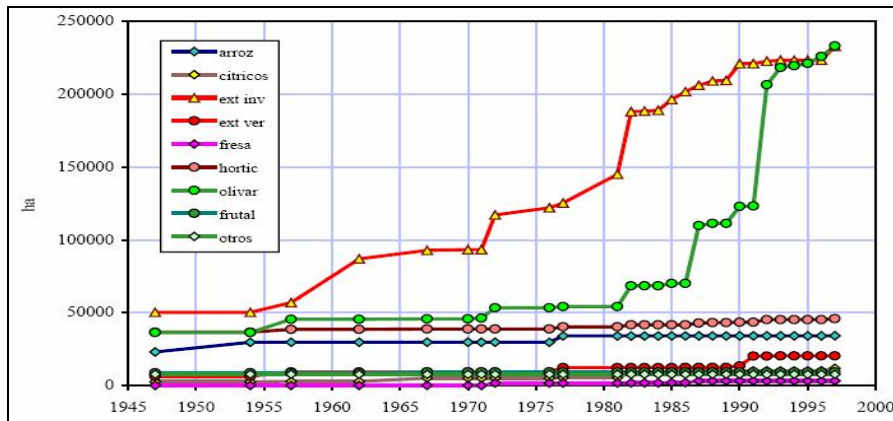


Figura 18. Irrigation in Andalucía. In Red with yellow triangles: winter extensive crops; green: olives; Red/rose: vegetables; blue: fruits; red/red: extensive summer; rose: strawberry; green/white: others (From National Water Plan)

4.2. THE CACÍN CANAL

Cacín irrigation extends along the left bank of the river Genil, in the western side of the Plain of Granada, over the municipal districts of Moraleda de Zafayona, Pinos Puente, Láchar, Cijuela, Chauchina, Santa Fe and Chimeneas. It is a sector of former dry land, next to traditional irrigation of the Vega de Granada, that was transformed in the beginning of the second half of the 20th century in an operation driven by the Institute of Colonisation of the Ministry of Agriculture and by the Ministry of Public Works.

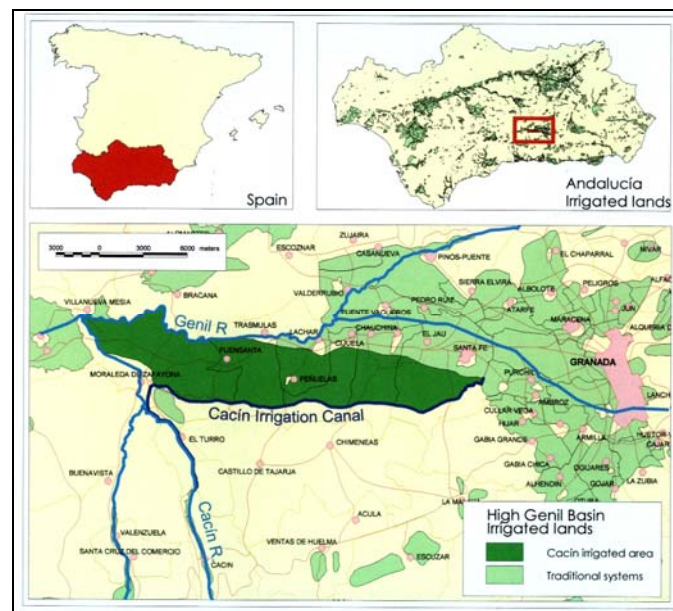


Figure 19. Localisation of the Area

Los Bermejales artificial lake is the key element of the Cacín Canal hydraulic system. The resources of the headwater of the rivers Cacín, Añales, Játar, Cacín and Granada are stored there, contributing an average flow of 2,042 cubic meters per second and about 40 Hm³ annually. The artificial lake also receives resources from the river Alhama, by means of a transfer canal that departs from Alhama de Granada dam and crosses the Cerro Liñán in a tunnel to discharge into the Bermejales Reservoir

spillway. The bypass contributes 8 Hm³ per year – flows that are released throughout winter. Between the months of May and October the resources are reserved for use in the Alhama valley and their spa. The technical characteristics of the reservoir are detailed in the following figure.

The water discharged from Los Bermejales circulates via a narrow gorge until it arrives at the Cacín Plains, for which 3 Hm³ annually is reserved for its irrigation, primarily dedicated to poplar plantations. Downstream from the urban centre of Cacín, after approximately 4km, is the El Turro Reservoir which the Cacín Canal is sourced from. The canal transports the allocation for the Cacín irrigated area and the volume of water dedicated to the supply of 12 municipalities in the area. The canal capacity is 6,000 l/s but nowadays it doesn't carry more than 3,000 l/s in peak times. Two decades ago, when there was a more demanding combination of crops, 4,500 l/s was often reached.

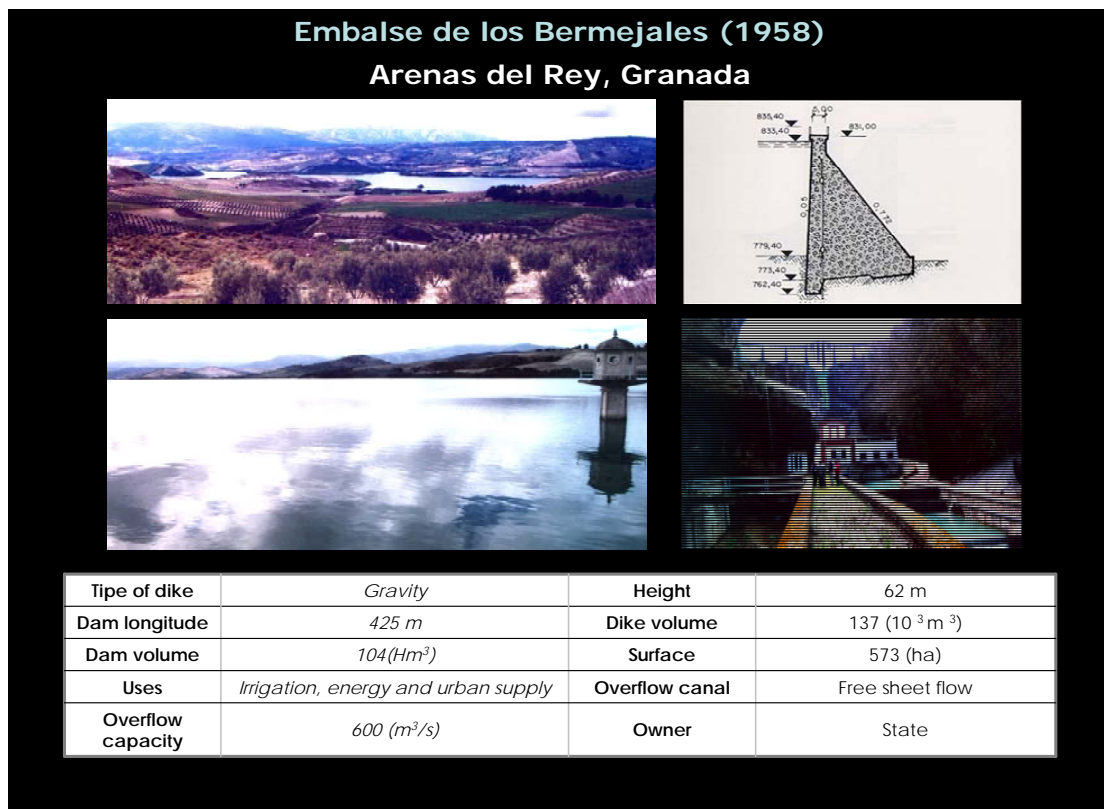


Figure 20. Los Bermejales dam

The first section of the canal, still parallel to the river, supplies the 45 hectares of the horticultural region of El Turro and also transports the allocations for traditional Cacín irrigation plots: the Moraleda de Zafayona and Villanueva de Mejía (*Caz*¹⁸ de Luján) plains, and that of the Huetor-Tájar (The Empress Eugenia Canal). These flows are directed down this canal to reduce losses in the fluvial bed and the water that comes down again from the spillway already in the Moraleda de Zafayona dam, from where the canals discussed get their water.

At this point the canal turns to the right and enters a tunnel by which it leaves the fluvial valley, to resurface in the area of la Cañada de Romero, where it feeds its first irrigation offshoots that supply the land of Moraleda de Zafayona.

¹⁸The local word *caz* means ditch or irrigation canal

The canal and its irrigated area is managed by the Central Council of Users of the Cacín Canal, which is made up of seven *comunidades de regantes*: CR of the Cacín Canal of Moraleda de Zafayona, CR of Láchar of the Cacín Canal, CR of Trasmulas of the Cacín Canal, CR of Cijuela of the Cacín Canal, CR of Chauchina of the Cacín Canal, CR of el Señor de la Salud de Santa Fe of the Cacín Canal and CR of Santa Fe City and Lands.

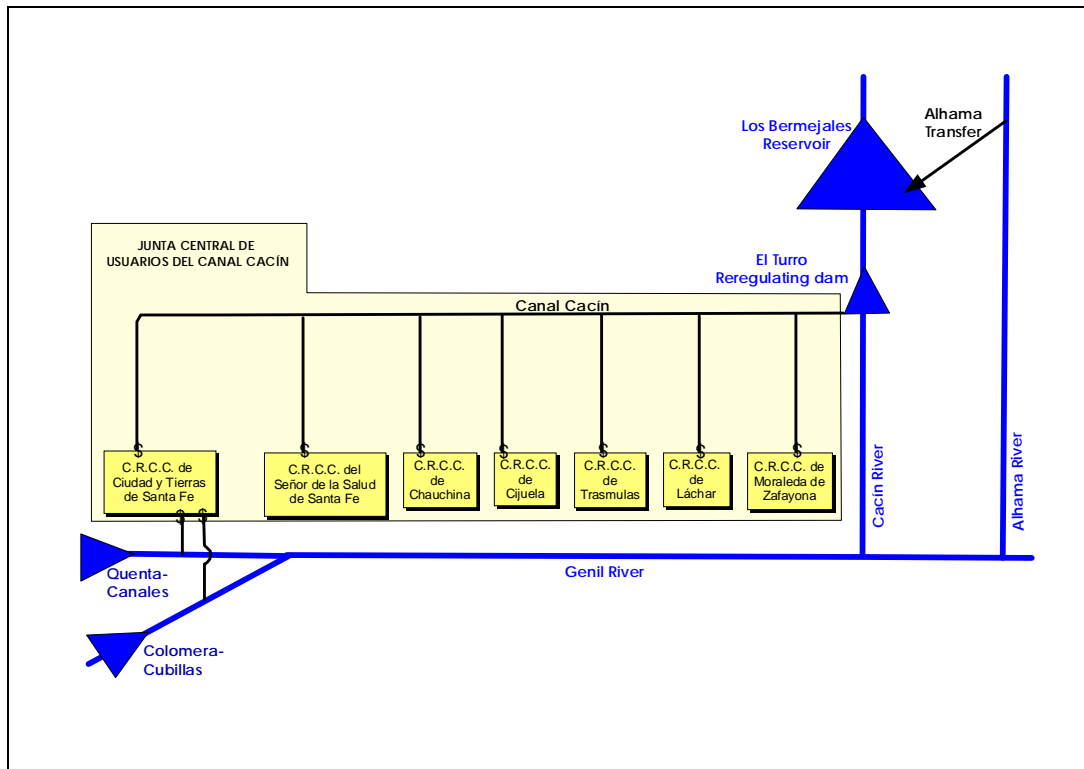


Figure 21. Outline of Cacín Canal Irrigation System

Five of these *comunidades de regantes* have delegated part of their administrative functions in the Central Council, while the other two, the CR of the Cacín Canal of Moraleda de Zafayona and the CR of Santa Fe City and Lands, carry out all the functions typical of this type of irrigation entity. In order to go deeply in the internal structure and management of this case study area, we'll describe the operative procedures of the Central Council of the Cacín Canal and two examples of the situations mentioned: the CR of el Señor de la Salud de Santa Fe of the Cacín Canal and the CR of Santa Fe City and Lands that also shows the particular nature of administering traditional resources of the Plain of Granada.

4.2.1. La Junta Central de Usuarios del Canal Cacín

a) Constitution of the irrigation entity (1952 - 1991)

The Cacín Canal and los Bermejales artificial lake project is one of the proposals for the creation of new irrigation defined by the Gasset Plan (1902), a National waterworks plan which was the starting point of the expansion of hydraulic infrastructures in modern Spain and the expression of the Model of the Offer and Regeneracionismo spirits. The works began after the Civil War and irrigation in the

first sectors of the canal were completed in 1952, in spite of the fact that the artificial lake was not finished until 1958.

In 1956 the Ministries of Public Works and Agriculture developed the Coordinated Plan of works for the irrigated area, with the objective of completing the secondary irrigation and drainage network, and of installing 344 new tenant farmers in lands acquired by the INC by means of the creation of four new towns: Romilla la Nueva, Fuensanta, Peñuelas, Loreto. The secondary irrigation network was completed in 1966.

The Cacín Canal began its irrigation in 1952 under the administration of the *Confederación Hidrográfica* of the Guadalquivir – from now on referred to as CHG – that used the city councils and the agricultural chambers of the area as local spokespeople. Initially the constitution of a combined *comunidad de regantes* was tested, the *Comunidad de Regantes and Users of the River Cacín*, that gathered in a general meeting on August 1st, 1952 and got as far as approving some ordinances and regulations. However the city councils' interest in controlling the administration of irrigation directly didn't allow them to solidify this initiative, and the creation of several *comunidades de regantes* in each of the area's municipalities was encouraged.

Firstly the *Comunidad de Regantes of the Cacín Canal of Moraleda de Zafayona* was created and later on, those of the remaining canal municipalities: CR of Láchar of the Cacín Canal, CR of Trasmulas of the Cacín Canal, CR of Cijuela of the Cacín Canal, CR of Chauchina of the Cacín Canal and CR of el Señor de la Salud de Santa Fe of the Cacín Canal. Also, the CR of Santa Fe City and Lands, an entity that managed this municipality's traditional irrigation began to administer part of the irrigated area irrigated, to be reallocated with flows coming from the Cacín.

During the years 1976 and 1977 the first meetings among the irrigators of the seven previous entities were carried out to form the Central Council. The CHG encouraged these meetings, which came to be held monthly within a short period of time, under the presidency of the Chief Engineer of the irrigated area. At the beginning, this Central Council virtually worked as a works council¹⁹, but with the passing of time it became an effective instrument of irrigation management: the meetings were good at creating a climate of well arbitrated dialogue between the farmers and their representatives and among each of the communities involved, teaching the newly born entities how to manage hydraulic conflicts. With the passing of time conflicts among farmers became scarce and the divergence of interests between the irrigation entities and the CHG became obvious.

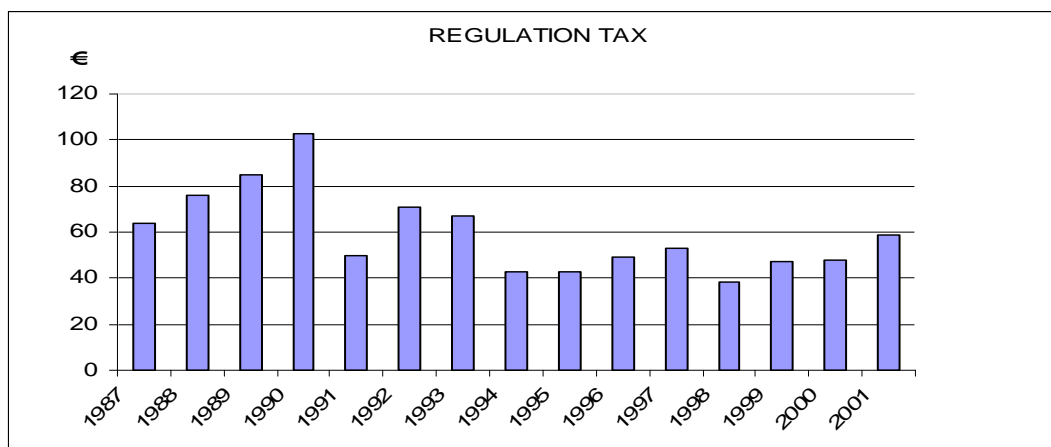


Chart 6. Evolution of the Rate of the Regulation Levy for Los Bermejales

¹⁹In accordance with the former water legislation

On February 15th 1988, the Central Council of Users of the Cacín Canal requested the transfer of the irrigated area, as had been recommended by the basin organism, interested in transferring the management of the irrigated area. The stimulus necessary to consider this enterprise was a considerable increase in the regulation levy that had reached 12,409 pesetas/hectare. Faced with a cost of such magnitude, which threatened the profitability of the operations, the only way to reduce the levy was for the farmers to take over the management of the irrigated area. So, after visiting the *Left Riverbank of the Bembézar Comunidad de Regantes* in Palma del Río (Córdoba) that had undertaken a similar experience, they began proceedings and in 1991 they took over the management of the canal.

b) Government Structure, Functions and Organs

The Central Council acts as representative of the seven area communities before the CHG and has assumed the administration of certain economic roles of some of them, such as the collection of the regulation levy. Also, the maintenance and conservation of the main canal and its service roads are the responsibility of the Council, with each local community being in charge of the secondary network. Lastly, the Council takes charge of distributing water to the local communities and of resolving conflicts between them.

To fulfil these obligations the Central Council is well represented in the basin organism. It has one member in the Reservoir Committee, as well as two more positions occupied by the CR of the Cacín Canal of Moraleda de Zafayona and the CR of Santa Fe City and Lands – communities located at the head and the tail of the irrigated area – and one representative in the Operations Council, not to mention one delegate of the aforementioned CR of Santa Fe City and Lands. Also, it is represented in the basin Water Council as part of its quota as members of FERAGUA (Federation of irrigators of the Guadalquivir).

The Council employs two full-time inspectors for the function of water allotment and surveillance of the irrigation network, as well as one office worker. The secretary is also on the community's payroll on a half-day contract, and four day workers are hired regularly to carry out the tasks of cleaning and maintenance of the network, for a total of 180 annual days of labour. Also, the services of a consultant lawyer are taken advantage of by means of a retainer and the technical support of the CHG is usually available for any contingencies, although the necessary work is contracted and paid to a construction company, under the supervision of the CHG engineers.

The main headquarters of the community is located in the first floor of a building situated in Santa Fe that is part of the union heritage, today property of the INEM (Spanish Institute of Employment) that is shared with other entities. The community has another premises in Moraleda de Zafayona, as well as the Administration of the Bermejales Reservoir House and the Engineer's House located next to Romilla la Nueva that is used regularly by the nursery service. These buildings are part of the canal facilities that were given to the farmers by the CHG when their management was transferred.

c) Water Management

Neither the Central Council nor the local communities hold administrative concessions for surface water, however the CHG decides on an annual allocation that, except for in periods of drought, varies between 5,000 and 6,000 m³/ha. During the spring, depending on the reserves available in the reservoir and the crops forecast for the season, the Central Council calculates the requirements, requests the flows in the Reservoir Committee of the CHG and sets the irrigation calendar. The allocation usually varies depending on the date of the beginning of the irrigation season; in dry years

this starts in May and in the wet ones it can begin in July. The calculation of the required allocation usually includes a reserve amount, but it is rare that it goes over 6,000 m³/ha because this amount is more than enough to cover the requirements of the area's crops: yields are not increased with higher allocations.

The Council receives the CHG water in the canal intake in the Turro Reservoir and commences its allocation amongst the *comunidades de regantes*. This distribution is based on demand. The inspectors receive the requests for water daily by telephone for the following day in the premises in Moraleda de Zafayona between 5 and 7 o'clock in the afternoon. At the end of the day they add up the requests and the allotments are organised for the following day, during which the inspector diverts the requested flows to the intakes of each community. The volumes distributed are measured by means of Parshall-type devices, both in the Turro Reservoir and in the main canal before the first intake, as well as in each one of the main distribution points. Each *comunidad de regantes* intake has its own measurement device.

Although the official registries assign 6,126 hectares of irrigation to the Central Meeting of Users, the surface area watered nowadays slightly exceeds this amount, without the irrigated area having been extended. This is possible for the reason that when the irrigated area was created, various non-irrigated areas remained within it, whether for topographical reasons or because it was forbidden at that time to irrigate olive groves. Later on, surface area reductions have taken place in the sectors next to urban areas, in the low part of the irrigated area, but at the same time some of these non-irrigated areas located within the irrigated area have requested water and have started irrigating their land. The changes in the distribution of crops, with a trend towards products with lower water consumption, such as the olive grove or the asparagus, favour the generation of surpluses that allow for the amplification of the watered surface area. Also, the CHG doesn't place any type of impediment in situations that it considers "not legal, but fair."

At the moment, the Central Council allows the transfer of resources within the irrigated area, and requests from proprietors from outside of the area have even been received – rejected up until now. The transfers within the irrigated area are carried out with different criteria in each local community and there are no direct exchanges between members of different communities. In Moraleda de Zafayona these are carried out with complete freedom, since irrigation is provided as needed, but in Santa Fe, the distribution of shifts limits the exchanges to farmers belonging to the same "*reguera*" (ditch). In most cases we are talking about temporary water transfers between farmers without an additional cost being applied to the resource. Nevertheless, there appear to have been some cases of surcharges and even of abuse or speculation. The community doesn't intervene in these operations and there isn't measurement of any type stipulated in order to limit or prohibit these situations.

On the other hand, there are also trades between the different *comunidades de regantes*, since there are communities which have had important reductions in their surface area due to urbanisation, whereas others still have areas of non-irrigated land within the irrigated zone, although outside of the area initially considered for irrigation. Nowadays the Central Council manages the transfer of water rights of abandoned operations to newly watered sectors and has commenced proceedings with the CHG to modify the characteristics of the irrigated area to adapt water rights to the current situation.

The Cacán Canal has also been used to supply drinking water to a large proportion of the area's municipalities. Besides the irrigation outlets, the canal's structure also incorporates outlets for the supply of drinking water and filtering and chloride plants to guarantee the quality of this supply. These users do not however have representation in the community, but pay their proportion of the regulation levy and Central Council expenses and collaborate in the cleaning tasks of the main canal. The canal provides 100 l/s for this use constantly throughout the the whole year, with the allotment

being transferred to the company Aguasvira and to the City Council of Cijuela. Before long, however, this usage will be limited to the municipalities of Láchar, Trasmulas and Moraleda de Zafayona, because the rest of the towns are going to be integrated into the Granada municipal water supply network.

d) Economic Management

The Central Council of Users of the Cacín is responsible for the annual payment of the regulation levy to the CHG for the water resources distributed to the local communities. In and of itself, besides getting paid by the communities for services rendered – administration, nursery, maintenance and conservation of the network, etc. – it invoices them an annual amount that is sufficient to make this payment to the basin organism. The regulation levy reached € 54/ hectare last year and the Central Council expenses amounted to € 15 / hectare.

There isn't a single operations procedure but instead each acts in a different way according to the needs or organisation of the local communities. In four irrigation entities, CR of Trasmulas of the Cacín Canal, CR of Cijuela of the Cacín Canal, CR of Chauchina of the Cacín Canal and CR of Santa Fe City and Lands, the Central Council charges an annual invoice directly to the farmer, on behalf of the local community, in which three items are included: the regulation levy, Central Council expenses and also the expenses of its own *comunidad de regantes*. The Council assumes the payment collection role for these local entities and then distributes the expenses per hectare.

The *Comunidad de Regantes* of the Cacín Canal of Moraleda de Zafayona and the CR of Láchar of the Cacín Canal have the administrative capacity to handle these activities and charge in a combined manner the relevant quotas for the expenses of the local communities, the Central Council and the regulation levy, in an annual invoice sent out by a professional collection agency, subsequently paying the Central Council the amounts owed for services rendered and the regulation levy.

Lastly, the case of the CR of Santa Fe City and Lands is somewhat peculiar and much more complex, since it is an irrigation entity that administers water rights for traditional irrigation and for two other regulated sub-basins, by which each sector of its irrigated area has a different system of tariffs. The amount corresponding to the regulation levy and Central Council services is collected by the local entity that gives the due amounts each year to the general community.

As we have already commented, at the end of the 1980s there was a steep rise in the regulation levy that stimulated the creation of the Central Council. The high cost of this levy forced a deficit of 3,000 or 4,000 pesetas per year for several years – a debt that was just paid off last year. Since the year 2001 there has been a small increase in these rates, as a result of the payment of the first annuity for the works on the bypass from the River Alhama to the Los Bermejales Reservoir.

Delinquency varies throughout the irrigated area between 5% and 7%, although two years ago it registered a substantial peak, reaching 20%. Faced with this situation, entities like the CR Cacín Canal of Moraleda de Zafayona and the CR of Santa Fe City and Lands specify actions in their ordinances such as the suspension of water distribution for delinquent payers.

4.2.2. The Comunidad de Regantes de la Ciudad y Tierras de Santa Fe

a) Constitution of the Irrigation Entity

The *Comunidad de Regantes* of Santa Fe City and Lands is one of the 52 historical entities belonging to the irrigation of the Plain (*Vega*) of Granada, traditionally governed by the Exclusive Tribunal of the River Genil Works and regulated by successive adjustments documented from the 12th century.

The Plain of Granada is made up of three sectors with different irrigation water origins:

- Surface water irrigation of the upper plain of the Genil and that of the rivers Monachil and Dílar.
- The Sierra de Arana karstic springs irrigation that supplies the northern area of the Granada Plain.
- The low lands irrigated with water collected from the water table and water surpluses, which includes the land of Santa Fe and other sectors next to the Cacín Canal irrigation.

Although Santa Fe irrigation has its origins in the Islamic era, the constitution of the *Comunidad de Regantes* of Santa Fe City and Lands took place on September 14th, 1906. This was made up of all of the proprietors of the municipal district with land on the left riverbank of the Genil, whilst the farmers of the right riverbank grouped themselves into the C.R. of the Caz Jotáyar of Santa Fe, a canal fed by the subterranean contributions of the "Madres del Rao".

The operations of the community of Santa Fe City and Lands numbered a total of 1,731 hectares that were supplied by various collections from the water table – Ojos de Viana, Spring of Isabel la Católica and the source of the San Juan riverbed – as well as from water from the Royal Dam of Santa Fe in the Genil and from run-off water from the Gorda Canal of Granada and of water returned from the irrigation of Purchil and Belicena.

The development of the Cacín Canal project allowed for the inclusion of new resources for the *comunidad de regantes* for taking advantage of surpluses, since the area irrigated by the community was located at the tail end of the new irrigation system. These flows were very abundant during the first years of operation of the project, but as the secondary network was completed and the transformation of the irrigated area advanced, the surplus water began to get scarce. In this context, the community negotiated the concession of a fixed allocation coming from the Cacín Canal. In the end the *Confederación Hidrográfica* granted an administrative concession for irrigation water of 272 hectares – equivalent to 5,100 *marjales*²⁰ – at the amount of 6,000 m³/ha/year, applied with a flow of 200 l/s. This concession is not applied to a specific geographical area, but is instead understood as a water right distributed in the group of *comunidad de regantes* that allowed the traditional integration of this irrigation system into the structure of the Central Council of Users of the Cacín Canal.

b) Government Structure, Functions and Organs

The activity of the *comunidad de regantes* is currently regulated by the ordinances approved by the CHG in June 1990, a document that constitutes a revision and adaptation to the *Ley de Aguas* and the *Reglamento del Dominio Público Hidráulico* of the ordinances approved in September 1906. As a result, their government organs are those that are established by the government regulatory framework: the General Council, as the community's sovereign organ, the Board of Governors, as the executive organ, and the Irrigation Jury, dedicated to resolve conflicts between users. The

²⁰A *marjal* is the unit of measurement used in the Granada Plain. Each *marjal* is equal to 528m², an area that corresponds to the size of the Lions Patio at la Alhambra.

community has a President, a Vice-President (honorary and unpaid positions) and a Secretary (paid position), elected directly by the General Council.

The General Council holds two regular annual meetings in the months of March and December. The first is dedicated fundamentally to the approval of the minutes and accounts of the previous year that are presented by the Board of Governors, and the second is for the renewal of positions and approval of the budgets and activities for the following year. The community positions the community have a four year term, and half are renewed every two years. To be entitled to vote one must own at least one hectare of land within the irrigated area. The proprietors that meet this condition have the right to one vote for each hectare owned, without any other limitations except for that one holder cannot exceed fifty percent of all of the votes held by all other community members. Also, the combining of various proprietors to reach the required minimum surface area to obtain the right to vote (1 ha) is allowed. The vote would be then exercised by one of them as representative.

The Board of Governors of the community is made up of seven members and the same number of alternates. To be eligible for these positions (honorary and unpaid), at least one *marjal* of land must be owned. The ordinances of the community (Article 58) recommend the representation of all of the sectors of the irrigated area in the composition of the Council. The ordinances also take into account the possibility that the President and the Vice-President of the community chosen by the General Council are not chosen as board members, in which case the Board of Governors should designate two of its members as President and Vice-President. The secretary of the community can be – and in fact usually is – secretary in turn of the Board of Governors and the Irrigation Jury. It is also usual for one of the board members to act as Treasurer/Accountant of the community, although the ordinances allow for this position to be carried out by a member of the community who isn't in the Council. In this case the position should be paid, whereas if the person is a board member, only the expenses arising from the fulfilment of the role are to be met.

The Irrigation Jury is made up of a President, elected from the members of the Board of Governors, and four regular members and as many alternates –that should not be on the Board of Governors – designated by the General Council. It is worth noting the presence nowadays of a woman on the Irrigation Jury. The farmers can present their accusations verbally before any representative or employee of the community, based on which the secretary will initiate proceedings. The subsequent legal process is public and verbal and sentences are able to be appealed within the period of one month, as a step prior to the administrative dispute procedure.

c) Agricultural Operations

The *comunidad de regantes* is formed from 1,700 land owning members. The right of access to water is bound to the property of the land and one can therefore only join the community by means of the inheritance or purchase of land.

The property is very fragmented. The average operation size is one hectare and the largest properties in the community don't exceed 10-12 hectares. The smaller sized properties barely reach 0.25 hectares.

The community's irrigated area is 1,800 hectares that is almost all cropped, despite the fact that during recent years a reduction of this area is being experienced as a result of urban development.

The main crop nowadays is the poplar which grows in 40% of the cultivated area, fundamentally in the sectors that are lowest and closest to the river. The rest of the irrigated area is occupied by

asparagus, tobacco and summer corn plantations. It is a combination that is more like the crops of the Plain of Granada than the rest of the irrigated area of the Cacín.

d) Water Resources

The *comunidad de regantes* has surface and ground water resources to supply the irrigated area. Originally, as we have seen, the use of water was limited to the use of the water from three sources or springs – Ojos de Viana, Isabel la Católica and the San Juan Riverbed – and surplus flows from the Plain that circulated via the river – the Royal Dam – or those that arrived from the tail end of the Gorda Canal and the irrigation of Purchil and Belicena.

Nowadays, the descent of the water table level has required the use of pump engines to elevate ground water, since the old springs hardly supply any water. Barely 150 l/s flow from the source of the Ojos de Viana during winter and it is dry during summer, whilst the San Juan and Isabel la Católica springs which used to contribute 250 l/s and 350 l/s respectively are permanently dry. For this reason the *comunidad de regantes* currently exploits subterranean resources coming from eight wells: La Presilla, Isabel la Católica, Las Lechuzas, Fresno 1, Fresno 2, C-6, C-7 and C-8. Nowadays these resources are essential for the community, since the surface water concession only allows for the supply of 1,236 of the community's 1,700 hectares.

Also, upstream from the Royal Dam, there is the Third Dam which supplies the canal of the same name and which controls a small sector located at sea level, to the left of the Caz de Santa Fe that enjoys the same rights as the Royal Dam, functioning as a parallel intake.

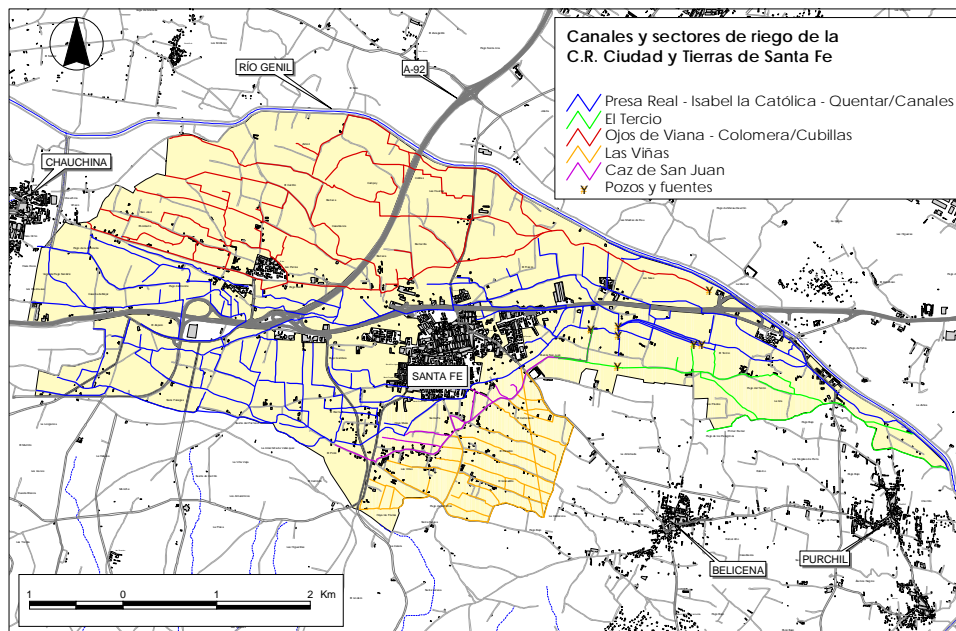


Figure 23. Irrigated Area of the CR of Santa Fe City and Lands

Historically, the main supply of surface water came from the waterwheel or Royal Dam in the river Genil, which the Caz de Santa Fe took water from since the Islamic era. All of the community's land had a right to this water, since the dam by its scale dominates all ground water collection. The only exception was the Upper Canal sector, to the south of the irrigated area, which had exclusive rights to water surpluses from irrigation from the Purchil and Belicena canals and from the municipal districts of Ambros, Cúllar Vega, Churriana, Armilla and Granada. Nevertheless, this sector has

nowadays been incorporated into the Caz of Santa Fe by means of a 125 hp motor that raises water from the Royal Canal, alongside the route to Belicena.

The rights over the Royal Dam were supplemented with the enjoyment of some returned water from the Plain of Granada, by means of rights over los Quintos and Alquezares. These are rights that were granted in the Islamic era and sanctioned later by the Catholic Kings. The Alquezares allows the irrigators of Santa Fe to take water from the five main canals of Granada during 48 hours of every weekend, between 12 on Friday and 12 on Sunday. Los Quintos (The "Fifths" in Spanish) makes reference to the right to participate in two fifths of the water circulating in the Gorda Canal of Granada from the mouth referred to as los Quintos, next to the river Beiro, in order to increase the flow of the Genil in the Royal Dam. This right is limited to the times in which, due to the Caz de Santa Fe being open, the water of the Royal Dam do not overflow, and so the farmers of Santa Fe don't take their complete allocation. If the water of the Genil passes the royal waterwheel or use is made of the Alquezares, the right to the use of los Quintos is suspended.

Nowadays, the regulation of the Genil basin has allowed for concessions to be obtained for the former allocations of surplus. In this way, the Ojos de Viana sector exclusively receives Colomera-Cubillas system surface water that is incorporated into the canal in a point located between the historical spring and the beginning of the irrigated area. On the other hand, the rest of the Royal Canal land has benefited from the implementation of the Quéntar-canals system that has regulated the head of the Genil. Also, as already mentioned, the community has been able to incorporate new resources stemming from the Cacín Canal, by receiving an administrative concession for the surpluses received since its construction. In short, there has been a notable increase in the reliability of supply, but this has led, as we will see later on, to an important increase in irrigation costs.

e) Water Management

During the irrigation season from May to September, shifts are started with lengths of between 12 and 16 days, depending on the canal. The water flows from top to bottom at 100 l/s and the inspector notifies its arrival to the intakes of each sector. Farmers who wish to water open their intakes and the inspector measures the flows calculated in function of the irrigation time in order to be able to later send the invoice. Throughout the entire summer wells are also used to supplement the irrigation.

Outside of the irrigation season water is available in abundance. The flows are distributed by "dulas", shifts of several days and hours of irrigation between canals, and the farmers can take water at any time, without prior notification to the inspector and in a free manner, without any control over the resource.

f) Prices and costs

The economic administration of the *comunidad de regantes* is quite complex, due to the diversity of water resources utilised and to the fact that these are allocated using different criteria. In this sense, invoicing is carried out in a different manner in the Ojos de Viana area, which has some 500 hectares that receive water regulated by the Colomera-Cubillas system, to the rest of the irrigated area.

In Ojos de Viana, a first invoice is issued during April and May which includes the Colomera-Cubillas regulation levy and the *comunidad de regantes* fixed expenses (maintenance canals, administrative expenses, inspectors of inspectors and guards). This charge is allocated by surface area (€/marjal).

Later on during the months of September and October another invoice is issued, this time as €/hours of irrigation. In this the variable costs are charged: energy use for the well elevation engines, telephone, possible workers salaries (inspectors). The calculation of this invoice includes a penalty system whereby those who exceed the number of irrigation hours which they have a right to are made to pay a more expensive quota.

Two invoices are also issued in the rest of irrigated area, but with with different items. During the months of April and May, a first invoice is sent out which only charges the general (fixed) community expenses in €/marjal.

In September and October another invoice is issued that includes the share of the of the payment of the regulation levy of the Bermejales Reservoir and the Quéntar-canal system, as well as the community's variable, including well energy expenses and the payment of salaries for any workers possibly hired during the irrigation season. This invoice is divided up by irrigation hours, at the rate of 100 l/s, without any type of penalty.

4.2.3. *Comunidad de Regantes del Señor de la Salud de Santa Fe del Canal Cacín*

The *Comunidad de Regantes* of el Señor de la Salud de Santa Fe of the Cacín Canal was constituted in 1972 to manage the irrigation of Santa Fe municipal district land which had not been part of the traditional irrigation of the Plain of Granada and which therefore didn't form part of the irrigated area of the historical *Comunidad de Regantes* of Santa Fe City and Lands. There were 701 hectares of dry land located in the highest part of the district, far from the reach of the irrigation networks via the traditional use of gravity. The Cacín Canal therefore marks the southern limit of the irrigated area, defined downstream by the Brazal del Secano (CR of Santa Fe City and Lands), the Arroyo del Salado and the Granada Airport land. Also included within the irrigated area were small sectors of the municipal districts of Purchil and Gabia la Grande – some 24 hectares of sprinkler irrigation – as well as some Chauchina plots.

a) Water Resources and Characteristics of the Irrigated Area

The creation of the Cacín irrigated area allowed for the administrative concession of 6,000 m³/ha/year to this land, an allocation supplemented by some irrigators by means of the use of ground water. There are between 10 or 12 low-powered private wells to increase water availability for some operations.

Nowadays practically the entire irrigated area is under cultivation and urban pressures don't exist in this area. On the contrary, proceedings have been initiated to extend the irrigated area to outside of the limits set down by the administrative water concession. The farmers wish to be able to carry out this amplification by means of a change in the delimitation of the irrigated area by the Central Council, compensating for the surface area losses that have been experienced in Láchar, Cijuela and Chauchina, so that the total irrigated surface area in the entirety of the Cacín Canal is not changed.

The irrigation entity has 205 members, who must be owners of land in the irrigated area. The community ordinances allow any titleholder who gives up his irrigation rights and does not have outstanding debts to abandon the entity. This regulation also denies all community rights to holders who don't notify changes in ownership within the community.

The average size of the operations is larger than in the Plain of Granada and is situated at about 3.5 ha. The most common size is somewhat smaller, at about 2.5 ha, and the largest property reaches 85 ha.

The olive has been the main crop for several years. It has displaced the cereals that were planted during the first decades of operation of the entity, which have practically disappeared today. Some asparagus and tobacco plantations also exist, but in both cases with total surface areas very much lower than for olives.

b) Water Management

The distribution of irrigation is made by means of a shift of eleven consecutive days, in which each operation holder is assigned a time for irrigation. To spread around the inconveniences associated with nocturnal irrigation, the beginning of the shift varies for each irrigation session. The community's Board of Governors can suspend the irrigation of land of proprietors who have not prepared the land to receive irrigation. The allotment system by means of shifts was imposed 14 years ago. Until then the distribution was made on demand, but given the large number of disagreements that arose between the farmers the decision was taken to assign a fixed irrigation time to each operation holder in function with its surface area.

To control the received and distributed resources, the *comunidad de regantes* uses modules to measure the resources contributed by the Central Council and the allocations sourced on each canal whose size is calculated according to the size of the surface area controlled by gravity.

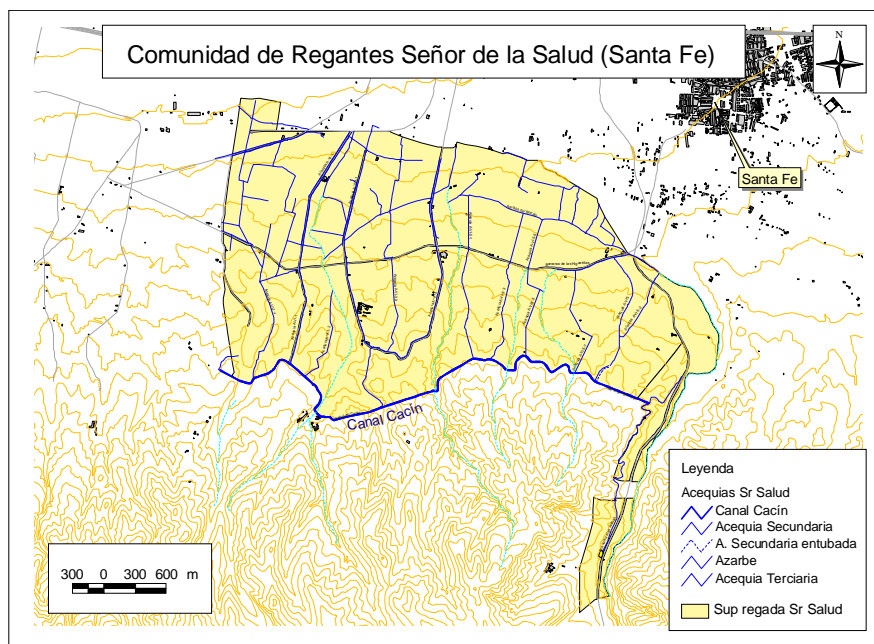


Figure 24. Area Irrigated by the CR of Señor de la Salud de Santa Fe

Somewhat more than 50% of the plots have drip irrigation systems. Also, and with the objective of minimising consumption in the flood irrigation of olive trees, whose planting is extensive, the farmers form a system of furrows that reduces the surface area flooded in each plot.

The trade of water between community members takes place with a certain degree of frequency. The farmers give the water from one irrigation session to other holders in exchange for having it returned to them at a later date, with the prior agreement of the inspector. In spite of the fact that

some attempts have been made, the sale of water between communities has not taken place due to the difficulty of transferring the costs of the levy and signing a legal contract between the interested parties. For this reason, the proceedings for the change of the irrigated area's delimitation previously mentioned have been initiated, with the aim of readjusting the distribution of resources by surface area in the entirety of the irrigated area. Nevertheless, there have been precedents whereby one community has transferred water to another without charge, in times in which the transferring community had surplus resources.

c) Structure and Administrative Organisation

The irrigation entity complies with the administrative structure defined by the *Reglamento del dominio público hidráulico*, as set out in its ordinances approved in 1972 and reformed in 1992. The community has a president and a vice-president – honorary non-paid positions – and a secretary. The sovereign organ of the community is the Board of Governors which meets twice a year, in March and November. The Board of Governors is made up of a president, vice-president, secretary and four board members, all chosen by the General Council. Half of the positions are renewed every two years.

The ordinances don't specify the composition of the Irrigation Jury – it is only stated that its president is designated by the Board of Governors. Nevertheless, the operation of the community is simpler, the president and vice-president of the community are also the same for the Board of Governors and this also ends up resolving the few disagreements that arise between *irrigators*. In short, the operation of the community doesn't require a structure as complex as what is defined in the prevailing legislation.

The community doesn't have its own premises and uses the facilities of the Central Council of Users of the Cacín Canal. It doesn't have hardly any hired personnel. Only one inspector dedicated to the surveillance of the irrigated area and water allocation and a part-time office worker, a role that falls upon the same people who carry out these functions in the Central Council. The Central Council therefore assumes the administrative tasks and the billing of the water including the collection of the regulation levy from the community farmers. As a result, the Central Council issues a single invoice per surface area unit (€/ha) to all of the members of the community which includes the costs of the regulation levy, administration, personnel and construction. During the last period the total costs per hectare charged to the farmers amounted to €168.20, of which €81.60/ha were dedicated to the payment of the regulation levy, €62.70 to the entity's own expenses and a further €23.80/ha to the Central Council of Users of the Cacín Canal. The annual budget in the year 2003 reached the figure of €117,305, nearly half of which (€54,017) was dedicated to the payment of the regulation levy, whilst a further €16,683 made up its contribution to the Central Council. The remainder was dedicated to personal and maintenance work expenditure.

5. CONCLUSIONS: TOWARDS A SUSTAINABLE MANAGEMENT OF IRRIGATION?

The Water Framework Directive of the European Union has introduced a third model of use of water, in which water is considered as an ecosocial asset, focused on conservation and improvement of water quality and aquatic environments. In this new model, that we call the model of sustainable growth, concessions and authorizations for the exclusive use of water should be subordinated to the objectives of quality; and prices should incorporate the full recovery cost, including services costs, opportunity cost and environmental impacts costs.

These new water policies of the European Union, which are binding on all the States members, are defined according to several principles.

- Consideration of water as an ecosocial asset and definition of objectives in coherence with this fact
- Territorial and management principles: integral action and basin unit
- Principle of planning for the achievement of objectives
- Environmental policy linked to economic control instruments
- Principle of transparency and social participation

As we have seen, some of these principles had been previously adopted by the Spanish legal water framework --principles of planning, basin unit or social participation-- but the environmental and water quality standards required by the EU are far from the Spanish reality and an important change in the daily functions of the *Confederaciones Hidrográficas* is demanded. These organisms have been working during 75 years promoting large waterworks subjected to a model of offer management and now they have to overcome this inertia to evolve to a structure more similar to an environmental agency. Some recent changes on the procedures of the *Confederación Hidrográfica del Júcar*, pilot basin for the application of the directive in Spain, move slowly in this direction.

Thus, despite the advanced starting point of the Spanish hydraulic administration for the acknowledgment of this European directive, it is coming into effect partially and sluggishly, and there's still some practices and sectorial politics which are not in coherence with the spirit of the Directive.

In fact, in 2004 the National Water Council rejected the proposal to establish a basic prize for water to satisfy the full cost recovery, measure that was withdrawn by the government. This opposition to the increase of water prizes has been the only question that has attracted the interest of the water users' associations, represented in the Water Council by their National federation. For the water users' associations, the rest of matters related to the Directive have gone unnoticed, there has not been a public debate among users and all the farmers and local leaders interviewed showed no concern about it.

This lack of concern is somehow a corollary of the success of the model of water users' associations and their participation in the public administration. There's a high level of satisfaction among irrigators with the structure, functions and operating procedures of the *comunidades de regantes*, based in a long historic experience, and a strong confidence in their mechanisms of representation before the administration. This is a reciprocal attitude, because the administration finds in them the required interlocutors to reach the objectives of resource allocation and distribution.

This satisfaction with the present structure and legal status makes the water users' associations reluctant to institutional innovations, because it meets perfectly all their demands. Nevertheless, the success of the model generates a paradox: there's a strong participative deficit in the internal structure of the water user's associations; just a short proportion of farmers attend the General Assemblies and only a few of them are interested in participating as elected members of the government boards. In fact, most of their representatives have a long period of permanence in their positions.

The fact that most irrigators have no interest in participating in the decisions making process is also related to the profile of the farmers in this *huertas*. In the 2 case study areas, mainly in the Júcar basin, there are a growing proportion of part-time farmers whose main occupation is not linked to the agrarian sector. The percentage goes beyond the 90% in the Valencian area.

The underutilization of the local participative channels has no consequences on the daily management of the irrigation entities, because the objectives and operative procedures short term decisions of the communities are stated in their own regulations (*ordenanzas*). But this situation affects to the decision making process, especially to those questions related to the strategic or long-term planning, such as the Alarcón dam conflict or Júcar-Vinalopó water transfer in the case of Júcar River, a politic that has been led by USUJ leaders without an internal debate at the different local committees, and much lees among farmers.

The requirements of a more sustainable use of water and the search for a greater efficiency have stimulated the generalization of technologies of pressurized irrigation, throughout ambitious programs financed by the administration --as a central matter of the new politic of management of the demand-- and generally named as "modernization" projects. These projects assure important savings in the unitary consumption by surface unit and also make more comfortable the irrigation practices of the predominant part-time farmers --this is also the key of its success. But sometimes these projects didn't improve the efficiency of the hydraulic system as a hole, affecting negatively the adjacent ecosystems. This is the case of the Albufera lagoon and marshes, traditionally supplied with return flows from the irrigation systems, which feed the wetlands ecosystem and allowed a more effective assimilation of pollutants. The future reduction of this return flows will endanger a traditional sustainable system, result of a long tradition of an integrated and sustainable management of agriculture and ecosystem conservation.

Moreover, at the regional level, and despite the long experience in management at the basin scale, the decentralization of the power in the autonomous government has introduced an element of complexity in management, which has aroused in several territorial conflicts among regions which share basins --such as Castilla-La Mancha and Valencia-- or those origin or destination of the Ebro Transfer Project. The political manipulation of these interests as vote-catching affaires has led to a growing tension and certain instability in the long-term planning of infrastructures development of management. Some of these conflicts --such as the Ebro or Júcar-Vinalopó water tranfers-- are the expression of a latent conflict between the model of the demand and the model of sustainable use.

To summarize, the present institutional model has been able to integrate a long historical tradition of local and basin management into the decentralized structure of the State and into a legal framework based on the model of the demand management. There's also a generalized feeling of satisfaction with the local structures of participation and an effective coordination between the administration and the user's associations, to allocate and distribute resources. But a detailed analysis of the institutional framework makes arise several black spots, which shows some practices incoherent with the new model of sustainable use of water, according to a transition stage in which there's still some inertia to overcome.

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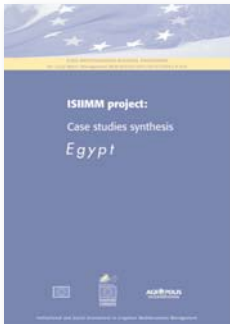
Morocco



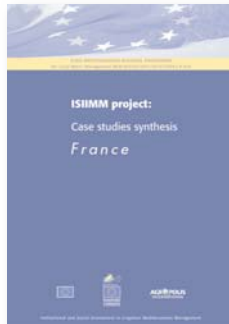
Spain



ISIIMM Project documents



Case studies synthesis
Egypt
(English)



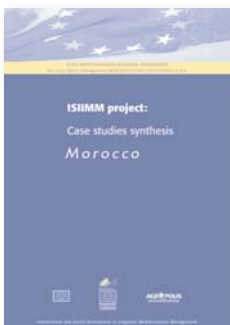
Case studies synthesis
France
(English, French)



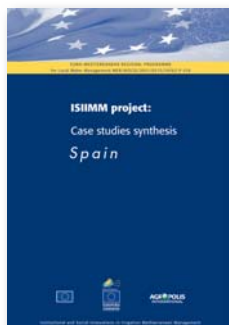
Case studies synthesis
Italy
(English, Italian)



Case studies synthesis
Lebanon
(English)



Case studies synthesis
Morocco
(English, French)



Case studies synthesis
Spain
(English)



General synthesis
(English, French)



Institutional report
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Partner

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