

# DRIP IRRIGATION IMPLEMENTATION POLICIES. EFFECTS ON THE WATER USERS' ASSOCIATIONS OF THE VALENCIA REGION

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During the last decades, numerous governments have opted for a policy of promoting drip irrigation in order to achieve a significant increase in the efficiency of water use and agricultural productivity, something which was at the same time being endorsed by a number of international studies and reports. Recently, however, different studies have questioned the validity of this technology as a means of achieving increased irrigation efficiency and have highlighted, in particular, the presence of unexpected effects on water and energy consumption (López-Gunn et al., 2012b; Van der Kooij et al., 2013; Scott et al., 2014). In the case of Spain, with figures for public investment in irrigation modernisation nearing the 3,490 M € mark, it is essential to apply the theory of the policy cycle to the process of promotion and implementation of drip irrigation systems, in order to assess where and how the money has been invested and how effective the results have been as regards the desired objectives, as has been suggested by López-Gunn *et al* (2012a).

Numerous works have explored the effects of water saving measures through analytical or mathematical models, but only a reduced number of publications have examined the situation before and after water saving investments. In this regard, the aim of this study is to carry out an *ex post* analysis of the generalised implementation of drip irrigation in the last two decades in the Valencia Region (Spain), based on various interviews with different water users' associations that provided information prior and subsequent to modernization. To this end, firstly we describe the drip irrigation promotion policies implemented by national and regional governments. Subsequently, we analyse the consequences for irrigation associations, as regards effects on water consumption and economic aspects.

For the last three decades, governments and irrigation associations in the region have made a clear commitment to the modernisation of irrigation infrastructures. Irrigation in Valencia, in a phase of clear expansion until a few years ago, has had to face up to a situation

of growing pressure on water resources. In a situation where rivers, despite strict regulation, cannot guarantee a supply of water to many irrigation associations, and with several aquifers overexploited, agriculture in Valencia was compelled to make a serious move to address the problem of how to reduce water consumption.

After a initial stage through which private agents led the installation of this new technology, the public administrations progressively became involved in drip irrigation promotion. Thus, in 1986 the Valencia Regional Government passed a law (Act 7/1986) on use of water for irrigation, designed to stimulate the rational use of water in irrigation systems in Valencia. Under this legal framework, between 1987 and 1995, 611 projects were financed, of which the vast majority (78%) were based on the concrete lining of channels or the replacement of channels with pipes, and only 39 works dedicated to transforming localised irrigation were carried out. The drip irrigation growing trend accelerated after 1995, when the Valencian Regional Government approved the Plan for the Modernisation of Irrigation. The Plan was the direct consequence of two facts: the cathartic drought of 1994-1995 (García-Mollá et al., 2013), with severe impacts on agricultural production, and the cancellation of the National Water Plan project of 1993, which had ruined all the Valencian expectations in new water transfers from the larger peninsular basins. For these reasons, the regional authorities intensified its efforts in promoting localised irrigation as a solution to uncertainty concerning water resources.

However, in 2001, a new National Water Plan project was approved, including a transfer from the Ebro River to solve the regional water resources imbalance. The project, extremely polemic, radically divided the Spanish society into supporters (conservative parties and benefited regions) and detractors (left parties and origin regions) (López-Gunn, 2007). In this context, the efficiency and productivity of irrigation quickly became a flagship premise for those who gave political support to the transfer of water resources. It was necessary to demonstrate that right up to the last drop of water was being made use of to have any hope of obtaining new resources, or to be able to survive without them. As a consequence of this, irrigators in Valencia have continuously mobilised claims for improved water concessions, and also strengthened their efforts to improve efficiency in water use in order to reduce water demand. On the opposite side, Ebro project detractors also highlighted modernisation of irrigation as an essential strategy to reduce water uses and to avoid unnecessary water transfers. Thus, a nexus was established between policies of management of both supply and demand models, apparently contradictory from a theoretical point of view, but with an overwhelming logic from the point of view of the farmers, and of course, irresistible for the parties' electoral strategists.

Ultimately, the policies which brought forth the technological changes were promoted both by those who defended a transition towards a more sustainable water management model, and also those in favour of increasing the supply of resources. A strong argument was put together around the seductive idea of «modernisation» of irrigation, a powerful discourse frequently and successfully constructed in these contexts (Boelens and Vos, 2012). Modernization even became a euphemism for drip irrigation development in the region, at the informal and formal level (García Mollá *et al.*, 2014). This discourse was backed by international documents, by estimates of savings made by scientific studies on irrigation efficiency, and by the need to change the image of wastefulness often unjustly acquired by

some irrigation systems. In addition, many farmers also assessed the advantages that the incorporation of pressurised networks would yield as regards the use of fertilisers and the adoption of more convenient irrigation practices. This alliance between Government and agricultural users of water supplies was also joined by business and professional groups who would benefit from the installation and maintenance of the new infrastructures, stimulating the rapid spread of new irrigation technologies.

Both the Central Government and the Regional Government act jointly by way of a framework cooperation agreement resulting in the partial financing and subsidising of each individual investment in collective irrigation networks. During the period 1997-2009 public investment in drip irrigation in the region was 560 M€, whereas the total investment was 1,000 M€ approximately (calculated from Valencian Regional Government and SEIASA data). According to the Agrarian Census, in 1999 there were 283.565 hectares of irrigated land in the Valencia Region, of which 101.157 hectares had localised irrigation. In the Census of 2009 the figure for irrigated surface area went down to 267.870 hectares, while the drip irrigation surface area increased to 181.289 ha.

The main goal of this policy of promotion of drip irrigation was to increase water savings. In the water users' associations analyzed, the reduction of water withdrawals have been generally significant. Some of them have achieved water savings capable to stimulate the recovery of aquifers previously overexploited. This has been possible because the regional contextual factors prevent, in most cases, from crop intensification and areal expansion, which have been proved in other regions as factors hindering the positive impact of water saving technologies.

In the WUAs using mixed waters, we have observed how the drop in consumption –due to drip systems but sometimes also to the reduction in the irrigated area–, has led to a fall in the percentage of groundwater used for irrigation and an increase in the use of –cheaper– surface water. We have described this process in several sections of the Júcar-Turia Canal, which went from using 40-70% groundwater to 80-100% surface water (García Mollá et al., 2012).

Impact on irrigation costs have negatively affected most of the communities interviewed. Costs have increased in all the WUAs in terms of cubic meters, and we have detected a significant augment in cost per hectare in traditional surface irrigation. Only in some WUAs using groundwater the increased energy cost (in terms of volume) has been compensated with the reduction of withdrawals. However, in WUA using surface water, costs could hinder farming profits, due to the current context of rising energy prices. This rise should dissuade most of the traditional irrigation systems from adopting these technologies without a previous complete financial assessment. The evaluation of these risks have been absent in many cases, as we have observed in some WUAs, which have taken on enormous financial commitments in a context of unfavourable market prices and agricultural abandonment.

Some of them have oversized the transformation projects or have postponed the payment of a significant part of the financing. This strategies could endanger the future viability of these WUAs, particularly in the current context of reduction of the irrigated lands. It must be borne in mind that any abandonment of the farm holdings may have a feedback effect on those who remain working in the sector, as there are fewer and fewer partners left in the association to assume the debt.

Finally, the design and construction of new pressurised networks is an opportunity to attain a greater degree of institutional and functional integration between WUAs –frequently atomized in groundwater areas–, reducing the costs of constructing, maintaining and managing the infrastructures, as well as probably making distribution more efficient. This is a lost chance in the Valencia Region, where only in two cases (in Mijares and Vinalopo) WUAs merging processes and infrastructures integration have been observed.

In conclusion, this policy of indiscriminate drip irrigation promotion has caused different and unforeseen effects, with both positive and negative consequences for WUAs and agricultural viability. In the future, public policies and private actions aiming at introducing water saving technologies should incorporate sound preliminary assessments to estimate the expected reduction of water consumption, to audit energy consumption, to evaluate the impacts on costs and financial balances and also to avoid other effects on farming. Other effects such as organizational changes, WUAs merging processes and heritage conservation should be also considered in order to achieve a complete assessment for this technological change. Depending on the contextual factors, the results of the assessment should determine whether drip irrigation is the optimal option or not. Moreover, accompanying or alternative measures required should be identified.