Collective irrigation reloaded. Re-collection and re-moralization of water management after privatization in Spain

Abstract

In recent decades, water has been subjected to different commodification and de-collectivization processes. Increasingly, this is also affecting collective irrigation water management. Critical analysis of this privatization and de-collectivization wave in the irrigation sector has mainly focused on neoliberal institutional policies and market-oriented legislation. However, subtly and silently but equally determinant, the adoption of water-saving technologies is fostering the penetration of private enterprise and market-based governance into these hydro-social settings. This paper discusses this phenomenon through a case study of the community of Senyera in Valencia, Spain, tracking the privatization and subsequent contestation and re-takeover of water management by irrigation system users. The article shows how privatization removes users' autonomy in the name of common well-being, and increases irrigation costs in a context of little transparency. But the case also highlights users' capacity to re-value and re-signify their past collective action, remembering and 're-membering to' the collective. Senyera water users critically and reflexively analyse privatization, reconstruct societal relationships around and embedded inside the new technology, and re-collectivize and re-moralize irrigation management in a new hydro-social scenario.

Keywords: Collective action, water privatization, water management, moralization of technology, drip irrigation.

1. Introduction. Community water control: the last bastion or a new market niche?

Since the 1980s, pressured by the emergence of neoliberalism, water has been subjected to commodification and privatization worldwide. Water pricing, market creation, and privatization of water supply or sanitation services are some components, frequently inter-related, of this de-collectivizing wave (e.g., Bakker, 2005; Castro, 2007; Harvey, 2003; Swyngedouw, 2005).

Privatizing public drinking water supply services has been the most frequent phenomenon, and undoubtedly the most strongly resisted. In fact, an increasing remunicipalisation of water in different-sized cities has responded to widespread dissatisfaction generated by private action, inseparable from increasing equity, environmental and public health concerns (Pigeon et al., 2013; Lobina et al. 2015). At the same time, many countries' neoliberal policies have grown into more covert privatization, commodification and marketization actions with subtler discourses and 'participatory' strategies, mainly in a neo-institutionalistic vein (Roth et al., 2015; Duarte-Abadía and Boelens, 2016).

Private enterprise has made up for their retreat from these cities by intensifying their action in other territories where companies discern business possibilities. This, then, is no neoliberal decline, but just a spatial variegation defining the current post-neoliberal scenario (e.g., Bakker, 2013; Yacoub et al., 2015). Aligned with this hypothesis, this

paper underscores how, in recent years, private suppliers are seeking new market niches, attempting to position themselves in other sectors such as irrigation management, which have so far been difficult to penetrate.

During the closing years of the 20th century, the arrival of the private companies penetrating the *agricultural water* sector was partly curbed by the scientific and political recognition achieved by collectively managed irrigation systems (Ostrom, 1992; Wade, 1994; Roth et al., 2015). However, irrigation did not entirely elude water commodification; compared to the drinking water sector, irrigation has experienced other means of de-collectivization, in terms of policies, scenarios, protagonists, strategies and impacts. For one, many countries' irrigator communities have been affected by water rights privatization and market establishment (e.g., Ahlers, 2010; Boelens, 2015; Bossenbroek, 2016; Scott and Raschid-Sally, 2012). Moreover, numerous large agri-business companies or other economic sectors have been detected driving water grabbing in traditional irrigation systems, in Latin America, Asia and Africa (e.g., Birkenholtz, 2016; Mehta et al., 2012; Swyngedouw, 2005; Yacoub et al., 2015). Finally, several companies took advantage of public irrigation management transfers (IMT) to user associations to position themselves as new co-suppliers of water service or undertake operation and maintenance functions (Vermillion, 1997; Garcés-Restrepo et al., 2007).

Since the early 21st century, several regions of the world have experienced more forceful penetration by service companies into irrigation water management. Occasionally, companies merely provide operational services under maintenance and service contracts, but in many other cases they have undertaken construction of networks and subsequent water resource allocation and distribution among users (Darghout et al., 2007). This penetration is camouflaged by the neoliberal catch-phrase of *Public-Private Partnership* (PPP) to dodge the negative connotations that 'privatization' has acquired. Spain and other countries also use "externalization" as a euphemism for this outsourcing.

Despite their recent materialization, a number of countries have already assessed this new 'public-privatizing' irrigation critically. In these cases, public-private partnerships have forgotten 'the commoners' themselves as a rightful partner, neglecting or side-lining the interests, knowledge and context of local water user communities and families. According to the cases recently analysed in Morocco, state-market-expert nexus has caused unequal socioeconomic impact among smallholders; unfair sharing of burdens, benefits and risks between public and private partners; environmentally fragile sustainability; and severe negative impact on local users' water management capacities (Houdret, 2012; Houdret and Bonnet, 2013).

The literature on this privatization and de-collectivization of irrigation has focused fundamentally on institutional policies and market-oriented legislation, paying little attention to transformation of technological systems and water devices (e.g., drip irrigation) as a *factor driving* privatization. Further, although there is abundant literature examining protests and mobilizations against neoliberalization or privatization in agriculture, there is a remarkable absence of studies addressing the construction of re-collectivizing alternatives in response.

This paper is a pioneering assessment of such conversion experiences – from community to private management and then back to the 'community reloaded' in traditional Spanish systems. This is happening in a national context in which management privatization initiatives have been tightly linked to modernizing irrigation,

mainly introducing water saving technologies. We have chosen the case of Senyera (Valencia Region) to analyse this process, because this community had a first phase of management privatization – tied to the technology changeover to 'drip' irrigation – and then regained community irrigation system control by farmers.

Information was collected through interviews conducted in January and June 2014, June and December 2015, and June 2016 with former and current members of the irrigator community governing board; former and current users' association technicians, and the private company (Tecvasa); former and current majors of Senyera; farmers from Senyera and farmers from the neighbouring water users' associations. The authors held winter interviews especially focusing on obtaining an account of the irrigation system and technological facts including all the empirical and economic data. Summer interviews were held by the authors together with three groups of 4-5 students co-tutored by the authors. These findings were expressed in three respective reports (De Beer et al. 2014; Führen et al. 2015; Borghuis et al. 2016). Some of the key actors were interviewed several times each year, and focus group meetings and collective interviews were held with some of these actors.

The next section first examines the cultural and moral dimensions underpinning collective irrigation management, which are quite different from the aims and thinking of private management. Next, we introduce how implementing drip irrigation systems has become the vector carrying privatization into community irrigation. Then we reflect on '(re)moralization' of water management and infrastructure as a response to this privatizing technology changeover, expressed analytically and socio-politically by the water user community's 'recollective efforts and struggles'. The third section will examine the illustrative case of Senyera, detailing the processes of privatization and 're-collecting'. The final section presents our conclusions.

2. Drip irrigation as a Trojan horse: subtle re-moralization of management and infrastructure

> "*Tools are intrinsic to social relationships. Each person relates to society through actions and the tools effectively mastered to carry out those actions. To the degree that one actively masters one's tools, their shape determines his/her self-image*" (Ivan Illich, 1984:90).

2.1. Collective irrigation institutions, technology and morality

User self-managed irrigation systems often express prolonged interaction between water user families and their environment, shaping socio-ecological systems in diverse contexts. Their collective management institutions have often lasted over time, clearly demonstrating their robustness and resilience (e.g., Glick, 1970; Maass and Anderson, 1978; Mabry, 1996; Roth, 2014). These systems are based on normative frameworks and collective water rights featuring social, cultural and moral values that are different from modern techno-economicist management frames and practices. Their multi-dimensional, contextual nature makes them inaccessible or unappealing to private enterprise and official government agencies, because they transcend conventional

econometric, functionalist and bureaucratic parameters (Cleaver, 2000; Hoogesteger, 2012; Roa-García, 2014; Romano, 2017).

Collectives self-managing their water use systems are usually socially diverse entities whose members – differentiated by ownership rights, gender, status or ethnic group – are united by mutual dependence to develop, use and manage their water resources, by a sense of collective water identity (Boelens, 2011, 2014). Each member's rights and obligations are derived from common rights and duties, and in the event of conflict there is great collective interest in resolving it quickly, to restore effective cooperation (Garrido, 2011). This collective contractual reciprocity (Boelens, 2011, 2015), historically rooted, is totally different from market-based contractual arrangements (Reimer et al., 2008); it builds on trust, community morality, the history of shared water defence, the creation and re-creation of common water property, and long-term social cohesion. This is the backbone of community systems.

The moral nature of collective irrigation has been discussed by various authors, among others as a spin-off from the moral economics theory developed by Thompson (1971) or Scott (1976) or the theory of legal pluralism (e.g., Benda-Beckmann et al. 1998; Roth et al., 2015). For example, Ferri (1997) and González-Alcantud (1998) have deciphered the normative or moral principles that traditionally governed irrigation ditch management in Valencia and Andalucía; Gelles (2000), Trawick (2001), and Boelens (2014, 2015) have critically explored such moral visions in the Andes; Arellano (2014) in New Mexico; Cleaver (2000, 2017) and Eldidi and Corbera (2017) in various African contexts; among many others. This moral involves the existence of a (collectively built but contested and continually adapted) *ethos* that imbues community norms, guides operational procedures, water access and allocation rules, and decision-making privileges, and which is a reference for farmers' behaviour (see Boelens, 2015; Roth et al., 2015). These collective moral frameworks for water coexists with situations of social inequality and internal conflicts (Mayer, 2002; Calatayud, 2008; Perreault, 2008; Sanchis-Ibor, 2016). So, rather than idealizing these moralities, there is a need to examine them with a constructively critical approach to each particular case.

What is crucial is that, beyond just legal constructs, locally prevailing (hybrid) moral frameworks as expressed in water rights, obligations, operational norms and governance practices become manifest concurrently in hydraulic technology, normative arrangements and organizational frameworks, all ingrained in particular political-economic and cultural-symbolic settings. And vice versa, hydraulic infrastructure contains human norms and morals, and power relations. This means that water management and hydraulic infrastructure are culturally, historically and politically *moralized* and also *steer* moral and social action.[1]

Such a moral dimension of irrigation materializes when designing infrastructure and norms for collective action. Communities, when designing their canal layouts, establish where to conduct the water and who not to give water; canal capacities, control structures and gate openings establish maximum water flows to be taken; hydraulic blocks and schedules require particular forms of organization and distribution, etc. Both technology and management rules are amalgamations of ethical principles and social justice, defining how burdens, risks and benefits are shared (Boelens and Vos, 2014; cf. Beccar et al., 2002; Mosse, 2008; Veldwisch et al., 2009; Meehan, 2013). Clearly, this

[1] This morality is often also integrated into local supernatural beliefs (González-Alcantud et al., 1995, Boelens, 2014; Arellano, 2014), manifested in ritualization or sacralisation of practices or key places in the hydraulic infrastructure.

means that hydraulic designs bear a significant moral cargo: this moralization of technical design (see Latour 1991, 1994; Winner 1993) steers the ways in which hydrosocial systems and artefacts facilitate or enforce 'right-ness' and obstruct 'wrong-ness' (as seen in the designers' eyes).

Obviously, local self-governing water user associations are not the only parties who can 'moralize' their water management and infrastructure. When local water securities, moralities and rights profoundly differ from external designers' moralities, as for example reflected in State laws and market-oriented water policies, they are commonly seen as "unruly," "disobedient," and "intangible", so officialdom often discursively labels them as "inefficient" (Boelens and Vos, 2012; Boelens and Seemann, 2014; Gelles, 1998; Perreault, 2014; de Vos et al., 2006). In most of the global South but equally in the North, State authorities set out to abolish extra-legal water management rules and rights in order to move towards modernity, framing this as 'moralization' of water control (Gelles, 2000; Boelens and Seemann, 2104). Such legal and expert moralization is commonly masked as a benevolent, missionary effort to make water use technology efficient, to rationalize farmers' irrational water rights, to modernize archaic forms of organization, following the moral obligation of technical and social engineers to help make water society modern.

These considerations are fundamental when addressing irrigation modernization affecting numerous communities worldwide in recent decades. When modernizing systems, the designer's morally-loaded messages are inscribed in these socio-technical networks geared to create social and political order (Latour 1992). Engineers, planners and constructing companies delegate functions, duties, ethics and values to the water facilities. Socio-technological 'scripts' (Latour 1991) or 'codes' (Winner 1985) often conceal power relationships and naturalize the politics of water system design and management – as 'hardened morality' they seek to enforce particular moral and political behaviour. In the words of Pfaffenberger, "technological activities bring entrenched moral imperatives into prominence" (1992:504). Or, as Callon argued, "engineers transform themselves into sociologists, moralists or political scientists at precisely those moments when they are most caught up in technical questions" (Callon, 1991:136). As Pfaffenberger showed, implementing externally-developed socio-technological systems induces not only new artefacts, "but also a new world of social relations and myths in which definitions of what 'works' and is 'successful' are constructed by the same political relations the technology engenders." (1988: 249). These new societal relationships, differing aims and moralities, that have become embedded in hydraulic artefacts and management forms, obviously differ from those developed endogenously by historical entities for collective irrigation management, and consequently tend to enter into conflict when modernizing irrigation.

2.2. Drip modernization and irrigation management externalization

The recent, fast and widespread dissemination of drip irrigation follows the above-described socio-technological pattern. In the last two decades, this technology has spread through numerous regions of the world, as a tool to reduce agricultural water demand. Countries such as India, Spain, China or the United States have introduced this tool on more than 1.6 million hectares (ICID, 2016). Drip irrigation has been spread by a pitch prepared by stakeholders such as the water device industry, official agencies and

global policy institutions, fundamentally grounded in discourses and concepts of water saving and efficiency.

However, in recent years, many authors have questioned whether drip irrigation actually achieves a net saving of water (e.g., Playán & Mateos, 2006; Perry et al. 2009; Lecina et al., 2010; Van der Kooij et al., 2013). Further, in certain contexts, it has negative effects on energy consumption (Jackson et al., 2010; Rodríguez-Díaz et al. 2011) and using it overall will increase irrigation costs (García-Mollá et al., 2014). In general, this tool needs commodified resources, market conditions and support measures to succeed (Dumont et al., 2014; Sanchis-Ibor et al., 2017; López-Gunn et al. 2012).

Therefore, Garb and Friedlander (2014) and Venot et al. (2014) call for a broader vision of such changes, and for studying irrigation technology as an integrated array of material and social elements (e.g., through 'technography', Jansen & Vellema, 2011). The first studies conducted in Morocco indicated that, when localized irrigation systems are introduced (sprinkler, drip) this significantly alters maintenance and management operating procedures, institutional structures, agrarian economies and livelihoods, and irrigation knowledge and culture (e.g., Venot et al., 2014, 2017; Bossenbroek, 2016). Impacts on community systems have included individualizing collectives, losing local autonomy, and generating dependence on centres of expertise and intermediaries with external knowledge, financing and material inputs (Bossenbroek, 2016).

In Spanish irrigation, we have also detected major changes in collective irrigation management institutions after these techniques are adopted. First of all, different irrigator communities have merged their networks with an eye to reducing water use and minimizing management costs, transferring control upward to a supralocal level outside the community (Sanchis-Ibor *et al*., 2016). In cases without upscaling, we have also observed a general trend to centralize management authority and procedures, among others as a consequence of introducing telecontrol systems in irrigation distribution (Ortega-Reig et al., 2017a).[2]

This technological change unavoidably shifts social and cultural handling of irrigation, facilitating entry by private enterprise into the domains of Spanish irrigator communities. Implementing this technology – mass-promoted and State-subsidized (García-Mollá et al, 2014) – has yielded a new market niche for private companies. Therefore, drip irrigation has acted as a Trojan horse, enabling the private sector to penetrate some long-standing irrigation systems, which had been an international benchmark of collective self-managed irrigation (Ostrom, 1990; Garrido, 2014).

Obviously, there is a continuum in these formulas of penetration by private enterprise, ranging from specifically externalizing certain maintenance tasks, all the way to supplanting the irrigator community's essential functions. Many irrigator communities have decided to engage specialists to maintain their systems, often turning to private companies, which entails a major break with tradition for Spanish collective irrigation management institutions. In such cases, such as the Royal Canal of Júcar, institutions do not lose control over their traditional functions, although there is some centralization of these management structures and procedures (Ortega-Reig et al., 2017a).

[2] The Spanish case (Ortega-Reig et al., 2017a), like Morocco's (Benouniche et al., 2014), also features *bricolage* and subtle transformation (Cleaver, 2017) by which irrigators adjust the technology to their own aims – often diverging from the goals of the State and the agents promoting drip irrigation (Ortega-Reig et al., 2017b).

However, on other occasions, we have detected full turnover of community irrigation to private companies, which perform functions that used to be collective, impose 'modern' practices and legitimize 'rational' knowledge. In these cases, age-old practices that underpin essential cultural values for coexistence of rural communities have been replaced by entrepreneurial management methods following rootless criteria of efficiency and pursuit of profit. This subtle sociotechnical transformation has received little attention to date, since most critical studies have focused almost exclusively on neoliberal policies and legal-administrative changes to examine privatization of irrigation management.

The Trojan horse gets in when irrigation system transformation begins. Private companies responsible for implementing new water works, connive with local elites or public administration who promote and subsidize them, incorporating maintenance service into their construction contracts, as with urban water supply (BOT, Build-Operate-Transfer). This way, after inaugurating the new irrigation system, they control it. This was the pattern in Senyera, which we analyse below, but similar formulas have been used in developing new irrigation systems in many other regions of Spain, such as the Segarra-Garrigues Canal (Catalunya), the Ontiñena Ditch (Aragón) or Adaja River irrigation (Castilla-León).

These water-technology and institutional-policy changes do not happen without local objections, which sometimes succeed. This happened, for example, in Càrcer (Valencia), where a private enterprise set up a new irrigation system and agreed with the irrigator community governance body to take over management from them. However, so many farmers mobilized against giving up management that they finally kept the private company from taking over. Critical scholarship tends to emphasize open opposition to water policy mega transformations (e.g., Hommes et al., 2016; Sneddon and Fox, 2008; Stoltenborg & Boelens, 2016) and also hidden, non-violent resistance in day-to-day life, through strategic, hybrid adaptations (e.g., Boelens, 2015; Hoogesteger et al. 2016; Mena et al., 2016. Cf. Kerkvliet, 2009; Scott, 1990). However, there are few studies of irrigator associations opposing privatization of their collective management who, after experiencing de-collectivization, decide *to take back* control from the private sector to re-create community management, as happened in the case of Senyera that we will analyse next.

What we want to highlight in the following case is the importance and power of *remembrance;* i.e., recollecting the past (the pre-drip collective water use society) in order to both examine the present (significantly influenced by experiencing privatized drip management) and envision the future (return to a renewed form of collective control). Perreault, in his article on water memory and collective experience as environmental justice, argues that, "as a representation of the past, memory is always also a representation of the present, and a reflection of contemporary realities, which in turn informs political demands. In this way, memory may be seen as a vital conceptual tool for envisioning environmentally just futures" (2017). Indeed, thought begins with remembrance, as Hannah Arendt stated[3] . However, remembrance, we argue, relates not only to 'remembering' but equally to 're-membering': becoming a renewed 'member'

[3] In *On Revolution*, Arendt argues for the importance of societies' recollecting and conceptualizing experiences essential for their political constitution, in order not to fall prey to de-politicized discourse and manipulation; "If it is true that all thought begins with remembrance, it is also true that no remembrance remains secure unless it is condensed and distilled into a framework of conceptual notions within which it can further exercise itself" (Arendt 1963:220). Here we show that this assertion is not confined to historic states and empires but also a fundamental need and practice in farmer communities.

of the (reworked) hydrosocial network, by re-thinking and re-conceptualizing thought, by reflecting on experiences. As we will analyse, Senyera farmers 're-membered themselves', as a result of questioning the ongoing privatization experiences in their community and actively working towards the re-collectivization of their hydrosocial network, with '*re-collective* morals'.

In our analysis, we frame Senyera farmers' efforts as '*recollecting water control*'. To 'recollect' refers to remembering (building on past experiences of community and privatized control), to re-membering (renewing people's membership of the renewed human/nonhuman irrigation network), and to re-collectivizing (taking back collective control and autonomy). Merriam-Webster's dictionary defines 'recollective' as "to bring back to the level of conscious awareness / to remind oneself of something temporarily forgotten / to bring an image or idea from the past into the mind". Simultaneously it refers to "having the power of recollecting".[4] Our conceptualization therefore also refers to the medieval Latin word *recollectus*, the past participle of *recolligere*, "to gather again". As we will examine in the next section, Senyera farmers, collectively remembering the past and questioning the present, have decided to engage in the process of 're-commoning' water governance, by recollecting their self-governance history and by recollecting what went wrong afterwards.

3. Senyera: from community-controlled gravity irrigation to privatized drip service and back, to 'community drip 2.0'

3.1. Collective management of gravity irrigation

Senyera is a small village, with 1169 inhabitants, located near the confluence of the Júcar and Albaida rivers. Since the medieval period, the fields of Senyera have been irrigated with water from the Albaida River, through the inter-community *Comuna d'Ènova* channel. This channel divides into three branches, one of which, the *Séquia del Terç*, supplies the fields of Senyera – currently 116 hectares — and *Castelló de la Ribera* (Figure 1). All the irrigators owning farms in Senyera are members of the *Sindicat de Regs*, an association for collective management of irrigation and defence of their common interests.

Agriculture there is practiced by elderly farmers (nearly half are over age 65), part-time work, and small fields (averaging half a hectare). The most common profile is a farmer who is the retired owner of a plot smaller than half a hectare. For the last 20 years, citrus fruits – mainly oranges – have been practically the only crop from this municipality. The total area planted was 140 ha early this century, but it decreased to 116 ha (387 plots) as a result of urban development projects – only partially executed – of which 77.5 ha are currently irrigated (283 plots) (Jiménez-Bello et al., 2007, 2010).

[4] http://www.merriam-webster.com/dictionary (2016)

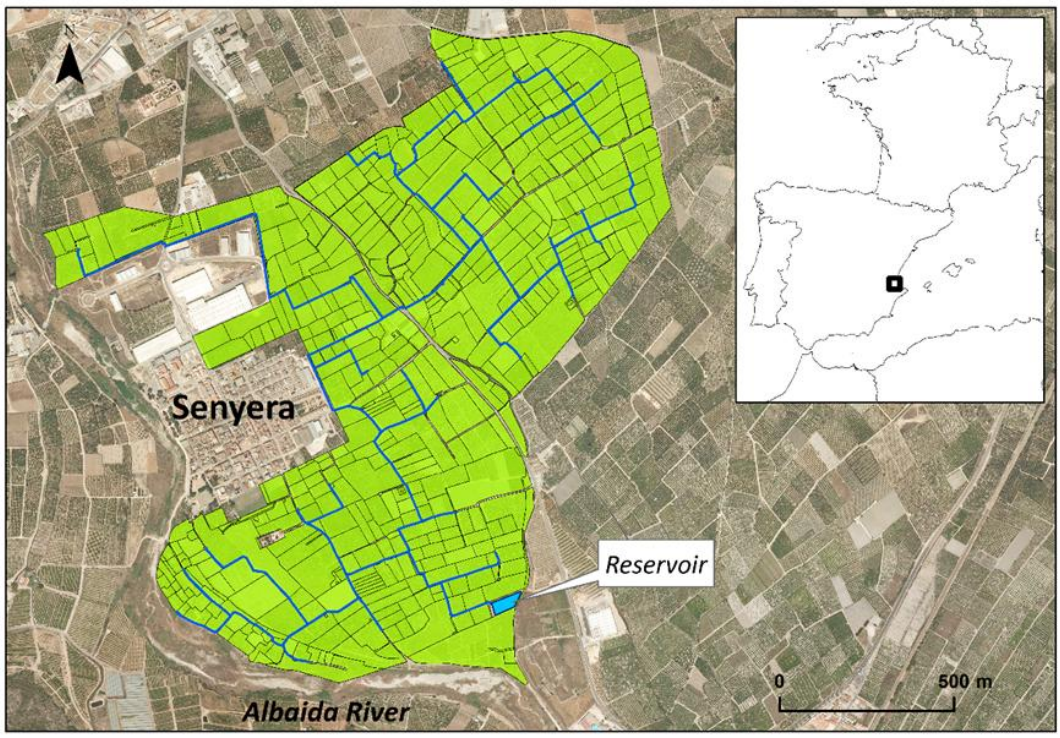

Figure 1: Senyera irrigated area and the drip network

Remembering the time of community water control "before the company entered", water users explain that their collective control and non-commoditized institutions and resource management were viewed as indispensable to secure and defend all their livelihoods. So, in everyday water and non-water related activities, Senyera families constructed and re-affirmed social and territorial bonds, shared infrastructure and a common water rights framework.

Historically, water rights were proportionally attached to land property, and water distribution followed a rotational schedule. The *regador* (ditch rider) hired by the community organized irrigation turns according to the schedule and farmers could arrange small adaptations though, in general, the one who had been waiting longest would receive water first. "Although people have different memories of the facts, they look back at it as an equitable system" (Borghuis et al., 2016:18). Water management transparency was accounted for by the *regador*'s presence in bar El Moreno during the summer and a bulletin board during winter time. Being there at a fixed time every day, being known by every farmer, made management accessible. The bar's bulletin board posted the schedule, and in the off-season (or during wet years) the *regador's* water management skills were not required. Farmers could irrigate on demand, after picking up a stick ('palet') and depositing three euros with the bartender, certifying a farmer's irrigation turn. Farmers had to stick the *palet* on their field and when they finished, the following farmer to irrigate picked it up and paid him the deposit. Information was quickly shared between farmers, and smooth negotiation, socialization and transparency of irrigation scheduling contributed to satisfactory water allocation – farmers knew when to expect their water, even during droughts.

Informal decision-making happened in bars, as they were (and still are) the social centre of the village for farmers. A meeting place every morning for the *esmorzar* (Valencian breakfast), where they would eat and drink together – a place for farmers to discuss the status of their fields, the water, and any needs and problems they have. Issues discussed at the bar and in the field were subsequently translated into proposals for the board and assembly meetings for formal decision-making (Führen, et al., 2015). Satisfaction and confidence ranked high among the farmers. User obligations, such as the collective labour input and water fees (€180 per hectare/year) were perceived as fair, as everyone was able to afford them and farmers knew what they were paying for and that the irrigator community did not want to make any profit. Overall, irrigation was an appreciated part of daily public life.

Senyera's water infrastructure and its embedded allocation rationality, therefore, reflected not just the region's agro-climatic and geophysical circumstances but equally the prevailing social, cultural and political forces of 'community'. Water allocation rules were entwined with a diversity of social norms in Senyera community settings, inside and outside the domain of functional water control. These include overall community rights and obligations, family relationships, political structures, and historically generated organizational patterns. As such, Senyera's common property owners embedded their individual rights — to use water and infrastructure and participate in local water governance decisions — in collective system ownership.

Clearly, this common property management and conservation in Senyera's irrigation system was grounded in mutual dependence among mostly smallholder users, vis-à-vis external power and adverse environmental conditions. Throughout Senyera's history, it has entwined and related to the simultaneous shaping of moral-normative structures, organizational-managerial relationships, cultural-political alliances, and the Séquia del Terç's material hydraulic structure. In a range of expressions, families explain that their community system thus generated and reaffirmed a mode of simultaneous belonging to the community, to the water and to each other – a 'hydraulic identity' and 'hydraulic culture' (Boelens, 2014, 2015).

3.2. Drip irrigation implementation and privatization

This water culture broke down in 2004, when the community received a proposal from the Senyera Municipality, firmly interested in completely transforming the historical irrigation network into a modern drip irrigation system. The project was brought before the Sindicat General Assembly for approval, and the town's mayor and a commercial water expert attended to explain and advocate for the project, to be implemented on a BOT basis. The overall opinion of farmers, now, is that they were misinformed, manipulated, and persuaded by the discursive power of the modernization and privatization dream. The community assembly was attended by only 55 of the 235 members, who approved the project with 47 yea votes. Out of the five bids submitted by different companies to implement the transformation, they chose Tecvasa, the most expensive, but the only one offering financing. Some irrigators subsequently disagreed with the Tecvasa plan, as expressed by a former president of the community who said: "The new mayor did not want anyone else's ideas. He had his own project. He wanted this to bring him fame, votes and popularity. The pros and cons were secondary. At any price, drip irrigation should be installed.... The 'quorum' was outspokenly illegal, but he

managed to start his project made by a so-called 'engineer' who was not independent, and the company was commissioned for more than 1 million Euros".

Once the Assembly had agreed, the company pressured for the paperwork to be done quickly and, in fact, in a few days they signed the contract – including full assignment of system management for 10 years – and the work began. Tecvasa soon also took over control and management of drinking water supply from the Municipality, and treated farmers with little transparency. Some irrigators said that the company claimed it would contribute 50% of the costs but actually this came from government grants to modernize irrigation. Community leaders who had posts in 2004 also told us of their difficulties in trying to understand the legal wording of the contract they had to sign with the company. As one of the members of that government board said: "The contract was drafted so that it was impossible to understand. I sat down to read it with the dictionary, but never figured out what it meant". Other interviewees said that the proposed contract that Tecvasa presented for the community assembly was substantially different from the contract subsequently submitted to be signed.

Some irrigators who opposed the transformation, regardless of their varied perception of whether drip irrigation systems were useful or not, radically rejected turning over system management for 10 years: "We don't like outsiders who tell us what to do. How can such a big company understand a small village like this? Here we understand each other, which is highly preferable to a company from outside the village" (quoted in Führen, et al., 2015:17). Nevertheless, they could not stop the legal process. The contract signed with the company committed them to a mandatory payment, and would force irrigators to indemnify the company if they decided to abandon the project. This left no room to discuss or reconsider the community's position.

Throughout 2004, the drip irrigation was set up, and the new system started operating. Most (but not all) farmers switched to drip irrigation on their fields, and were charged for this by the private company. The former president of the Sindicat says it was not entirely free choice because Tecvasa pressured farmers. Of all farmers who made the conversion to drip, none indicated water saving as an incentive, although this policy discourse had justified drip irrigation modernisation. Rather, ease of watering, avoiding night irrigation, reducing time spent on irrigating, and ease of adding fertilizer were their motives.

The new system had a 98,000 m^3 reservoir to store river water and a distribution network supplying 57 sectors (Figure 1). It had 52 multi-outlet hydrants and a total of 331 intakes. The infrastructure soon revealed operating deficiencies due to improper design and construction. The location of the reservoir and the pumps chosen to pressurize the network – submersible pumps – were a poor choice with low energy efficiency. It was the start of a long-term community headache, operationally and financially, because farmers had to repay most of the construction and all operating and maintenance costs. Further, the network was over-sized, as often happens in irrigation modernization projects: to make them 'profitable' (Boelens, 2015; Sanchis-Ibor et al., 2016, 2017): Tecvasa based the system design on a larger land area, to present a lower cost per hectare and facilitate approval. This resulted in higher construction costs than necessary.

3.3. Community reaction and growing discontent

In 2006, a new governing board took over for the irrigator community, and asked the majority agrarian *sindicato* in the region for a report to assess possible reversal of agreements with Tecvasa. The report disappointed the irrigators, confirming that they had no legal way to recover irrigation management until the contract expired in 10 years.

As time went on, irrigators became increasingly frustrated, as network design and management problems arose. Poor construction of certain stretches could not withstand their design pressure and piping often burst. Further, irrigators began having problems with some crops. Drip irrigation was not effective in watering older trees, because it did not cover the entire root system. This also affected production in particular in those irrigated zones with older trees. De Beer et al. (2014:18) observed: "According to the president, the mayor and the water lawyer, the aim of the modernisation was to increase yields. None of the farmers mentioned an increase in yield, and as orange prices sagged, the financial gain became lower and lower. Some farmers recognized a drop in their yield after implementing drip, because the drip system could not reach the extended root systems of old trees that were adapted to surface irrigation".

Irrigators' disenchantment also grew when they saw how they lost autonomy and transparency in the entity's administration. Tecvasa designated several system-operators to manage the infrastructure, following a watering schedule made by a computer program developed for the company by a team of university experts. There was no direct contact between the system operators and the farmers concerning water allocation, which made it difficult for farmers to consensually arrange, negotiate and adapt daily irrigation turns to their needs. Different cultures clashed, as one farmer expressed: "I had a conflict with a Tecvasa engineer and said: you know a lot about books, but not about the field", while characteristically Tecvasa blames the tight-knit community for not functioning according to standards: "The community needs to develop professionally, but there are social and political forces that inhibit this" (quoted by Borghuis et al. 2016:16)

The Sindicat lost most of its operational authority, since Tecvasa was in charge of all management decisions. "Nobody came to speak to us. Tecvasa was like a satellite controlling us", a farmer explained. The current president observes: "We continuously had to remind Tecvasa that *we* are the owners, that they are only service providers, but they would not listen and understand". Tecvasa also prevented farmers from seeing the irrigation meters, to ascertain whether the volume of water reaching their fields matched the company's invoice: "Each sector has a measurement box in which each field has its own measurement device, so each farmer has his own meter. These boxes cannot be entered by the farmers, the system is operated by Tecvasa, the operator is the only one who can control and monitor these measurement houses" (De Beer et al., 2014:17). The impossibility of checking irrigation meters obliged the governing board to closely monitor billing, which interviewees said detected invoices with errors, always in the company's favour.

Fundamentally, Tecvasa followed market morality. Contrary to the deep-rooted collective water control and livelihood morality of the Senyera farmers: "... for Tecvasa, drip implementation in Senyera was a test case. They executed the project to expand business in irrigation. They seized opportunities in Senyera to get involved in drip irrigation due to the subsidies available" (De Beer at al. 2014:24) – and to see how much profit they could skim from the smallholder community. One of the main factors

bothering irrigators was the rising costs of irrigation. O&M costs tripled, from 180 €/ha to 572 €/ha. However, in addition to these costs the works were amortized: 4918 €/ha were to be paid, over ten annual receipts delivered to the irrigators. The total cost of irrigation, consequently, was multiplied six-fold over the 10 years that Tecvasa managed the irrigation system, reaching 1064 €/ha. The company also made hefty profits by introducing fertirrigation systems. Fertilizer prices, seldom more than 400 €/ha before the transformation, reached 1680 €/ha on plots incorporating drip irrigation.

For the smallholder majority, living under privatized and commodified management was harsh. The context of low orange prices and high irrigation costs because of Tecvasa management left little profit margin. A farmer owning an average plot of 0.5 ha made barely 600€ a year, not counting labour and pesticide costs, so in some cases it was too little to pay for picking the oranges. The contract signed with Tecvasa was also especially expensive for the community when users paid late. If some irrigator failed to pay in time, the company did not have to collect, but the Sindicat as a whole had to cover any shortfall and pay the company directly. The company also imposed an anti-abandonment clause, so farmers had to pay even if they gave up on their crops and water rights.

Despite the major problems with the management and service provided, Tecvasa tried to promote this case as exemplary, collaborating with various university researchers. Studies were conducted on deficit irrigation (González-Altozano, 2007), a GIS was designed to integrate agronomy and water to manage Irrigator Communities (Jiménez-Bello *et al*., 2007); several technical assessments were made to increase efficiency in distributing fertilizers (Jiménez-Bello *et al*. 2010); and improvements were developed to minimise energy consumption (Jiménez-Bello *et al*. 2011). However, technicians working for Tecvasa said improvements in irrigation costs from this work, reducing energy costs, were not passed on to the irrigators. They only increased the company's profit margins.

The company also profited by cutting back irrigation system maintenance to a minimum. According to the Sindicat's governing board, the company engaged no insurance for the infrastructure and neglected the facilities, especially in the last few years, so badly that they left various elements out of service when the contract ended. Nearing the end of the 10-year contract, farmers' overall opinion was that "technical operation and maintenance can be done far cheaper, and it should be done by someone with a farming passion, from the community itself" (De Beer et al., 2014:21). By contrast, Tecvasa was a firm believer in the experts' syndrome, wanted to continue, and assumed that it had made the farmers sufficiently dependent upon its expert services – "Tecvasa is sure that it will be difficult for the water users to manage the drip system by themselves" (De Beer et al., 2014:21). After 10 years of "BOT" neoliberal discourse, this may raise eyebrows with respect to the meaning of and intentions behind the "T".

For 10 years, farmers lost their profit margin, transparency and autonomy. The loss of autonomy and dissatisfaction with the company's management discouraged irrigators from attending general assemblies. The one with decision-making power, Tecvasa, only occasionally appeared at these meetings. As a water user expressed: "Tecvasa just came whenever they wanted". In the eyes of Tecvasa, however, they refused to join the general assemblies because they considered it to be "... a fake democracy: out of the whole membership, there are only a few who attend" (quoted in Borghuis et al. 2016:21). However, at the last general assembly of the 10-year management assignment, held to decide about possibly renewing the contract, attendance was massive.

3.4. Dismantling the Trojan horse: the return to collective management

Finally, in early 2015, when the contract expired, the community decided to regain control over the irrigation system. Though Tecvasa wanted to continue its profitable job, the current president explains "We refused. We were fed up with them!". The Sindicat hired a local technician to manage the irrigation system and began taking different actions to reduce irrigation costs. The results from the first year of collective management have been hugely positive, a tremendous economic relief for Senyera's farmers. The community has cut irrigation management costs to 468 €/ha, a reduction of 18.1%. However, the costs of injecting fertilizers in the irrigation system have also dropped by 67.8% (from 1680 €/ha to 541 €/ha) thanks to the governing board's actions. At the same time, farmers say they have observed substantial improvement in their trees' conditions with the new fertilizers. "The trees are green now", as one community member characteristically told us. And despite the substantial cutting of costs, the Sindicat has ended 2015 and 2016 fiscal years with a surplus in their accounts, to be used for collectively decided purposes. In the same vein, Borghuis et al. (2016:25) state that profits are not taken away by Tecvasa but are invested in the collective system: "Even though it is generally believed that the open market will make services cheaper, Senyera community self-management shows the contrary".

Though, as we have explained, the drip system imposes major social requirements for use, and moral scripts, the farmers' conscious transition towards 'recollective water control' shows that technology's 'hardened morality' is not cast in concrete. Reproduction in the user's society, of norms and social relationships as embedded in Tecvasa's externally designed irrigation technology, is not a deterministic one-way process. Senyera water users show that irrigation technology is not an autonomous agent that can dictate the patterns of human social and cultural life. As Pfaffenberger argued, the use, operation and outcomes of sociotechnical designs and networks can be challenged; its original scripts "do not provide the only way to get the job done" (Pfaffenberger 1992:498). For example, recollecting experiences and re-thinking the system, the farmers wanted more flexibility in water conduction and application artefacts. The irrigation system of Senyera is now based on two irrigation types: both surface and drip. For surface irrigation and flooding the fields, a secondary canal provides the water that enters through small gates or *paletes*. Alongside the local drip technician, the *regador* has been re-installed and is the person in control of the surface system. As Borghuis et al. explain: "The farmers contact him to request an irrigation turn, for which the farmer can choose to let him open/close the gate at field level or do it themselves. Farmers using drip irrigation also have access to surface irrigation, which they use during hot periods" (2016:14). Both the reservoir and the community well (only used in case of drought) are accommodated to be able to provide water to both surface and drip irrigation.

Moreover, the farmers interviewed express huge satisfaction at recovering collective management of their irrigation – "Now we manage it. We are proud to have the system back in our own hands". When the automated drip irrigation system breaks down the system operator manually controls the water allocation and the farmers talk directly to him if they want particular changes (e.g., an extra irrigation turn). Face-to-face (or direct phone) contact with the system operator has been re-established, the system operator enjoying trust and closeness similar to the former *regadores*. Farmers express

faith in both the execution of the water control tasks and in payments of their dues, since they can now easily read on the bills what amounts they have been charged for: "Now we have more work, but it is far better. Now we work for ourselves. Now the operator works for us and gives us all the information. This was not the case during Tecvasa. It is not only a question of money; it is also a question of pride" (farmer quoted in Führen, et al., 2015:16). Interestingly, when the board suggested to lower the technician's wage, the farmers opposed this, stressing the fine relationship between system operator and users.

This also revived meetings at the bar, both informal and formal, ordinary and extraordinary. Discussing their modes of water governance, water rights and allocation practices, and infrastructure, it shows that at the heart of the matter is autonomy in decision-making, transparency and closeness, fair obligations and prices, and flexible use and operation of technology. Users feel that they can develop and practice their own norms, that they have been able to master and re-moralize their technology and system management. This has recovered the climate of trust that had been broken by privatizing management. This is what we have highlighted with the notion of '*recollecting oneself*': "To use one's memory to become aware", and in the end "To become aware of one's immediate situation or purpose after a distraction".[5] Senyera's efforts and struggles are not just *against* privatization but also *for* a renewed hydrosocial network. They express that their renewed community identity, adapted sociotechnical system, shared water governance and regained water users' autonomy are grounded in recollective consciousness and re-membrance.

4. Conclusions. Re-moralizing and recollecting water management

Reforming and renewing irrigation technology unavoidably redesigns the social dimension of irrigation. Even though neither 'the expert designers' nor 'the users' are monolithic moral and normative blocks with standard interests and assumptions, but complex networks often accommodating non-aligned values, norms and visions, infrastructure changes do in fact change norms and organizations, and can therefore alter their intangible values.

When these changes happen within collective management bodies, by their own decision and under autonomous control by users, interactive, two-way adaptation occurs. On the one hand, the community applies or modifies technology according to their moral criteria and matches the new infrastructure to their needs, by intervening in or supervising engineering design to reform the irrigation system, or later, by introducing adjustments and creating their own particular usage protocols. On the other, conversely, the adopted technology may induce significant changes in community structure and dynamics, often unexpectedly, which oblige the entity to reorganize to adjust to or take advantage of the new hardware's demands and potential.

The case of Senyera could have fit into these parameters, since most farmers had no significant objections to implementing the new technology, although they did not share the aims usually associated with this irrigation technology ('optimizing efficiency'). Rather than saving water or increasing production, farmers in Senyera, mostly elderly, wanted the convenience offered by this technology – mainly to stop having to irrigate at

[5] www.thefreedictionary.com/recollect

night. However, in Senyera the new technology was assimilated through a different, sudden, conflict-ridden process. First, change of technology and management was not by community initiative, but proposed by outside agents, with goals and morality completely alien to the collective farmers' entity. Next, above all, because technological change was accompanied by privatizing management, dispossessing some fundamental rights, and breaking down their daily practices, irrigators perceived this as invasive, and it prevented any gentle adaptation.

Management privatization both externalized and expropriated Senyera water users' own social and material properties. This process is more far-reaching than just economic expropriation: not only part of the products of the irrigation process and the means of production are expropriated, but also the local definitions of labour place, labour time and labour rhythm. Next, in Senyera, locally existing skills and knowledge regarding water design and use have fallen prey to this process of profound expropriation. Existing norms were challenged concerning the organization of labour to operate and maintain the system, and local agreements regarding the distribution of rights and obligations.

As the Senyera case shows, the issue of communities' managerial independence versus 'outside' political-operative control was defined not only by (neoliberal and/or modernizing) legal provisions and organizational structures, but also by the very details of technical irrigation design. In Senyera, the network design prevented users from seeing irrigation meters, or defining the irrigation turn schedule (computerized) so system transparency was lost, breaking long-standing bonds among irrigators and between them and the *regador*, and thereby the foundations for users' trust of the system.

Tecvasa had the right to decide about schedules, flow rights, water distribution and the choice and quantity of fertilizer in the water. Water users maintained their rights to water shares but their right to use and control the infrastructure was withdrawn, as they did not have access to the distribution facilities and thus were not able or allowed to operate the drip irrigation system by themselves. This power, driven by the criteria of maximizing business profits, with the lack of transparency and an iron-clad contract, transferred high operating costs to irrigators, kept maintenance investments to a minimum and generated no return for users from technological improvements that were gradually incorporated into the irrigation system. Even from an exclusively economic perspective, contrary to neoliberal discourses about private, free-market management, Senyera's experience shows how collective action administers irrigation more efficiently than giving up management to a private enterprise. Much of this advantage is due precisely to the shared collaboration morality and quest for the common well-being, which outsourced management cannot provide, because they need to maximize industrial profit. This is due, ultimately, to an idiosyncrasy that Tecvasa never grasped.

The contract was not extended for several good reasons: high system operation and maintenance costs, the lack of transparency and access to operation facilities, and disputes about legitimacy. Furthermore, there was a strong drive to return to communal autonomy and self-governance, through a process of re-collection. Farmers remembered and reworked their social practices, their informal networks and the benefits of collective action. They were still proud of their identity, more strongly united by the invasion by an outside agent that had taken over control of their irrigation system.

Farmers re-membered themselves by activating and renovating their management network, recovering the unwritten social norms, and achieving an unprecedentedly high

level of participation in the general assemblies. They also re-membered themselves by making the drip technology their own, by adapting the hardware to their needs and combining localized irrigation with periodic floods through the old gravity network. All of this resulted in a re-commoning process, taking back autonomy, self-governance and collective action. The hydro-social system has been re-moralized according to ancient principles and practices that govern commons in the region since medieval times, but assimilating in it new hardware.

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Figure

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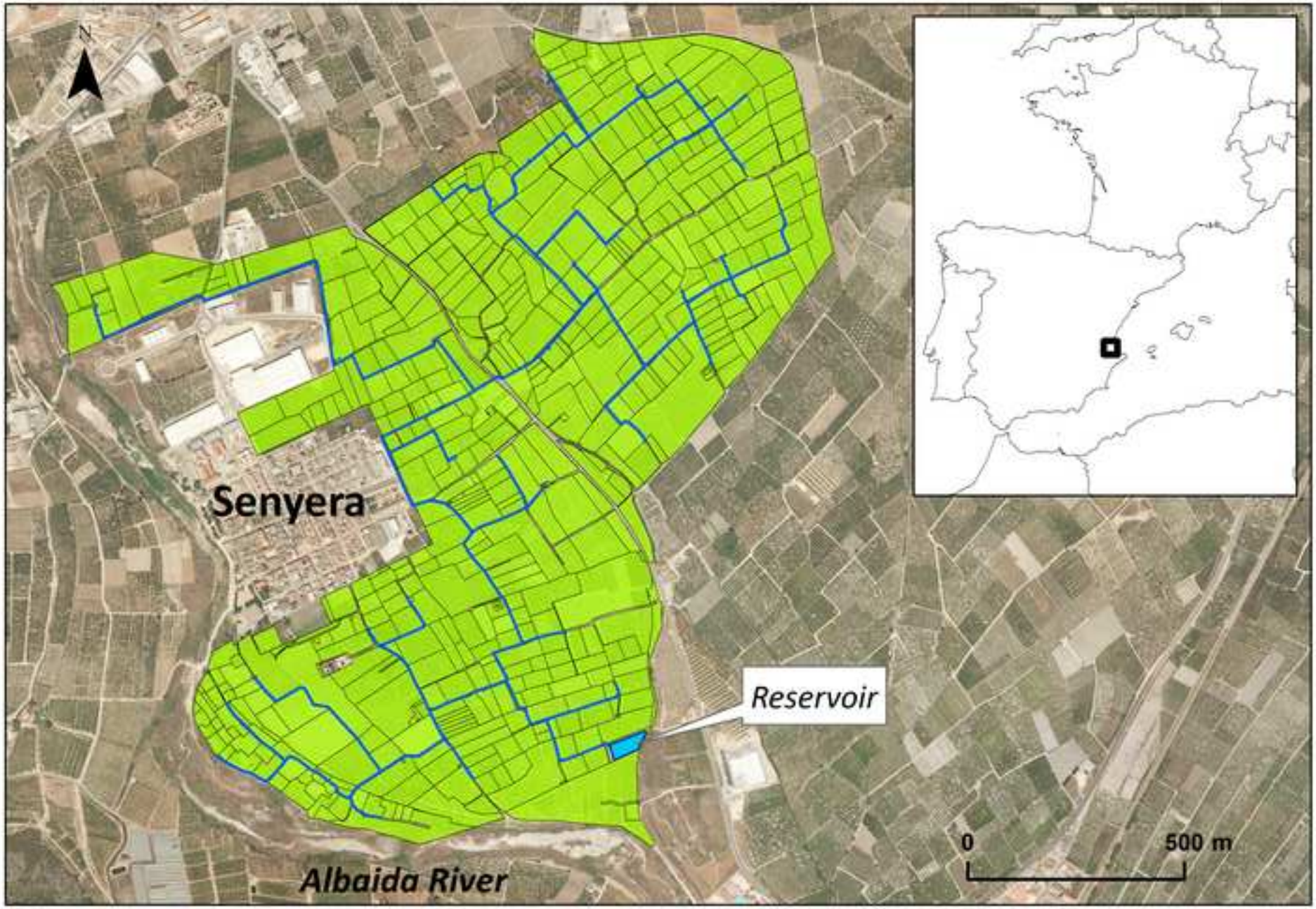

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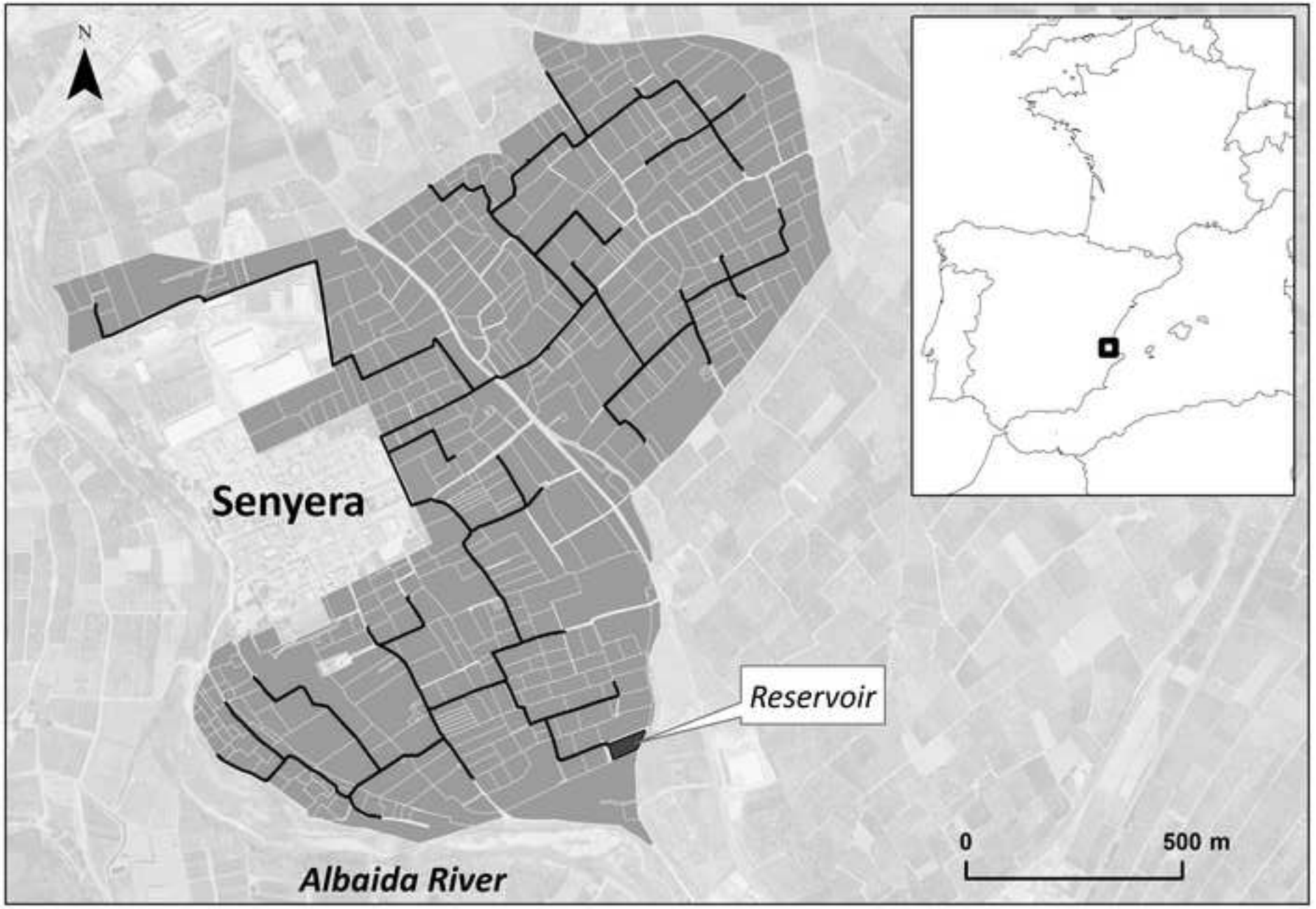

Highlights

- Forceful service company penetration into irrigation management is expanding
- Drip irrigation adoption is a Trojan horse facilitating private sector intrusion
- We analyse disputed privatization and return to collective control
- Privatization removes transparency, users’ autonomy and increases irrigation costs
- Users can reload and 're-member' their collective action, re-moralizing management

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