Pursuing the State's Hydraulic Mission in a Context of Private Groundwater Use in the Izmir Province, Turkey

Selin Le Visage, Marcel Kuper, Jean-Philippe Venot, Murat Yercan, Ela Atiş

Le Visage, S; Kuper, M.; Venot J.-P. Yercan, M. and Atış, E. 2018.
Pursuing the state's hydraulic mission in a context of
private groundwater use in the Izmir Province, Turkey.
Water Alternatives 11(2): 421-438

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Selin Le Visage

Paris Nanterre University, UMR LAVUE; and UMR G-EAU, Cirad, University of Montpellier, Montpellier, France; s.levisage@gmail.com

Marcel Kuper

G-EAU, Cirad, University of Montpellier, Montpellier, France; and IAV Hassan II, Rabat, Morocco; marcel.kuper@cirad.fr

Jean-Philippe Venot

G-EAU, IRD, University of Montpellier, Montpellier, France; WRM Group, Wageningen University; and RUA, Cambodia; jean-philippe.venot@ird.fr

Murat Yercan

Department of Agricultural Economics, Ege University, Izmir, Turkey; murat.yercan@ege.edu.tr

Ela Atış

Department of Agricultural Economics, Ege University, Izmir, Turkey; ela.atis@ege.edu.tr

ABSTRACT: Since the 2008 global food crisis there has been renewed interest in irrigation infrastructural development, which has sometimes been taken up by the same agencies that developed large-scale surface irrigation in the 20th century. This article presents a case study of the recent '1000 small dams in 1000 days' programme in Turkey to analyse the continuities and ruptures in the way the development of surface irrigation infrastructure is conducted by the state. The comparison of two small dam projects in the dynamic agricultural province of Izmir shows how the irrigation administration is pursuing its hydraulic mission, sustaining its expertise and strengthening its authority. The development of infrastructure goes beyond irrigation objectives, as it materialises the iconic power of the state in rural areas by rapidly providing visible results. However, the development of public irrigation is taking place in a very different context from that of the 20th century. The state faces farmers who are already using groundwater for irrigation and hence challenge the hierarchical organisation of public surface irrigation schemes. Although the irrigation administration continues to dictate the terms of irrigation development, it acknowledges these changes by engaging in pragmatic discussions with farmers, who are no longer mere 'beneficiaries' but actively engage in negotiations to play a significant role in the management of newly built irrigation infrastructure.

KEYWORDS: Small dams, conjunctive use, irrigation associations, irrigation cooperatives, bureaucracy, control, Turkey

INTRODUCTION

In the 19th and 20th centuries the large-scale, state-led development of water resources was a key element in the modernisation of agriculture in many countries around the world (Bakker, 2002). In the

global South this trend accelerated in the 1950s as governments, often supported by international donors, engaged in what has been dubbed a "hydraulic mission" (Allan, 2003; 2010; Wester, 2009). At the time, the development of large-scale hydraulic infrastructure was at the heart of nation building, implemented by hydraulic administrations, which have been labelled 'hydrocracies' (e.g. Molle et al., 2009).

The ambition of the state to control water, land, farming systems, value chains and, ultimately, the farmer, characterised large-scale irrigation development (Pascon, 1978; Lees, 1986; Béthemont, 2009). However, from the 1980s onwards the central role of the state in planning and managing irrigation started to shift due to several trends: (1) increasing recognition of the negative social and environmental impacts of the state-led, large-scale irrigation development model (Blanc and Bonin, 2008; Béthemont et al., 2003) and the dissatisfaction of users who subverted the planned development process (Poncet et al., 2010), (2) the financial burden that large-scale irrigation represented for the state in a context of economic liberalisation and structural adjustment plans (Sampath, 1992), (3) the promotion by donors and governments of participatory irrigation management and/or the transfer of management responsibilities to farmers' associations (Coward, 1980; Ostrom, 1992; Agrawal, 2003) and (4) the "general abundance of foodgrain in the world associated with the rapidly escalating capital cost of surface irrigation development" (Svendsen and Rosegrant, 1994).

At the same time hydraulic 'bureaucracies', reluctant to devolve their power, continued to function in a similar way (Molle et al., 2009). They often used reforms imposed on them by external donors to maintain the upper hand in irrigation management and development, for example by creating water users associations subordinated to the administration (Suhardiman, 2013; Harris and Islar, 2014). Hydraulic administrations in the global South, therefore, did not actually abandon their hydraulic mission (Swatuk, 2008). They officially complied with institutional and policy reforms in the 1990s and early 2000s and pursued their core activity of infrastructure planning and development.

Following the global food crisis and the recommendations in the World Development Report 2008 (World Bank, 2007), there has been a striking return of infrastructure development projects in the agricultural sector worldwide. These have included desalination in Morocco, multiple donor-supported irrigation projects in Cambodia (Ivars and Venot, 2018) and the Sahel Irrigation Initiative funded by the World Bank that aims to extend the current irrigated area from 400,000 ha to 1 million ha in the Sahel region of West Africa (World Bank, 2017). The promotion of infrastructural projects appears to be taking place with a new rhetoric of modernity and development, since what is presented as 'modern' has evolved over time in accordance with changing expectations: dimensions of participation, 'integrated projects', social and, more recently, environmental considerations. However, supply-driven water management strategies focusing on the construction of irrigation infrastructure are being implemented in a different context from that of the 20th century. Arguably, one of the biggest and most profound changes in irrigation over the past 40 years concerns the emergence of a global 'groundwater economy' (Shah et al., 2003). In a context of increased water demand, the availability of relatively cheap pumping technology and water policies driven by ideas of economic liberalisation, groundwater-based private irrigation has boomed, also within public irrigation schemes (Giordano and Villholth, 2007), boosting the agricultural economy (Shah et al., 2003; Shah, 2005; Llamas and Martínez-Santos, 2005). More than 100 million ha, i.e. a third of the world's irrigated area, now rely on groundwater abstraction (Margat and van der Gun, 2013). In this groundwater economy farmers have invested in tubewells mainly on their own initiative rather than through their governments or communities. Where farmers gained experience in irrigation development, the state in many cases had little expertise in groundwater extraction or management or even lacked the legitimacy to intervene in groundwater-based irrigation (Shah, 2009). Thus, public irrigation projects have to deal with new field realities after 30 to 40 years of a farmer-led expanding groundwater economy. Within this new context, the aim of this article is to analyse how the planning and implementation of infrastructure and the management of and access to irrigation supply are negotiated between farmers and the hydraulic

administrations. This article is investigates the case of Turkey's hydraulic administration, which is investing in new infrastructure for agricultural development, and its farmers, who have experience, some of several decades, in using groundwater for irrigation. This study shows how the renewed encounter between the hydraulic administration and rural communities is characterised by negotiations concerning the management of new irrigation infrastructure.

The article begins by looking at two contrasting small dam projects, implemented as part of a national initiative named '1000 small dams in 1000 days'. This initiative marks the presence of the state in rural areas through the development of irrigation infrastructure and constitutes, we argue, the pursuit and adaptation of its hydraulic mission in a new context. Taking 'small dams' as an entry point for our analysis echoes older and more recent scholarly attention to irrigation infrastructure (Molle, 1994; Shah and Raju, 2002; Riaux et al., 2014; Venot and Krishnan, 2011) that has been shown to provide an interesting vantage point from which to study broader issues of the governance of natural resources (Aubriot and Prabhakar, 2011). Compared to large dams, which have mostly been studied in relation to issues of displacement, social conflict and environmental impacts, small dams offer an opportunity to analyse the encounter between planned irrigation projects and existing irrigation dynamics at a local scale. This is possible because of their specific characteristics: these are small projects and yet they can have significant impacts on rural communities at the local level; they can be planned and built rapidly, often as part of national-level initiatives. Indeed, a small dam is a hydraulic object but also a symbolic one. Governments in many countries worldwide have resorted to this strategy to showcase their role, as well as assert their authority over rural areas (e.g. Venot and Krishnan, 2011; see also Faggi, 1990, for a similar argument on irrigation projects in general).

We will show that, in the case of Turkey, the '1000 small dams in 1000 days' programme should be read as a continuation of the administration's hydraulic mission. However, since it is taking place in a context where groundwater now plays a significant role in the rural economy, the way this mission is unfolding at the local level has changed considerably. We will demonstrate this through two contrasting case studies. The first relates to a new small dam coveted by a well-organised irrigation cooperative located outside a publicly managed irrigation system. The second relates to an irrigation community located within the large-scale Gediz irrigation scheme, originally established by the state but where farmers now irrigate individually using groundwater. This community appears much more reluctant to engage in collective action concerning irrigation water, including the management of a newly built small dam. Before turning to the case studies, the following section provides a brief overview of the role of the Turkish state in irrigation development.

THE ENGAGEMENT OF THE TURKISH STATE IN IRRIGATION DEVELOPMENT

This section provides some keys to understanding the hydraulic administration's current modes of engagement in the irrigation sector and looks at the many changes in the institutional history of water development and management in Turkey, as well as at the continued importance of irrigation for the state. The hydraulic administration has continued to develop expertise and indeed a certain monopoly on irrigation despite the apparent contrasts between (1) a period that saw the development of surface water and the construction of large-scale irrigation schemes (1950s-1980s), (2) a period of irrigation management transfer (since the late 1980s, early 1990s) and (3) an increase in the use of private groundwater (particularly since the 1990s). Irrigation continued to play a central role not only in agricultural development but also in the building of the nation. The hydraulic administration remained involved in the management of water resources, for example through the supervision of irrigation associations, while the recent '1000 small dams in 1000 days' programme marks the pursuit of a direct role in the development of irrigation infrastructure.

Irrigation management transfer and the hydraulic bureaucracy

After the fall of the Ottoman Empire the republican elite led by M. Kemal Atatürk aimed to modernise Turkey and establish a modern state by creating a new legal system and public bureaucracy (Kibaroğlu and Baskan, 2011). Between the 1920s and 1950s the state focused on the exploration of new land and water resources (Tigrek and Kibaroğlu, 2011), through surveys led by new government bodies, for example the Ministry of Public Works and the Electrical Power Resources Survey and Development Administration (Kibaroğlu and Baskan, 2011). These organisations also oversaw the implementation of the first large-scale hydraulic infrastructure. One of the most pressing goals was to improve public health, which explains why the Ministry of Health formulated the Law on Waters. This led to investment in drinking water supply and the draining of swamps (ibid). The country's economic development was stimulated by transforming large spaces of the Turkish urban and rural geography through the intensive construction of infrastructure and the systematic exploitation of water resources for hydropower or irrigation.

In 1953 the State Hydraulic Works (Turkish acronym DSI) was created and became central to the state's involvement in the irrigation sector, with technical water expertise concentrated in a civil engineering corps. The DSI answers directly to the central government at national level rather than to local administrations, which gives it a high level of autonomy. Through the DSI the state invested massively in large-scale hydraulic planning for Turkey's socioeconomic development (Warner, 2008; Kibaroğlu et al., 2009). This also led to a centralised and nationalised system of resources management that reinforced the government's power over certain regions, as in the case of the GAP in the east of Turkey (*Güneydoğu Anadolu Projesi,* or Southeastern Anatolia Project) (Harris and Alatout, 2010).

As public expenditure was high, Turkey adopted new water management approaches in the 1990s to satisfy conditions laid down by major donors, including the International Monetary Fund (IMF) and the World Bank (Kibaroğlu et al., 2012). The state liberalised the water sector and engaged in the transfer of irrigation management, as explained by Warner (2008): "the Turks clearly decided not to fight the 'consensus' but rather conform to it when money became very tight in 1994. (…) To be able to count on its water wealth to help secure its security position – but finding itself able neither to access multilateral funds nor to shoulder the cost of GAP on its own – Turkey liberalised its water sector". Thus, in 1993 the Turkish government embarked on an ambitious reform project to transfer irrigation management from the DSI to local irrigation associations. This was also motivated by a desire to reduce the administrative and financial burdens on the state caused by large-scale surface irrigation systems (Svendsen and Murray-Rust, 2001; Yercan, 2003; Yercan et al., 2004, 2009; Dorsan et al., 2004; Koç, 2007; Kibaroğlu et al., 2009). In an accelerated programme the DSI transferred the management of close to 1 million ha in 3 years (Svendsen and Nott, 2000). Uysal and Atış (2010) calculated that, by 2004, 1.86 million ha (i.e. 94% of the total area under the direct control of the DSI) had been transferred.

However, the DSI was able to maintain a power base in the large-scale irrigation schemes whose management had been transferred. Only the responsibility for the operation and maintenance (O&M) of the irrigation networks had been transferred to irrigation associations. The latter were responsible for distributing water to farmers, cleaning, maintaining and repairing the canals and collecting payments. The DSI still owned the infrastructure (Scheumann and Ul-Hassan, 2001) and remained in charge of the overall planning of water distribution. While the transfer of management to irrigation associations brought change – for example, improved fee collection (Dorsan et al., 2004), reduced wages and an expansion of the irrigated area in some cases (Yercan et al., 2004) – the DSI retained its coordinating role and technical expertise. Our interviews with farmers within the large-scale irrigation scheme of Menemen in 2015 and 2016 reflect the key position the DSI has maintained: irrigators feel barely involved in decision-making in what they repeatedly refer to as the "DSI's irrigation scheme".

Furthermore, it was not until 2009 that farmers directly elected members of the irrigation association boards. In 2011 there was even an overt return of the DSI to irrigation management: Law 6172 of 2011 transformed existing irrigation associations into legal public entities under the authority of the DSI. While the absence of a law clarifying the status of irrigation associations and their relationships with the DSI may have hampered their involvement in operation and maintenance (Uysal and Atış, 2010), the new law could be interpreted as a means for the administration to maintain control over irrigation management (as is the case in Morocco, where Water Users Associations have a member of the administration on their board; see Kadiri et al., 2009, for an analysis of the appropriation of these associations by local communities). The DSI's influence over irrigation associations and irrigation management more generally was clearly highlighted during our interviews:

> Irrigation associations initially faced some issues. The DSI had to transfer the management of its irrigation networks, so these associations were created, but before there was real regulation. (…) Participation is good (…) but without control [by the DSI] it leads to political behaviour: employment of friends, low fee collection from the farmers… Many associations got into debt" (interview with a secretary of an irrigation association in the Menemen plains, Gediz basin, 2015).

Our interviews with board members of irrigation associations also showed that the management transfer frequently led to problems of maintenance: "the main issue was the deterioration of irrigation networks. There are places without water because canals ended up in poor condition" (interview with a secretary of an irrigation association in the Menemen plains, Gediz basin, 2015). This justified the DSI's supervisory role over the irrigation associations with regard to the technical and administrative aspects of large-scale schemes and particularly its control of the budgets.

Turkey thus officially embraced the international trend towards irrigation management transfer in large public irrigation schemes. However, while it conformed to the consensus, as argued by Warner (2008), the DSI never intended to abandon its core activity of irrigation planning and development and supervising irrigation associations. This is illustrated, for example, by the implementation of the GAP, which continued well into the 1990s (Özerol and Bressers, 2016).

Keeping an eye on private groundwater use through formal irrigation cooperatives

As in many other countries, groundwater use in Turkey has increased significantly in recent decades. According to the DSI, groundwater irrigated areas increased from 100,000 ha in 1978 to over 600,000 ha in 2012. These figures are likely to underestimate actual groundwater-based irrigated areas, as (1) they are difficult to monitor as farmers often dig wells on their own initiative, and (2) they overlook the extent of conjunctive use of surface water and groundwater within large-scale irrigation schemes.

In contrast to many countries where the groundwater boom took place 'under the radar' of the administration (see Shah, 2009 on South Asia), state involvement in groundwater exploitation was high in Turkey. Indeed, while farmers often gain access to and use groundwater individually, the state monitored this sector, especially through the establishment of irrigation cooperatives. Although based on a legal framework dating back to 1954, such cooperatives have not been much studied. They partially inspired the irrigation management transfer programme (Svendsen and Nott, 2000) and, according to the DSI, represented about 480,000 ha of groundwater-based irrigation in 2014. Irrigation cooperatives are formal, farmer-managed organisations (with dozens to hundreds of members), which manage small-scale irrigation schemes at village level (500 to 1000 ha). They are responsible for managing collective boreholes, including the distribution of groundwater to farmers, the maintenance and repair of the boreholes and the collection of fees from farmers. They coordinate with the energy company, the DSI and the local authorities. In some cases, irrigation cooperatives also manage local surface water resources. Cooperatives enabled the collective organisation of groundwater irrigation, which farmers otherwise often engage in on an individual basis. They allowed an increase in irrigated area by providing water to farmers who otherwise could not have invested in a borehole. As with

irrigation associations in large-scale systems, cooperatives face multiple challenges, including high levels of debt. Based on our analysis, the keys to a cooperative's 'success' appear to be: (1) the centrality of its role in the local economy through its enabling of irrigated agriculture, (2) the degree to which it controls the distribution of water resources in the area (cf. Shah, 1995 on the concept of the 'salience' of milk cooperatives) and (3) its members' relationships with the local administration and the DSI. Although irrigation cooperatives are far less dependent on the DSI than irrigation associations, they nevertheless constitute a way for the state to supervise groundwater abstraction. Within irrigation cooperatives, water is not extracted by countless uncontrollable individual pumps but distributed by a few collective boreholes, which are drilled with the authorisation of the DSI and often equipped under their technical supervision. Irrigation cooperatives are also a conduit through which the irrigation administration can promote specific practices and technologies, such as drip irrigation, or even with whom they negotiate the specifics of projects, such as the management of newly constructed small dams. As such, although not at the core of its activity, the DSI has always maintained expertise in groundwater exploration and a key role in providing authorisation and technical recommendations for drilling. The role of the DSI, and sometimes of the Special Provincial Administration, in groundwater governance was clearly highlighted during our interviews with employees and board members of several irrigation cooperatives in Izmir: "in 2005 Özel Idare [the Special Provincial Administration] installed a closed [pressurised] irrigation system for six boreholes. This was free of charge. But we had to pay back the project they carried out in 2008 [a similar project for other boreholes]" (interview with a president of a cooperative, Izmir province, 2015).

The '1000 small dams in 1000 days' programme: Pursuing public irrigation development

In 2006 the State Planning Organisation of the Turkish Prime Ministry prepared the government's ninth development plan 2007-2013, which recognised "the significant role of irrigation in improving the performance of the agricultural sector" and highlighted the need to expand irrigation further. In 2012 the Minister of Forestry and Water Affairs launched the '1000 small dams in 1000 days' programme on a national scale. According to the information provided in 2016 by the DSI, who implemented the programme, the aim was to increase the total water storage by 750 Mm^3 to irrigate an additional 170,000 ha. The small dam programme was intended to provide faster results than larger projects, with greater geographical coverage: "it is easy with small dams. To build a small dam we can do everything in three years! (…) Small dams are better than big dams for local development; they only affect a limited area. Also, we have a rate of return in only seven years!" (interview with DSI employee in Ankara, 2017). Interviews with DSI staff also illustrated how the programme showcased the role of central government in country-wide rural development: "it is a programme launched by the Minister of Forestry and Water Affairs to improve irrigation. (…) We, we do as much as possible, according to what is possible in our region" (interview with DSI employee in Izmir, 2017).

Indeed, the programme was presented as the government having to prevent contestation by the rural population. The latter felt marginalised following the restructuring of the agricultural sector that entailed a reform of the credit system, a reduction in subsidies, the privatisation of agricultural companies and the restructuring of marketing cooperatives (Aydın, 2002; 2010; Keyder and Yenal, 2011). This was exacerbated by administrative reforms under the metropolisation policy, which led to the suppression of many local municipalities and village authorities, and the extension of metropolitan areas. More than half the population are now officially 'metropolitan' residents, despite actually living in remote villages in sparsely populated rural areas. These reforms also affected water management as they weakened the organisations in charge of local rural planning, which were directly involved in the development of small-scale irrigation. For instance, the role of *muhtars*, village representatives, was reduced to administrative support, while the General Directorate of Rural Services and, subsequently, the Special Provincial Administration, both of whom had been active in rural development programmes, ceased to exist.

In this context, the *gölet* (small dam), a hydraulic artefact, became a political object, and the '1000 small dams in 1000 days' programme a channel through which the central government could showcase its continued interest in rural areas by investing in hydraulic infrastructure. According to the DSI, the programme was intended to contribute to several national objectives, including (1) increased water storage capacity, (2) the transition from rainfed to irrigated agriculture in rural areas that were not covered by large-scale irrigation schemes and (3) the transition to pressurised irrigation systems (sprinkler and drip – more easily installed in small dam projects than converting large-scale schemes) to alleviate the pressure on groundwater resources. The programme also aimed to stimulate the Turkish economy by involving the private sector in infrastructure construction, under the supervision of the DSI – a trend that had begun in the 1990s. Beyond the national objectives the DSI's communication materials emphasised the project's economic, environmental and social goals at the local level, such as increased revenue from irrigated agriculture, the prevention of fire and soil erosion, flood protection and the creation of recreational areas.

The DSI played a key role in implementing the programme. Its regional delegations were in charge of designing as many small dam projects as possible. Though the programme faced delays, 1000 projects had been identified, and many built, by 2016. The choice of dam sites was to be based on hydrological and economic opportunities. When a request was made locally – by muhtars or irrigation cooperatives, for instance – the DSI undertook a feasibility study and subsequently financed the construction of the small dam from its own budget, without needing permission from local authorities or other ministries. The majority of small dams were built with irrigation development in mind, but a few with low irrigation potential were justified by other means, such as fire prevention, or were simply a response to political pressure ahead of elections. There was no official consultation with local communities prior to construction. The DSI contacted those local actors to whom it wished to delegate the management of the gölet once it was built. Based on our interviews with the DSI, we assume that, as well as representing a technocratic approach to irrigation development, the general lack of consultation in the planning of the small dam projects reflected a desire to achieve visible results quickly rather than enhance integrated local development. Yet, despite the apparently linear, top-down, homogenous planning and design of the dams, the DSI looked for 'takers' of the project in a pragmatic way. DSI representatives were able to transfer the management of the small dams to irrigation cooperatives, district municipalities or village authorities (outside the metropolitan areas). However, the transfer would take place on the condition that the cost of the project would be reimbursed by users, which had to be negotiated on a case-by-case basis. This had not been implemented by 2016. The following section investigates two small dam projects with contrasting situations in terms of irrigation practices: one where farmers have organised themselves in irrigation cooperatives around groundwater abstraction and another where the community has access to a large surface irrigation scheme built by the state.

METHODOLOGY AND BRIEF DESCRIPTION OF THE CASE STUDIES

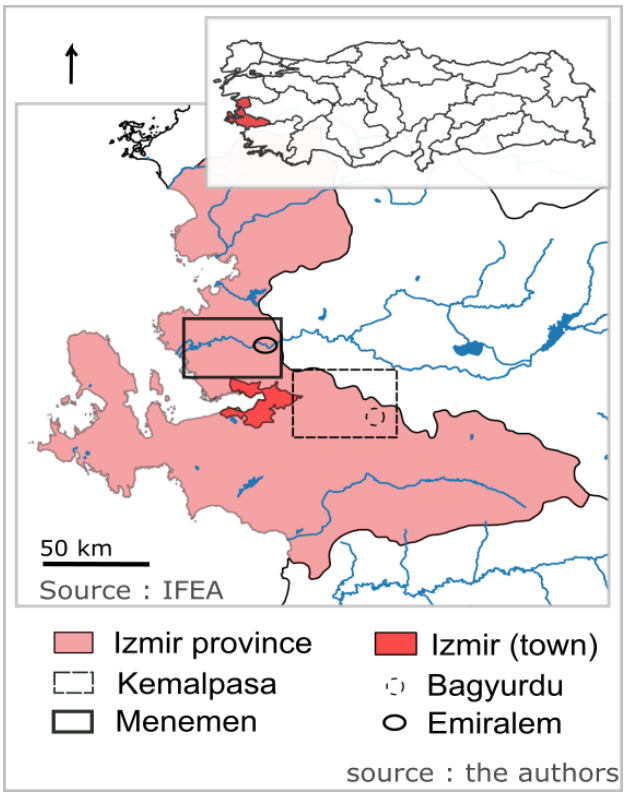
We adopted an empirical approach using a specific irrigation infrastructure – small dams – as an entry point to explore around 40 years of irrigation practice in Turkey's Izmir province. The main objective of the study was to investigate the encounter between the state and farmers in a context where state-led small dam projects are often implemented in areas where farmers have organised themselves to abstract groundwater for irrigation.

To show how the local history of irrigation influenced the relationship between farmers and the DSI, research was conducted in two contrasting regions of Izmir province – one entirely dependent on groundwater, the other characterised by conjunctive water use in a large-scale irrigation system. In the first case we selected the village of Bağyurdu in Kemalpaşa district and in the second the village of Emiralem in Menemen district (see Figure 1). In Kemalpaşa district formal irrigation cooperatives

manage groundwater access and distribution at the village scale. These cooperatives enable farmers to grow profitable irrigated crops without having to invest in expensive individual tubewells. The Menemen district, on the other hand, is located in the downstream part of the large-scale Gediz irrigation scheme, which is characterised by conjunctive water use. There, although farmers are supposedly organised in irrigation associations to operate and maintain canals, countless private tubewells dot the agricultural landscape, competing with and complementing the surface water delivered by the public irrigation system. In this case, individual access to groundwater offers farmers an opportunity to switch to higher value crops and presents an alternative to the bureaucratic organisation of irrigation.

In both case studies we conducted open and semi-structured interviews with farmers, board members of the irrigation cooperatives (in Bağyurdu and the neighbouring villages) and irrigation associations (in Menemen), together with direct observation of agricultural practice in the two villages. Semi-structured interviews with key figures in 13 other communities (including seven irrigation cooperatives) potentially involved in the '1000 small dams in 1000 days' programme in Izmir province gave our results a broader perspective. We also conducted interviews with local officials from the Ministry of Food, Agriculture and Livestock in both districts, and with representatives of the chambers of agriculture. Finally, we interviewed DSI staff in Izmir and Ankara for general information about the small dam programme and to discuss our field observations.

Figure 1. Location of the case studies.



Note: We used vector maps provided by the IFEA (French Institute of Anatolian Studies)

The relationships between the state and its irrigation administration on the one hand and the communities and farmers on the other differ in the two case studies. In the village of Bağyurdu in Kemalpaşa district although the irrigation cooperative is relatively autonomous, it frequently interacts

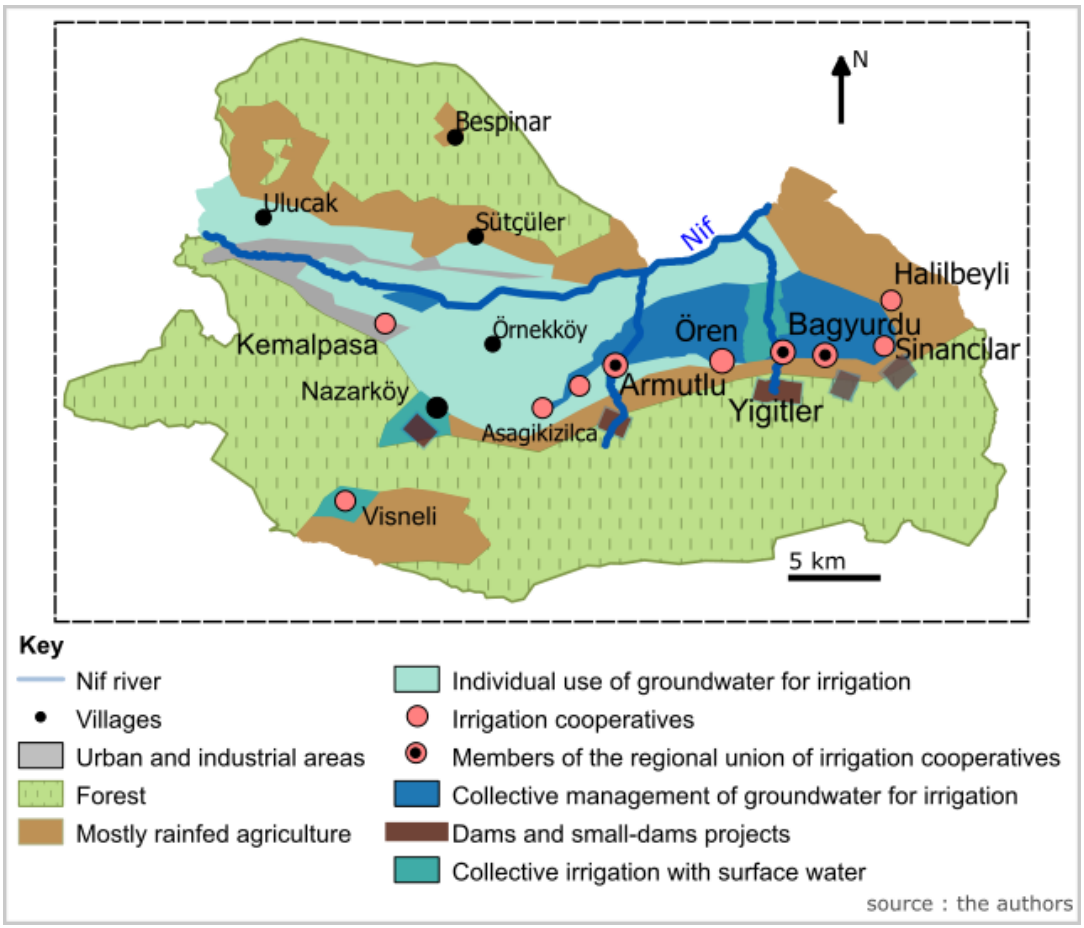
with the DSI, particularly when the latter plans, designs and implements new projects, such as the installation of tubewells or the modernisation of irrigation facilities. In Emiralem in the Menemen district the relationship between farmers and the DSI is tense. This is linked to the fact that farmers previously refused to use and pay for surface water, leading to the removal of the surface irrigation infrastructure and precipitating a switch to individual, groundwater-based irrigation. In the following sections we will show how their divergent histories of irrigation management and development influenced the way each community engaged with the DSI's initiative of building a small dam in their vicinity.

IMPLEMENTING A SMALL DAM PROJECT: CONTRASTING FARMER RESPONSES

Cooperatives and surface water: Formal institutions and a coveted resource

Agriculture in Kemalpaşa district was rain-fed until groundwater access enabled the irrigated fruit production for which the region is now known (peaches, olives, grapes), particularly its exported cherries. Groundwater was first used by a few farmers in the 1970-1980s and then expanded in the 1990s with growing numbers of individual private boreholes used concomitantly with drip irrigation. From the 1960s onwards ten irrigation cooperatives were established in the Kemalpaşa district, mostly along the tributaries of the Nif river (see Figure 2), irrigating a total area of more than 3000 ha by 2015. This figure can be compared with the area irrigated individually or collectively in the district, which was evaluated in 2015 at 13,000 ha by the Ministry of Agriculture.

Figure 2. Irrigation systems in the agricultural valley of Kemalpaşa.



The expansion of irrigation cooperatives, in number and area, went hand in hand with the development of irrigation and arboriculture in the district and is an indication that collective irrigation management at village level has strengthened over time. In successful cooperatives the board and employees regularly interact with their members to ensure the efficiency and security of the water distribution system. This includes reducing water turns, establishing lists and making staff work at night. "During summer I work until midnight to open and close the valves for the water turns. (…) Now it is calmer. This morning a farmer called me; a pipe was leaking close to his garden" (interview with a cooperative employee, Izmir province, 2016). However, not all cooperatives followed the same trajectory, and such organisation should not be idealised. In villages where farmers rely on irrigation for their livelihoods some cooperatives took control of water services, managing both surface and groundwater access. In villages with active land markets, cooperatives progressively took over more surface area through flexible rules for water use (but strict rules for payments and debts), with staff providing services right up to farm plots. Meanwhile, other cooperatives faced real difficulties, particularly concerning the repayment of debts to the DSI for borehole installation or securing the energy costs of their operation. Cooperatives in Kemalpaşa sometimes faced challenges stemming from farmers' lack of interest in irrigated agriculture and preference for livestock, which reduced the number of potential members.

In recent years irrigation cooperatives have faced major financial challenges. These were related to increased energy costs due to a drop in the water table (which varies between 20 and 250 metres in the area) triggered by growing numbers of boreholes and the establishment of water-consuming industries. The increased energy costs also partly explained why irrigation cooperatives 'welcomed' the state's small dam programme in the region.

The irrigation cooperative of Bağyurdu in Kemalpaşa district is one of the biggest in the area with 800 members officially, irrigating 700 ha. Plots there are very small (0.3-0.5 ha) and the average farm size is 2-3 ha, only part of which is irrigated. The cooperative became operational in 1981 when the DSI installed 16 boreholes. It has managed to reimburse the total investment of the 22 boreholes it now owns, among which 18 were functioning in 2017. The boreholes are interconnected and the network is structured in three main pipelines supplying water to farms. In addition to groundwater, the irrigation cooperative also provided surface water through a small diversion structure, but surface water only flowed until May. From May onwards only groundwater is generally used. Between 2012 and 2014 a 37 metre-high small dam (0.432 Mm^3) was built upstream of the irrigation cooperative as part of the '1000 small dams in 1000 days' programme. The dam was designed for agricultural use, with an underground water distribution network intended to irrigate 115 ha. During the planning stage of the project the DSI contacted the Bağyurdu cooperative informally to obtain information on the local agricultural and irrigation conditions, but no official meetings were held.

Once it was constructed the cooperative was very keen to manage the small dam, for several reasons. First, more than 70 ha of the 115 ha of the project area were already irrigated by the cooperative's groundwater and many of the remaining plots belonged to its members, who often own several small, dispersed plots. Second, the irrigation cooperative was already using the surface water that would now be stored in the dam. Third, despite the renowned stability of the cooperative over the years, it faced increasing energy costs due to the drop in the water table, and the gravity-based distribution of pressurised water from the dam could help lower those costs. Fourth, obtaining the management of this particular small dam played a central role in the medium-term strategy of the cooperative, since surface water had become a coveted resource with the increasing cost of pumping. Another project for the construction of a larger dam (25 Mm^3) was underway in a neighbouring village to benefit four villages, including Bağyurdu. Obtaining the management of the small dam could strengthen Bağyurdu's position in the coming negotiation for the management of the bigger dam, as the cooperative would be able to show it had experience in surface water management. The cooperative was also keen to test the DSI's new technology – a remote-controlled, automatic valve opening system that marked the latter's claim to 'modernity'.

Negotiations over the management of Bağyurdu's small dam revealed several issues linked to Turkey's recent administrative reforms, giving the metropolis and district municipalities greater power. With the abolishment of small municipalities and village authorities in metropolitan areas, such as that to which Kemalpaşa now formally belongs, small dam management could only be transferred locally to either the district municipality or irrigation cooperatives. The DSI preferred the latter, due to their longstanding relationship: "the cooperative has to manage the small dam in Bağyurdu. They know how to irrigate at least! And [Kemalpasa's district] municipality is so far away…" (interview with a DSI agent in Izmir, 2017). This allowed the cooperative to connect the pressurised network distributing water from the small dam to its own groundwater distribution system, despite the district administration informing the DSI in early 2016 that it wished to manage the dam, thereby putting on hold the official transfer of its management to the irrigation cooperative.

Interviews with board members of other irrigation cooperatives put the case of Bağyurdu in perspective. The water stored in the newly built small dams in Kemalpaşa is coveted by most irrigation cooperatives, such as Bağyurdu, due to the increasing energy costs associated with the groundwater they have been using for decades. Surface water is seen as a new resource that can be used conjunctively with groundwater. However, not all cooperatives have managed to mobilise their members and negotiate with the DSI to take on the management of the newly built small dams.

Resistance in Emiralem: Rejecting management responsibilities but using the water

The Gediz basin (northeast of Izmir) has witnessed large-scale, state-led irrigation development since 1938. This 96,700 ha scheme is irrigated with surface water from two main reservoirs – the Marmara lake and the Demirköprü dam. In 1994 the Gediz basin was selected as one of the DSI's four pilot schemes for the transfer of irrigation management. Ten irrigation associations were established in 1995 (Svendsen and Murray-Rust, 2001), including the 'Menemen Left Bank IA' (16,500 ha) and the 'Menemen Right Bank IA' (6365 ha). These two irrigation associations manage two open canals diverting water from the Emiralem regulator (Figure 3), which was built between 1939 and 1944.

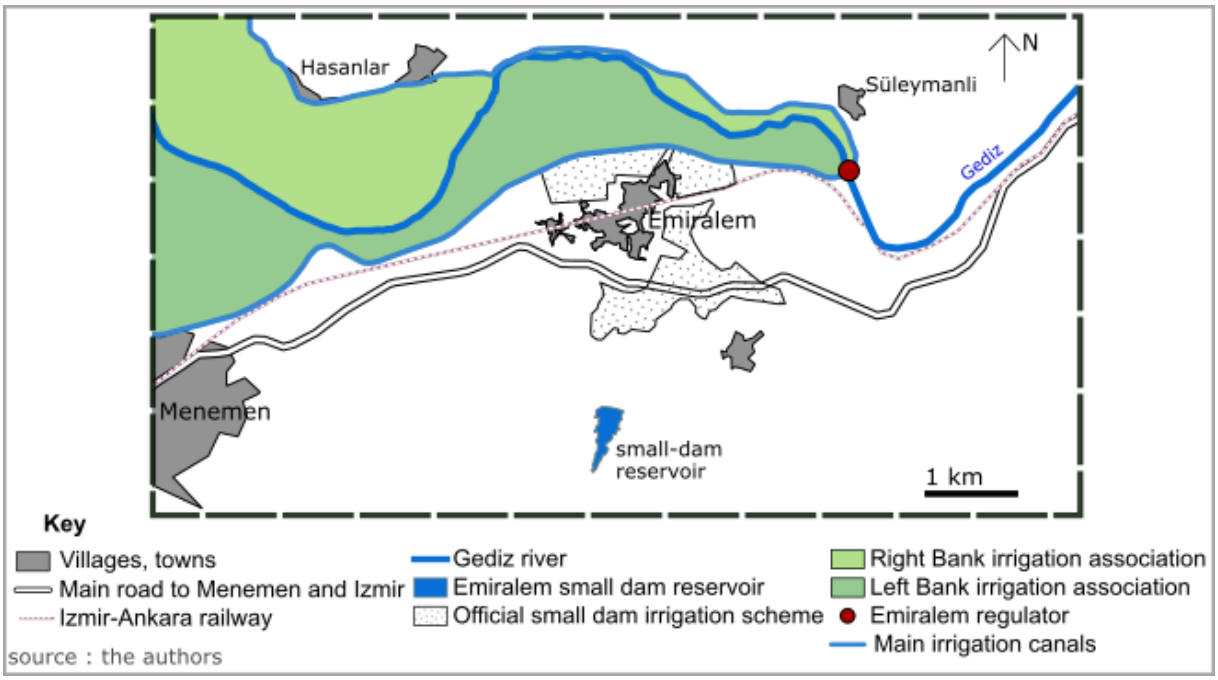
The case study village of Emiralem is in Menemen district, just north of Izmir in the downstream part of the Gediz basin. It was incorporated into the large-scale surface irrigation system in the 1990s and has since faced numerous challenges. Although groundwater abstraction in the surface irrigation system was barely mentioned during our interviews with representatives of the DSI and the Ministry of Agriculture in Izmir, in the field it became the key to Emiralem's irrigation development. By the 1990s its farmers had already started using groundwater to grow high-value horticultural crops, considering that canal irrigation did not suit their needs, rather viewing it as adapted to 'real large-scale agriculture', such as the cotton production further downstream.

For 20 years Emiralem's horticultural farmers showed no interest in contributing to the operation or management of the canals. They almost exclusively used groundwater, which supported a switch from extensive grazing to high-value horticultural production on intensively managed small plots (0.05 to 0.2 ha, producing strawberries, peppers, lettuce, etc). A combination of groundwater use, drip irrigation and greenhouses allows farmers to sell their products before or after the peak production seasons, thereby obtaining high incomes. They look out for new production techniques, try rotations, visit agricultural trade fairs, for instance in Antalya. This situation would eventually lead the Menemen left bank irrigation association to literally remove the secondary and tertiary canals in 2012, and thus Emiralem's access to surface water, even though the village is still officially part of the scheme.

The hydraulic administration marked its re-engagement in Emiralem by constructing a 26 metre-high small dam (1.37 Mm^3 of storage capacity) as part of the '1000 small dams in 1000 days' programme. The dam was designed to irrigate 212 ha with a buried distribution network suitable for drip irrigation (see Figure 3 below). As in Bağyurdu, water distribution is possible without pumping and hence requires no energy, meaning low costs for water distribution. However, the future manager of the dam will have

to repay its investment cost, i.e. around 110,000 TL/year for 30 years according to the farmers (€32,000/year as at March 2016). After two years of construction the reservoir was filled with water in 2015.

Figure 3. Official irrigation schemes in Emiralem.



Interestingly, there is now a conflicting discourse about who originally requested the small dam. According to the DSI, the dam was constructed at the request of the local population, whereas the inhabitants say they never asked for it. By 2016 no formal body had taken on the management of the dam despite several negotiations being opened between the DSI and local authorities. In late winter 2014, once the dam had been built, the DSI asked for the creation of a cooperative to manage the small dam, but the farmers did not want to get involved. The farmers of Emiralem are interested in the good quality, cheap water offered by the small dam as it can be linked to their farm distribution system through the pressurised network. They criticise the poor surface water quality of the Gediz, polluted by industries upstream, and point to the high pumping costs of groundwater. However, they are not keen to create a cooperative to manage the small dam. The farmers we interviewed mentioned their negative experience with a previous irrigation cooperative set up in the 1980s to manage collective pumping from the Gediz River, saying it would not be the right choice for Emiralem. They told us that running a cooperative requires a lot of time and that they are already involved in time-consuming market-gardening activities and the sale of the products.

> The employee [of the cooperative] was earning 800 TL to sleep all day long, whereas I work twenty hours and sleep four hours when I go to the market. I even doze off on the road… We don't want someone who sleeps twenty hours and works four hours! No, a cooperative here, it's impossible (interview with a farmer in Emiralem, 2016).

As no cooperative was created in 2015, the DSI looked for other options. The municipality was not interested in taking on the management of the dam and had no experience in irrigation management. The DSI then suggested that the existing Menemen Left Bank irrigation association should take over (Emiralem's farmers were still officially members of the association). The association initially agreed in a

general assembly, before retracting. According to some of the board members of the association, the small dam was a possible solution to the declining water table faced by farmers, but the removal of the irrigation canals in the 2000s had left a tense relationship between farmers and the irrigation association, making the latter unwilling to manage the dam: "they don't know how to work together there!" (interview with the secretary of the irrigation association, 2016). As no formal organisation accepted to manage the small dam in Emiralem, the DSI let the villagers use the water. Individually or organised into small, informal groups, farmers installed pipes to bring the water to plots located beyond the official boundary of the scheme, which allowed them to decrease their groundwater consumption in the summer of 2015. The DSI hoped this would serve as an incentive for creating a cooperative: "the small dam was full; we were not going to waste the water. At least they [the farmers] will see it is good water. Next year they will need a cooperative" (interview with a DSI agent, 2016). In 2017, after three years of informal use, the situation was unchanged; no cooperative had been created and farmers continued to use water from the small dam informally. However, tensions started to appear, and farmers accused one another of wasting water. That year the water stored in the dam was used up within 2 months, while, according to some farmers, it could have lasted for 3-4 months. It remains to be seen whether this will trigger a collective answer to the management of the small dam.

DISCUSSION: POWER OF THE STATE, EMANCIPATION OF THE FARMERS?

Small dams and groundwater: A hydraulic mission never abandoned

Notwithstanding the institutional actors and management models that emerged in the irrigation sector from the 1980s onwards, we argue that the Turkish hydraulic administration never really abandoned its 'hydraulic mission' and continues to exert significant control over the sector.

We interpret the '1000 small dams in 1000 days' programme as a manifestation of (1) the DSI's continued involvement in irrigation planning and development and (2) its ability to face new realities and the will of the central government to widely and quickly demonstrate its involvement for the benefit of rural areas. According to the DSI, small dams allowed irrigation to extend beyond the agricultural plains, where large-scale schemes are located, towards hillier and more remote areas that hitherto relied exclusively on intermittent streams and groundwater, thus contributing to the government's objective of developing agriculture. Furthermore, recent literature (Venot and Krishnan, 2011) has highlighted how, as relatively quick to plan and build, small dams have been an effective way for the state to respond to local political demands, to reinforce its legitimacy and, in the process, re-assert its control over rural areas.

Interestingly, the DSI also managed to retain an important role in the groundwater economy, unlike other countries where the development of groundwater use took place 'under the radar' of the state (El Agha et al., 2017). The DSI actively engaged with the booming groundwater economy, notably through its authorisation of well drilling and its technical recommendations, the planning and implementation of collective boreholes and the establishment of irrigation cooperatives to manage them. However, its control of groundwater abstraction is at best partial due to the countless illegal individual boreholes.

From power over farmers through hydraulic works to negotiation for control

We showed that the implementation of the '1000 small dams in 1000 days' programme cannot ignore a new trend in irrigation, i.e. the increasing role of groundwater, which is often accessed and used at the farmers' initiative. The case of Kemalpaşa showed groundwater to be the 'collective lever' of an irrigation community engaging in high-value arboriculture in areas located outside surface irrigation projects. The case of Emiralem, on the other hand, highlighted the autonomy obtained through groundwater use within a large-scale surface irrigation system. It has become a way for farmers to cope with bureaucracy through 'informal adjustments' (Lees, 1986) as small-scale farming and centralised

irrigation management are often incompatible (Béthemont, 2009). As explained by Lees (1986), "standardised bureaucratic rules oblige farmers either to behave in ways inappropriate to their variable circumstances, or to break the rules". As observed in North Africa (Kuper et al., 2016), tapping groundwater was often a key to autonomy for farmers who aimed to 'free' themselves from 'state' water and its constraints in large, gravity-based irrigation schemes. Whether within or outside of large irrigation schemes, accessing groundwater generally gave farmers the opportunity to acquire experience of irrigation and also, in the case of irrigation cooperatives, of negotiation processes with local state authorities, something that would prove central when the DSI investigated and implemented small dam projects.

The involvement of the hydraulic administration in the irrigation sector is changing, as public projects are implemented in a context of over 30 years of private groundwater economy. It is undeniable that in Turkey the DSI has retained its authority over surface water ownership and use. It retained institutional and technical control thanks to the exclusive expertise of its engineers or through its closely associated private contractors. When it comes to small dam projects, the DSI is often alone in defining the contractual conditions under which the management of the dams is transferred to village authorities, municipalities or irrigation cooperatives. However, this is not a one-way process, and water users are far from mere passive observers. Local communities and authorities can resist (for example by continuing private groundwater use), skirting the conditions of project transfer, or engage in negotiations to influence the terms of the transfer. While the planners' vision for the irrigated landscape can materialise through infrastructure, its control, management and, ultimately, its use require the elaboration of norms and rules to be appropriated by the users. The administration may still target rational, efficient production and the economic development of rural areas, or pursue political goals by increasing the irrigated area, but its new projects face farmers with longstanding experience in irrigation. Thus, the irrigated landscapes envisioned by the planning state must compete with the localised, socialised territories, experienced by the communities over a relatively long period (Di Méo, 1998; Ghiotti, 2006; Ruf, 2014).

Our two case studies revealed that the encounter between the state and farmers differed according to the historical and existing modes of water management and the related farming systems. In Kemalpaşa the top-down implementation of a small dam project was met by dynamic, groundwater-based irrigation cooperatives. These cooperatives negotiated the terms of their involvement: the DSI was looking for a 'taker' for a planned project, while the cooperatives saw the small dams as an opportunity to further secure its water supply and position itself for future negotiations. The DSI preferred to transfer the dam's management to an irrigation cooperative rather than to urban municipalities, as it prefers working with the former. Conversely, in Emiralem, where the relationship between the state and farmers had been tense in the past, farmers were reluctant to relinquish their individual, groundwater-based irrigation system, and no irrigation cooperative was created to manage the newly built small dam, even though farmers were actively using its water on an informal basis. We believe this could be the first step towards a "renegotiation of their independence" (Kuper et al., 2009) with the DSI in an area where relationships between the state and farmers are highly symbolic, and farmers claim their autonomy through groundwater while still officially being members of an irrigation association.

CONCLUSION

This paper has explored the shifting role of the hydraulic administration in irrigation planning and development in Turkey. We have shown that the DSI is still pursuing its historical 'hydraulic mission', presently through the '1000 small dams in 1000 days' programme, which is being implemented at village level but has a widespread geographical spread over the national territory. This development in infrastructure, however, is taking place in a different context from that of the 20th century. The

hydraulic administration now faces experienced farmers who have largely taken agricultural development into their own hands by irrigating with groundwater to support intensive and competitive farming systems and who are well versed in negotiations with public authorities. Our research shows that farmers engage with the infrastructural development interventions of the hydraulic administration (pressurised drip irrigation, high-value agriculture, etc) but in a way that best suits their local context, needs and interests. Irrigators are not passive recipients but rather dynamic agents who try to adapt to change, notably by diversifying their livelihood strategies (Scoones, 2009; Keyder and Yenal, 2011) and, in our case, the modalities of access and use of irrigation water.

The modernisation of irrigated waterscapes through irrigation development is no longer exclusively in the hands of the hydraulic administration. Although the planning and implementation of the '1000 small dams in 1000 days' programme did not involve any consultations with farmers, multiple interactions took place on how the small dams should be managed, and irrigation cooperatives had a degree of bargaining power as intermediaries between irrigators and representatives of the state. By discussing the encounters between the administration and rural communities, our study contributes to an emerging literature that questions the idea that the Turkish state is monolithic and disconnected from the rest of society (see Aymes et al., 2013). Our findings support Gourisse's (2013) call for studies on the coproduction of public action in Turkey. These should move away from a dichotomous vision framing a dominant state and civil society as independent blocs and instead open the blackbox of their interdependence. This could be undertaken through empirical studies of local initiatives in rural Turkey that inevitably enter a dialogue with the state.

ACKNOWLEDGEMENTS

We would like to thank the farmers, irrigation associations and irrigation cooperatives for their time. We are also grateful to the SIRMA network, within whose framework this work was carried out. We thank the reviewers of this article for their constructive comments.

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