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A political economy analysis**

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Contents

List of Figures	iv
List of Appendices	iv
List of Acronyms	v
Abstract	vi
Relevance to Development Studies	vi
Chapter 1 Introduction to the study	1
1.1 What is this research paper about?	1
1.2 The ‘energy crisis’ and irrigation alternatives	4
1.2.1 Condensed theoretical framework	5
1.3 Methodology and positionality	6
Chapter 2 Historical context: Agricultural Modernization and State-led development in Spain	8
2.1 The Spanish model of agrarian change	8
2.2 The role (and politics) of irrigation	10
2.2.1 Contemporary issues on irrigation	11
Chapter 3 Case study: land politics and the quest for alternatives	13
3.1 Background: context and actors	13
3.2 The Political Economy of Agriculture in Híjar	16
3.3 The ‘Platform 0 cost’ and the struggle for the land	18
3.3.1 Installation of the HyPump	22
Chapter 4 Analysis and conclusions: power, land and agrarian change	24
4.1 Social drivers and perspectives	24
4.2 Unpacking the ‘state-society’ relations	26
4.3 Final considerations	28
Appendices	30
References	31

List of Figures

Figure 1 Village of Híjar (Source: Fieldwork 2021)	14
Figure 2 Model of HyPump in Híjar (Source: aQysta 2020)	16
Figure 3 Members of the ‘Platform 0 cost’ (Source: La Comarca 2017)	19
Figure 4 “ <i>The plot parcelling is at 0 cost; did you know it?</i> ” (Source: Fieldwork 2021)	20
Figure 5 HyPump in Híjar (Source: Fieldwork 2021)	22
Figure 6 HyPump’s reservoir (Source: Fieldwork 2021)	23

List of Appendices

Appendix 1 Photovoltaic park	30
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List of Acronyms

AACC	Autonomous Communities
CAP	Common Agricultural Policy
CCHH	Hydrographic Confederations
CHE	Hydrographic Confederation of the Ebro
DGA	Direction of the Government of Aragon
EIA	Environmental Impact Assessment
INE	National Institute of Statistics
LCA	Law of Administrative Contracts
LRYDA	Law of Rural and Agrarian Development
MITECO	Ministry for Ecological Transition and the Demographic Challenge
RET	Renewable Energy Transition
TSJA	Superior Court of Justice of Aragon
UAGA	Union of Farmers and Cattle Ranchers of Aragón

Abstract

This research paper tells the story of a long-standing conflict between a group of Spanish farmers and irrigators of the village of Híjar and the Direction of the Government of Aragón (DGA). By tracing the arrival of a renewable energy irrigation technology (HyPump) in the village, this study exposes the social, political and economic dynamics behind this event, and its relation with the broader processes of ‘agricultural development’ taking place in Híjar.

The origin of the confrontation goes back to the DGA’s decision to constrain a procedure of land consolidation, allegedly free by law, to an irrigation modernization project, which would have had to be partly assumed by the Irrigation Community of Híjar. The introduction of the HyPump in the village represents a local attempt to oppose this imposition. Informed by an agrarian political economy perspective, this study examines the ways in which local political actions encounter institutional structures of power and authority. Overall, it reveals that the local drivers for mobilization, as well as the underlying processes behind the introduction of the irrigation technology, are deeply related to the problem of the land.

Relevance to Development Studies

In Spain’s political history, agriculture and irrigation have played a central role in national development. Particularly, land consolidation and irrigation modernization have been portrayed as two major instruments to achieve ‘agricultural development’. However, when deployed in particular contexts, these policies reveal the structural tensions of the Spanish model of agrarian change. The case study of Híjar unveils the conflicts and struggles that emerge when top-down ‘agricultural development’ projects are implemented in a particular locality, and its critical analysis exposes contrasting visions and political repertoires in the pursuit ‘development’. Ultimately, this study contributes to rethinking agricultural development processes from local perspectives, practices and subjectivities.

Keywords

Agrarian political economy, agriculture, irrigation, renewable energy irrigation technologies, agrarian change, Spain.

Chapter 1

Introduction to the study

1.1 What is this research paper about?

This research paper tells the story of a long-standing conflict that brought together a group of Spanish farmers and irrigators from the village of Híjar and the Direction of the Government of Aragón (DGA). Specifically, this study focuses on the relation between the above-mentioned confrontation, and the introduction of a renewable energy irrigation technology (HyPump) in the village.

The dispute was the result of the DGA's decision to constrain a process of land consolidation, allegedly free by law and of public utility (García de Oteyza 1953), to an irrigation modernization project meant to be implemented by the public company SIRASA¹, created in 2000 by the DGA to execute investments in rural areas and stimulate 'agricultural modernization'. As a result, all public works oriented to promote agricultural development began to be undertaken by SIRASA, which is not governed by the Law of Administrative Contracts (LCA) nor it is entitled to the protection of public interest, and that, ultimately, charges for the works it executes (Technical Report 2020)².

Land consolidation is a public service that has the purpose of solving the problem regarding the excessive fragmentation of agrarian property. That is, one of the functions through which the agrarian reform has been proposed, although with different political projects behind it (Gonzales Perez 1953). Both land consolidation and irrigation modernization are extremely costly processes. However, insofar as the former requires satisfying the public interest, it is illegal to oblige those affected by the process to assume the costs of its implementation³. In these regard, joining this process to an irrigation modernization project could turn into a mechanism for obtaining some economic profit, which was the political strategy that the DGA/SIRASA designed.

In 2008, the DGA communicated to the village of Híjar that the process of land consolidation would only be implemented if accompanied by an irrigation modernization project, part of whose costs were to be assumed by the Irrigation Community. To face this imposition, a group of farmers, irrigators and local actors started to politically organize in order to demand a land consolidation without any cost. The following fragment expresses their position towards the project:

"It is the duty of this union to denounce the arrogance of these organizations and to remember that those affected are citizens with full rights, many of them dedicated to agriculture all their lives. It should be remembered that the Irrigation Syndicate of Híjar has also a public-legal nature [...] and that all its members are people with intimate and direct links to agriculture, either because they are active farmers, or because they have

¹ Rural Infrastructures Society of Aragón. Now SAGRA: Aragón Society of Agro-environmental Management.

² The 'Technical Report' was compiled by the members of the 'Platform 0 cost' in an attempt to keep a record of the events. It was written by the lawyer of the group, who sent it to me on a personal communication on the 15th of September, 2021.

³ Law of Rural and Agrarian Development (LRYDA), January 12th 1973.

exploited farms in Híjar for more than twenty years and continue to be owners of arable land in that town” (Irrigation Syndicate 2012, p. 7)⁴.

As part of the strategies of this group of local actors to withstand the implementation of the irrigation modernization project, they began exploring irrigation alternatives that would not require such exorbitant costs as the ones imposed by SIRASA. In this context, as a result of this local initiative, the HyPump was introduced in Híjar. The HyPump is a hydro-powered pump, created by the Dutch high-tech company aQysta, which utilizes the energy of irrigation canals to carry pressurized water to drip or sprinkler systems⁵ (aQysta 2018). Unlike conventional pumping systems (e.g., diesel-powered pumps), it does not necessitate any fuel or electricity to operate.

This technology is part of the larger program of the renewable energy transition (RET), which has become increasingly prominent in the global sustainability discussion. In Spain, the entity in charge of leading the transition to the use of renewable sources is the Ministry for Ecological Transition and the Demographic Challenge (MITECO). Although the creation of this Ministry represents a step forward for Spanish environmental policy, there is still not an integrated policy that encompasses the different Ministries. Particularly regarding the ‘agricultural sector’, and the unprecedented challenges it is facing regarding the climate crisis, the Spanish government still promotes an agricultural development model that prioritizes increased production and productivity, technological innovation, and close integration with the industrial sector, often to the detriment of small farmers and the environment (Clar et al. 2017).

The irrigation modernization program is an expression of this rationality, as its main objective, besides contributing to water savings, comprises increasing the productivity and competitiveness of the irrigation sector (Plusquellec 2009). Driven by the National Irrigation Plan (MAGRAMA 2012) and the Emergency Plan for Modernization of Irrigation, this policy program aims at transforming the total national surface of the irrigated area into a conventional pressurized irrigation system, mainly through the installation of drip irrigation. Nonetheless, the modernization of irrigation has historically been proven to be not exempt from social conflicts and controversies. “The high investment costs and energy demand of pressurized irrigation have placed a huge burden on some farmers with small margins, which account for a significant part of the Spanish farming industry” (Alarcón et al. 2016, p. 2).

Moreover, despite that drip irrigation contributes to water savings up to 30 to 50%, when integrated into an electric or diesel-based system (Intriago et al. 2019), it considerably increases energy consumption and with it the costs for irrigation (aQysta 2020). This is particularly important in Spain, where the wholesale electricity market prices have almost doubled over the past two years (Pacce et al. 2021). This is why, on the other side of this trend, renewable energy irrigation technologies have been presented as an integral solution to the various challenges to agricultural production, contributing to reduce farmers' dependence on fossil fuel energy (Nederstigt and Jan 2014). These technologies can also be integrated into a broader pumping system that can include the installation of drip irrigation. However, they rely on renewable energy sources (e.g., solar power, wind power and hydropower) (Intriago et al. 2019) to operate, and are usually employed on a small-scale level.

⁴ Report prepared by the secretary of the Irrigation Syndicate of Híjar as part of the documentation sent to the Hydrographic Confederation of the Ebro (CHE) to reassert its position towards the project. Own translation.

⁵ Pressurized irrigation is defined as a network installation composed of pipes and other devices designed to supply water under pressure from the source of the water to the irrigable area (FAO 2000).

Both conventional and small-scale renewable energy irrigation systems encounter many complexities when introduced in local agrarian contexts. Particularly, in Híjar, the arrival of the HyPump unmask complex political dynamics around the resources used for agricultural activity, exposing the fragile condition of agriculture in the village and the role of the state in shaping the fate of ‘agricultural modernization’. In this sense, it provides an entry point to examine, by prioritizing the local perspectives, the relations between the state and the society; as well as the roles of the different actors involved in the confrontation, their projects, ideals, and the social, political, and economic relations that shaped their actions and positions.

That is why the main objective of this study is to explore the social, political, and economic dynamics underlying the introduction of the HyPump in Híjar, by taking into consideration the relations between the state and the local actors. To do so, three central axes are proposed: First, I describe from a historical perspective, the consolidation of the Spanish model of agrarian change, how it interrelates with the current trends regarding irrigation and how it influences the political performance of the regional authorities (DGA and SIRASA). Second, I present the case study and detail the conflict that resulted in the introduction of the HyPump in the village, highlighting the diversity of discourses and positions among the local actors. Finally, I explore the tensions within the ‘state-society’ relations, considering the process of agrarian change that is taking place in Híjar. In these regard, the main question that will guide my study is the following: What are the social, political and economic dynamics underlying the introduction of the HyPump in Híjar? To unravel it, three key questions will guide my analysis: a) Who are the key actors in the process and what role do they play? b) what are the factors driving a group of local actors to mobilize and pursue the introduction of the HyPump? and c) to what extent does the institutional structure constrain local initiatives?

My analysis and conclusions will be carried out on two levels: local and structural. On the first level, I will suggest that the reasons behind the arrival of the HyPump are strictly related to the problem of the land, anchored in past - and current - conflicting ‘state-society’ relations. On the second level, I will conclude that the institutional structure that currently operates in Híjar to promote ‘agrarian modernization’ hinders the actions and demands of the individuals. Overall, this will lead me to reflect on how the arrival of this technology in the village reveals the unequal nature of the dynamic of social conflict and the power relations that shape the interactions between the different actors. Thus, the relevance of the case of the HyPump lies in the fact that it brings to the fore the political relations around the most important resources for agricultural activity: *land*, *water* and *energy*, in a particular context of agrarian change.

There are, nonetheless, some limitations to this study. First, my results are mostly confined to what I was able to collect in less than three weeks of conducting fieldwork. However, the openness and disposition I received from the people I interviewed, who naturally had an interest in telling this story, allowed me to gather a considerable amount of information during my short but very productive stay. Second, because of this, I engaged with and interviewed more people who were on a specific side of the conflict, which is ultimately the perspective I am trying to portray. Even so, throughout the story, I attempt to objectively present the arguments of the other side as well. In the following sections, I will present the general context of the study, mainly in relation to renewable energy irrigation technologies. Then, I will introduce the theoretical framework, as well as the methodology that guided my study. In chapter 2, I will describe the Spanish context of agrarian development, which will be useful to understand the case study, developed in chapter 3. Finally, in chapter 4, I will carry out the analysis and draw the conclusions to the study, aiming at bringing the findings from the field into dialogue with the supporting theoretical discussions.

1.2 The ‘energy crisis’ and irrigation alternatives

In the past ten years, the world has experienced a convergence of multiple crises - food, climate, energy and financial (Borras 2009) - that have placed the need to address the goal of achieving ‘sustainable development’ in the centre of the global debate. The ‘sustainability discourse’ seems to have been established as common sense for the international policy spheres (Agyeman et al. 2002); however, several voices have questioned its proximity with mainstream market-led development and technical eco-modernization solutions (Walker 2012; Allouche et al. 2015). Particular focus should be given to the ‘energy crisis’ being the result of the consolidation of a world economy that is extensively dependent on fossil-fuel-based energy. As Jason Moore (2015) argues: “Nearly everything in our world depends on Cheap Energy: everything we associate with ‘economic development’ turns on fossil fuels” (p. 109). The fragility of our energy and economic system is even more conspicuous nowadays, with oil prices rising and fossil fuel reserves reaching their lowest limits (Rifkin 2007). In this context, the transition to a low-carbon economy to achieve the global goal of ‘sustainable development’ seems imperative (Foxon et al. 2010).

Amidst this rising tendency, renewable energies have become pivotal in the global energy transition, as many countries, particularly in the global North, have included the target of ‘renewable energy transition’ (RET) in their environmental agendas (IRENA 2018). The RET captures existing efforts to “steer communities, states, and countries away from fossil-fuel reliance and toward renewable energy production and use” (McNulty 2014, p. 4). Nonetheless, the RET does not come without political and economic conflicts, since it implies a shift in the centres of power and decision-making (Allouche et al. 2015). Albeit transformations are always an opportunity to reorganize hegemonic configurations and foster new equitable social relations (Shakespeare 2020), they can also reproduce the status quo: approaching climate change as an apolitical issue, thus placing the RET within a market-technical framework (Middleton et al. 2015). As a response to this, Burke and Stephens (2018) have described the RET as a political struggle that, in turn, intersects with other local political struggles, and that needs to be engaged with issues of social and environmental justice. Thus, the political interconnections of energy with other resources such as land and water, is of fundamental importance, especially with regards to agriculture and food production (Middleton et al. 2015).

In his book ‘Class dynamics of agrarian change’, Henry Bernstein (2010) describes the transformation from ‘farming’ to the ‘agricultural sector’ as a consequence of the advent of capitalism in the countryside. To these days, in conformity with the fuel-based capitalist economy, the way modern agriculture has developed is also highly dependent on fossil fuels. In fact, the productivity growth that the agricultural sector experienced is a consequence of the fossil fuel-based energy subsidies (Backhouse et al. 2019); which, in turn, has generated a vast reliance on external inputs (e.g., chemical fertilizers, seeds, tools) throughout the entire sector, from large-scale to small-scale agriculture (Bernstein 2010).

Amidst the rising tides of agriculture and climate change, renewable energy technologies are conceived as a promising solution to break the cycle of energy dependence on fossil fuels, as they only rely on clean sources, such as solar energy, wind energy and hydropower (Crieckmans 2011). Particularly, renewable energy irrigation technologies have shown themselves to be promising comprehensive solutions to the confluence of various crises: energy, water, food, and climate (Jha and Tripathy 2018). Some corroborating arguments to promote these technologies are related to their characteristics of being cost-effective, environmentally sound, and technically simpler (Gopal et al. 2013). Moreover, when implemented at a small-scale level, these technologies have the potential to contribute to achieving energy sovereignty and building decentralized energy systems (Burke and Stephens 2018).

Irrigation technologies driven by renewable energy also fall within the category of ‘modern irrigation systems’⁶, which can include drip or sprinkle irrigation to deliver the water to the fields. Particularly, “drip irrigation is a technology with great potential for improving the efficiency of water use, and for increasing crop production and food security” (Grab and Friedlander 2014, p. 13). Although these systems are usually attached to ‘conventional’ electric or diesel pumps to operate (Intriago et al. 2019), the justification of their use and implementation is precisely ‘water savings’, shadowing the fact that they “bear high operation and maintenance costs because of continuous use of electricity from the grid and expensive fuels, respectively” (ibid. p. 2). In this sense, contrary to water pumping systems driven by renewable energy, conventional pumping systems end up placing high economic and environmental costs for farmers.

On top of this, in Spain, the implementation of these ‘modern irrigation systems’ have served particular political and economic projects oriented to promote a certain type of agricultural development. These projects have found their justification and social legitimization in ‘technical’ explanations that do not take into account the socio-political-economic complexities of the local context in which they are deployed (Stensrud 2019), nor do they consider the power relations between the actors interacting in this processes, the cultural significance of irrigation water, and the politics of irrigation (Gelles 2000; Bollens and Gelles 2015). In this line, Franquesa (2018), when exploring the interconnections natural ‘apolitical’ resources and the broader political processes around them delineates two distinct but intertwined worlds: One is the world of energy, that “operates in an abstract space, made of magnitudes and flows, the strategic space of state and capital, connecting nature and power”. The second is the ‘material’ world, “the texture of everyday life, a universe where every name, every piece of land, every food is signified, pervaded by multiple relations rooted in history” (p. 7). The first one, although seemingly invisible, has political consequences in the ‘material’ world.

1.2.1 Condensed theoretical framework

In line with the objective of this study, which is to analyse the socio-political-economic dynamics underlying the introduction of the HyPump, the theoretical background finds support in some agrarian political economy debates. These altercations provide a critical framework to explore the local complexities and the web of social relations and political struggles that resulted in the advent of the technology in the village.

First, locating the analysis of the case study within agrarian political economy implies focusing on the interplay between structures, institutions and actors, relation that is key to examining the processes of agrarian change (Bernstein 2010). This critical understanding of social patterns and interactions will be useful to address questions of agency. This will be done by exploring the limits of the local autonomy in relation to institutional structures (Van der Ploeg 2010), as well as the dynamic and contextual changes in which the technology enters. Moreover, agrarian political economy’s focus on social relations will allow me to distinguish between the different positions that coexist in the locality; to point out the extent to which the interactions among actors are mediated by this social differentiation, and by the relation that they have with the land. As Polanyi (2001) argued, land is the base of social relations, and it is therefore embedded in the different dimensions of everyday life. Land, as well as water and energy, brings together different actors, each pursuing specific economic interests, on multiple levels and scales (Palmer et al. 2009; Wells-Dang 2013). A political economy approach provides a critical lens to examine the connections of political processes around resources, and capital, identifying the locations of power in the processes of agrarian

⁶ Since the Spanish state has carried out the policy of irrigation modernization, I will use the term ‘modern’ to refer to irrigation systems that rely on non-renewable sources.

change (Borras 2009). Every project, on either large or small-scale, carried out in agrarian localities is inherently linked with social, economic and political dimensions of power (Hirsch and Scurrah 2015), which have to be taken into account to determine “who gets what at whose expense and who makes rules and decisions on whose behalf” (idem., p. 1). In other words, identifying the winners and the losers of every project of agricultural ‘development’ and ‘modernization’.

Additionally, some debates in agrarian political economy have placed the analysis of social relations around land in the framework of the ‘state-society’ relations (Hart et al. 1898). Focusing on the role of the state is central for understanding the influence that political processes such as dictatorships have on shaping agrarian structures of land ownership (Moore 1966) and agricultural ‘development’. In these regards, a political-economic analysis on the process of land governance provides an understanding of the ways in which the state exerts its authority to attain particular social and economic outcomes through land use, distribution, and access (Hirsch and Scurrah 2015).

At last, a critical agrarian political economy framework places the case of the HyPump within the process of agrarian change, considering the institutional structures in which the event is located, thus opening the way to explore the social, political and economic dynamics around water, land and energy.

1.3 Methodology and positionality

For this study, I chose to apply an ‘ethnographic’ approach that prioritized the collection of information from primary sources. While ethnography involves long-term stays in the locality, during the short period that I conducted my fieldwork, 17 days, I sought to apply ethnographic methods: semi-structured interviews, informal conversations and participant observation, which was central throughout my fieldwork. Complementarily, I revised secondary sources (e.g. archives, maps and technical data sheets), mainly in the Municipality and library of the village. This allowed me to learn about the local history, and to access data related to institutional aspects of agriculture.

Regarding the interviews, a considerable part of them was made in groups, and some were conducted with the same people. In total, I interviewed 21 individuals⁷. Even though I already had a couple of contacts upon arriving in the town, I proceeded using a ‘snowball’ technique, thanks to which the people that I interviewed would refer me to others. Notwithstanding, I tried to look for contrast among the informants; for instance, in terms of age and gender, but most of the people I interviewed were male adults and older farmers. The conversations that I managed to have with the women of the village were mainly informal, and generally about topics that were not related to agriculture or irrigation.

The reason I went to Híjar is because I currently work for a project that is indirectly connected to aQysta. As part of a multidisciplinary team, we conduct research on the level of adoption of renewable energy irrigation technologies in smallholding contexts. Despite having a connection with a similar project in Peru, due to the pandemic, my fieldwork options were restricted to the European context. Spain was always the first choice due to the convenience of speaking in my native language. Because of my work, I was aware of the existence of the pilot project in Híjar and managed to get in contact with a young farmer that was one of the users of the HyPump.

⁷ 5 farmers, 5 members of the Platform, 2 landowners, 2 external actors, 2 members the Irrigation Syndicate, 2 from the farmer’s Cooperative, 2 local authorities, 1 from aQysta. I also had informal conversations with other people of the village in diverse informal settings. Not all the interviews were recorded.

When I arrived in the village, I introduced myself to the local authorities and explained the reasons for my visit. I made it clear for both aQysta and the farmers using the technology that I was conducting independent research, and that I wanted to understand the processes underlying the arrival of the technology from the local perspectives, which was my main goal when I first arrived. As I properly started to conduct the interviews and engage with the people in the village, the stories and conversations directed the interviews to other topics and problems that went beyond technology itself. And so, the narrative of the story - and my understanding of the process - began to change. At the beginning of my fieldwork, I was not aware that the introduction of technology had started from a local initiative, nor that there was a conflict - still latent - with the DGA. The more interviews I conducted, the more the narratives transcended the space of the technology and began to shed light on the links with other demands and struggles, which is what I hereby try to portray. This study, thus, is the result of these changes.

Chapter 2

Historical context: Agricultural Modernization and State-led development in Spain

In this chapter, I briefly narrate the process of ‘agricultural development’ in Spain, with a particular focus on the relation between two processes: the land consolidation and the modernization of irrigation. The aim is to set the foundations for the understanding of the case study that will be presented in chapter 3. Due to the long period of dictatorship that the country experienced in the 20th century, the Spanish process of agrarian change presents some important particularities that differentiate it from the classic model of agrarian transformation that took place in other Western European countries (Clar et al. 2017). This revision is useful to comprehend the historical-structural context in which the event is placed, as well as to further develop an informed and situated analysis.

2.1 The Spanish model of agrarian change

The year 1936 marked the beginning of what was going to be one of the longest dictatorships in the history of the European continent. Francisco Franco, in his 36 years of dictatorship, embraced the project of modernizing Spanish agriculture through the implementation of a technical reform with the final goal of boosting economic development and increasing productivity (Clar et al. 2017). This reform, designed by agricultural ideologists aligned with the regime, was effectively implemented in 1950, when the new agricultural policy started.

Several authors (Federico 2005; Hamilton 2014) recognize this period as the beginning of the great transformation of Western agriculture, which implied shifting from ‘traditional farming’ to modern agriculture. This definitive change also had implications in the form in which the institutions, mainly the state, interacted with the emerging ‘agricultural sector’ (Bernstein 2010). The authoritarian character of the agrarian transformation that took place in Spain did not provide any space for resistances or for the inclusion of peoples’ political voices. For instance, the agricultural unions were prohibited, which resulted in the absence of a local institution to question and contest the state-led agricultural development model⁸ (Bernal 1993). Consequently, the consolidation of the agrarian development model was mostly designed and imposed from above, leaving little possibility for farmers to intervene (Clar et al. 2017). Furthermore, the ideological foundations of the agricultural program of the fascist party (the ‘Falange’) gave rise to a powerful discourse that neglected class differentiation in the countryside, not even considering the social, political, and economic differences between the large and small properties (‘latifundios’ and ‘minifundios’). From this standpoint, the difference between the ‘farmers’ and the ‘owners’ was dimmed (Gomez Benito 1995).

The common pattern of change of the other Western European countries that were under democratic regimes gave rise to the creation of a protectionist model on agriculture; the most salient example being the implementation of the Common Agricultural Policy (CAP) in 1962 (Brassley et al. 2012). Unlike other farmers that received compensations and strong government support (Sheingate 2001), in Spain the “non-democratic context, the enormous discretionary power of government policy, and the weakness of the rest of the

⁸ This does not mean that there were no other forms of resistances, but these are issues that are beyond the scope of this paper. For further exploration of these topics see Bernal (1993).

institutions translated into an implementation of agricultural productivism with no checks and balances, and with hardly any compensation for those affected by it” (Clar et al. 2017, p. 336). Moreover, this top-down process of agrarian change not only silenced local political voices but also its focus on productivity did not consider environmental circumstances and possible repercussions (Clar and Pinilla 2011).

Some of the policies that characterized the authoritarian process of state-led agricultural modernization were the expansion of irrigation, the hydraulic policy, the establishment of tenant farmers, the land consolidation policy, and agricultural extension (Clar et al. 2017). Particularly, land consolidation (or land parceling) is a public land management instrument whose main objective is to make the small plots profitable through land reorganization and property distribution (Garcia de Oteyza 1953). When implemented during the regime, the one-sided way of exercising authority and taking decisions on the uses and access to land, shaped the form in which the land consolidation was implemented and enforced (Palmer et al. 2009). As part of the national project of boosting productivity, the overall aim of the land consolidation was abolishing smallholding farming, which was conceived as a burden for progress. In line with this, the Minister of Agriculture of the time stated: “Until we eliminate the ‘small farms’ of the northern half of Spain we cannot talk about modernization of its agriculture” (Cavestany 1995, p. 309).

Despite the initial positive effects of the land consolidation, after some years of being implemented, the limits of this reform started to come to the surface (Barceló 1994). The major costs of its implementation were not translating into an increase in growth and productivity, as the farms were still not appropriately sized. For instance, between 1954 and 1971, the average increase of the plots was from 0,5 to 2,5 ha. (Carrion 1973). After the dictatorial period, several Autonomous Communities, as well as local actors, continued to push the process of land consolidation. This, however, has not always been successful: it requires a strong political will and high expenditures, which often results in the application of abusive and corruptive practices (Technical Report 2020). The motivations that incite the different actors to pursue a land consolidation process are not always aligned, which leaves room for it to become an unjust process for small farmers.

The end of the dictatorship, in 1977, did not bring about a substantial change in the agrarian development model. This was mainly because of two reasons: first, after a long-term process of dictatorships, agricultural and rural institutions had to be re-established; second, “the principal objective of Spain’s democratic agricultural policy was productive convergence with the CAP with a view to joining the EU” (Clar et al. 2017, p. 336). The entrance of Spain to the European Union in 1986 gave access to broader markets, stimulating economic growth. As for the farmers, the entry into the European Union meant the beginning of a series of compensations to which they had previously been denied access during the dictatorial regime. These grants were also applied to those who abandoned agriculture, which resulted in a sharp decline of the agricultural workforce in the countryside.

Spain is one of the countries of the EU where agricultural abandonment is more likely to occur, due to the low profitability of its agriculture. According to the projections made by the European Commission (2018), Spain and Poland are more prone to face the greatest abandonment of agriculture by 2030, both in absolute and relative terms. Spain is the “only EU country under threat to lose more than 1 million ha (around 20% of all EU losses)” (Perpiña et al. 2018, p.4). In fact, from 1986 to 1996, approximately 850,000 workers dropped out of agriculture (Lamo de Espinosa 1997), and a significant portion of those who stayed was thanks to subsidies. “Spanish agriculture, which entered the EU believing that its competitiveness would be the key to opening the door to the European markets, has become a ‘compensated’ or ‘subsidised’ agriculture” (Ibid. 1997, pp. 141). The failed nature of the land

consolidation, as well as the weak institutions resulting from the long dictatorial period, left many small farms, heavily dependent on subsidies, and thus economically fragile.

2.2 The role (and politics) of irrigation

Another crucial and distinctive feature of the Spanish model of agricultural change is the expansion of irrigation. Understanding the key role of irrigation in Spain's national development is important to make sense of the processes that will be described in the next chapter.

The naturally arid conditions of Spain, which made the land less productive than in other countries, laid the foundations to promote the expansion of irrigation as a determinant to increase agricultural productivity. The result of this long-standing project has resulted in placing Spain as the country with the largest irrigated surface area in the European Union (Clar et al. 2017). Particularly, in the agricultural sector, irrigation accounts for 60% of the total agricultural production and 80% of the national exports (Lopez-Gunn et al. 2012).

Although this policy was initiated during Franco's regime, with the arrival of democracy, the efforts to increase irrigation continued (Duarte et al. 2014), albeit through different strategies, progress' ideals and technologies. In this sense, Spain's agrarian modernization plan cannot be understood without considering the political role that water plays in shaping the production of socio-technical configurations (e.g., construction of dams, reservoirs, and expansion of irrigation), and in influencing particular imaginaries of development (Swyngedow 2015). A quick review of this process is relevant for the purposes of this study.

The late 19th century encompassed a period of profound social and political transformation, exacerbated by the severe economic crisis that resulted from the end of Spain's era as an imperial power⁹ (Ibid.). Consequently, the tensions and differences between the bourgeois class and an impoverished rural population intensified, and water "became a symbol of prosperity and modernity, and irrigated agriculture seen as pivotal for change" (Lopez-Gunn et al. 2012, p. 84; Lopez-Gunn 2009). As a result of the central role of water in the process of agrarian change, the so-called hydraulic paradigm became the dominant strategy that insinuated the policy decisions related to water, where agriculture (and hydroelectricity) had a predominant role (Ibid.). Under this paradigm, the way to solve the problem of water scarcity was through state intervention, primarily with infrastructure and technological plans.

Franco's dictatorship shaped both rhetorically and materially the project of modernization of Spain, which was mainly achieved through water engineering. While the first period of the dictatorship (1939 – 1955) served as a reinforcement for the discourse that favoured the need for expanding irrigation through hydraulic state projects, during the second period (1955 – 1975) the project of hydro-modernization was put in place on the basis of political-economic networks "and flows of capital, expertise, and steel" (Swyngedow 2015, p. 14).

In 1990, the paradigm of the massive hydraulic works was finally contested, when counter-hegemonic voices framed this old infrastructure as inadequate and outdated (Lopez-Gunn et al. 2012). This also led to a change in the imaginaries of 'modernization', moving from infrastructure to 'efficiency'; jointly seeking to save water while increasing productivity. Agricultural modernization was to be achieved by 'irrigation efficiency', a concept that implies that water savings could be reached by technological change and innovation. In this context, flood irrigation started to be conceived as outdated. Flood irrigation, also known as gravity or blanket irrigation, is a technique thanks to which the whole surface of the plot is

⁹ In 1900, Cuba, the last Spanish colony, became independent. The period that followed is known in Spain as *El Desastre* (The Disaster).

filled with water. Although it does not require any use of energy to transport the water or irrigate the fields (Technical Report 2020), it utilizes large amounts of water.

From 2002 to 2015, Spain carried out an intense irrigation modernization process, mainly through the installation of pressurized irrigation systems (Berbel et al. 2019). The main benefits underpinning this policy were the increase in production, incomes, direct and indirect employment, and contribution to DGP (Lopez-Gunn et al. 2012). Nonetheless, its high investment costs and energy demand reinforced existing social tensions in the countryside, as the costs of these projects - although largely subsidized – still represented a burden for farmers (Alarcon et al. 2016). In addition, an exhaustive study by the WWF (2015) found that these projects respond to economic interests rather than to local socio-political contexts and interests. Based on this, the report categorized irrigation modernization as a poor deal for nature and society. On the technical side, two major challenges have been identified regarding the modernization process: first, it has been argued that it can result in a major increase in energy use (Lopez-Gunn et al. 2012); second, it is linked to a potential ‘rebound effect’, where instead of reducing water consumption, it tends to increase it (Berbel et al. 2015).

2.2.1 Contemporary issues on irrigation

In contrast to traditional irrigation systems, such as flood irrigation, that have been portrayed as ‘inefficient’ because large amounts of water are wasted, the modernization of irrigation finds its environmental justification in water savings and efficiency (Alarcón et al 2016). In Spain, the water rights system is linked to land rights, meaning that there are no incentives for efficient water use: farmers pay per irrigated hectare, not per cubic meter used (Lopez-Gunn et al. 2012). This is one of the reasons why the modernization program continues to be promoted. In fact, three-quarters of the country’s irrigable area is currently equipped with modernized irrigation systems, which represented 74.2% of the total surface in 2016¹⁰. Nonetheless, the major unintended consequence of this program is the significant increases in energy consumption, “leading to substantially higher costs for farmers, and acting against the EU climate change, mitigation and adaptation strategies” (WWF 2015, p. 8).

Since the process of ‘energy liberalization’ in 2008, which implies starting to pay per cubic meter, the energy prices have increased by about 50% to 80%. “Whereas the cost of water per ha was estimated at 80-100€/ha, the costs of energy was around 200-300€/ha, that is the irrigation communities are now paying three times the cost of water in energy costs” (Lopez-Gunn et al. 2012, p. 91). As a response to this, in 2017, the National Federation of Irrigation Communities (FENACORE) demanded the Government to articulate the framework regulations to promote, in this way, the production of distributed energy for self-consumption in irrigable areas, and to make effective a reduction in tariffs (Agrodigital 2017).

The irrigation modernization project has also been called into question because of the lack of transparency of the authorities on technical and governance issues (WWF 2015). The links between irrigation modernization and specific economic interests have been exposed in several national projects¹¹: since the decade of 2000s, the Spanish government has been allocating great amounts of public funding to the modernization of irrigation. Nonetheless, the accountability and the regulatory framework in irrigation investment are rather weak. There are hardly any Autonomous Communities that subscribe to the Water Framework Directive (Directiva Marco del Agua) to control issues surrounding irrigation. Generally,

¹⁰ International Commission on Irrigation and Drainage (ICID) and Crop Surface and Yield Survey (ESYRCE) 2016.

¹¹ For example, Inca project, Can Bossa and project of Totana.

these projects are carried out through simple agreements between the Irrigation Community of a village and the public company in charge of implementing the project (Idem 2015).

These water-energy considerations are central in the promotion of renewable energy irrigation technologies. Particularly, Spain has recently approved the Climate Change and Energy Transition Law (2021), which aims at boosting the progressive penetration of renewable energies on the economy and society. However, these projects are primarily promoted on a large scale, which suggests that the productivist paradigm has not yet been challenged. Some new trends are encouraging the integration of irrigation systems while keeping the underlying logic of agricultural intensification.

In short, because of the country's natural conditions and political history, agriculture and irrigation have had a central role in Spain's national development. In particular, the model of agrarian change devised from above responded to the productivist rationality and economic objectives of the political elite. In this quest, they established an agricultural development model that silenced powerful institutions and social groups, leaving almost no space for the political participation of diverse local actors, a differentiation that was also denied. The design and implementation of the land consolidation, as well as the irrigation modernization program, which were highly detached from the farmer's needs, are some examples of this top-down process. In the following chapter, I present how the convergence of these two processes in Híjar reveals that these long-standing policies still stem from an institutional context that has been unable to disentangle from this 'way of seeing' the countryside, the agriculture, and ultimately, the farmers.

Chapter 3

Case study: land politics and the quest for alternatives

In this chapter, I narrate the story and the details of the conflict between the DGA and a group of local actors. I intend to provide a panorama of the local complexities that characterize the setting in which the HyPump was introduced, and the process of agrarian change that is taking place in Híjar. By doing so, I aim at pointing out that the technology did not arrive in an ‘empty space’, but in a highly politicized environment. Particularly, I introduce the three major groups of actors that were involved in the process: the local actors, mainly composed of the Irrigation Community, the Irrigation Syndicate and the farmers; the State, represented by the DGA/SIRASA; and the private company, aQysta.

3.1 Background: context and actors

Híjar is located in the province of Teruel, region of Zaragoza, Autonomous Community of Aragón. According to the National Institute of Statistics (INE)¹², in 2020 the total residents’ count amounted to 1,754 with 883 men and 871 women. Additional INE data from the same year indicates that 48.35% (848) of the residents registered in the Municipality were born in Híjar, 35.18% (617) emigrated from other regions of Spain and 16.48% (289) came from other countries. In this last group, the vast majority (188) have immigrated from Morocco.

With regards to the age of the total number of inhabitants, the INE indicates that by 2020 the average age of the residents of Híjar was 46.52 years. This statistic is in line with the current demographical trends in Aragón. By 2016, it was considered the second European region for the highest presence of aged residents (Féret et al. 2020). The ageing of rural areas is related to the phenomenon of depopulation since those who tend to move to the cities are young people and adults. This results in negative natural population growth (the difference between birth and death rates) (Pinilla and Sáez 2016). Such is the case of Híjar, wherein in 2018 the number of births was 8 while the number of deaths was 28, which makes a difference of -20. In fact, Teruel is one of the six provinces in Spain with the widest demographic gap, in which the population density is 6,8 inhabitants/km² (Bandrés and Azón 2021).

In Híjar, however, the demographic challenge has partly been reverted by the increasing immigration patterns. According to the INE, from 1996 to 2020, the number of inhabitants of different countries increased from 0.20% to 16.48% (285), while the number of inhabitants born in Híjar decreased from 58.31% to 48.35% (-303). Aware of the limitations of my study, it is important to mention that within the number of farmers with whom I spoke, all were over the age of 40. Only one of them was a young farmer, who had entered agriculture because of a government initiative aimed at promoting the participation of young farmers in the sector.

¹² Instituto Nacional de Estadística: <https://www.ine.es/index.htm>, accessed November 5th, 2021.



Figure 1 Village of Híjar (Source: Fieldwork 2021)

The village is situated in the valley of the Martín river (see Map 1), which is an affluent of the Ebro river. The waters of the Martín River, as recognized by the Arbitration Sentence of the year 1512¹³, belong to the Irrigation Communities of Híjar, La Puebla de Híjar and Urrea de Gaén; three villages that comprise the ‘Acequia de Gaén’ Community, as well as the Irrigation Community of Albalate del Arzobispo. Despite the recent changes in the agrarian structure, Híjar has always been considered an agricultural village. Historically, the agricultural landscape has been divided into two parts: the dryland, also called ‘*el Monte*’, which is used for the non-irrigated crops, and the irrigation land, also called ‘*la Huerta*’. This study mainly focuses on the irrigation area, which is where the modernization project was going to take place. In ‘*la Huerta*’, the main cultivated crops are cereals (barley, wheat and corn), which account for an average of 56% of the total irrigated area, followed by alfalfa (21%), olives (9%), almonds (8%) and peaches (5%). The remaining area is used for family gardens (aQysta 2020). Most of these crops are sold to the Híjar farmers Cooperative, which is in charge of their wholesale distribution¹⁴.

The most common irrigation technique has always been and continues to be flood irrigation. Although the entire surface counts with irrigation canals and ditches, most of the irrigation infrastructure is poorly maintained. In recent years, some farmers have been piping their plots, a few of them even installed a pressurized irrigation system at their own costs. However, most of the infrastructure has not been repaired, resulting in some instances in an obstruction of the water flow and, thus, of the irrigation activities. The entire irrigated area of Híjar is managed by the Irrigation Community. Officially, within the irrigation governance structure, the Irrigation Communities are part of the Hydrographic Confederations (CCHH),

¹³ Ratified by the Supreme Court of Spain on May 9, 1836, and by Order of the Supreme Government on April 26, 1873 (Irrigation Ordinances of Híjar, n.d.).

¹⁴ Official name: Cooperativa Comarcal del Campo San Braulio. With the exception of a few particular members, the Cooperative did not play an important role in the conflict; its actions are limited to the purchase, sale and distribution of crops.

which are specialized public entities attached to the MITECO, whose central role is to manage water resources in each Autonomous Communities. For agricultural uses, the Irrigation Community of Híjar coordinates with the Hydrographic Confederation of the Ebro (CHE).

The *Irrigation Communities* are water users' associations (Sancho 2020). They are formed by all the users with the right to utilize a given watercourse, destined mainly to irrigation. This means that the concession is given to the land, not to the owner (Ramos and Merino 1998). The Irrigation Community is governed by the Irrigation Ordinances and it is organized by an Assembly, formed by the President of the Irrigation Community and the Board of Directors, informally called 'Irrigation Syndicate' (Technical Report 2020). According to the Irrigation Ordinances of Híjar, the irrigation shifts of the villages that comprise the 'Acequia de Gaén' Community are divided into 14 days¹⁵, 7 of which are assigned to the village of Híjar.

The *Irrigation Syndicate* is composed of a group of irrigators whose main function is to manage and administer the water (Sancho 2002). They deal with issues concerning irrigation, such as regulating the maintenance of ditches and the enforcement of the shifts. Unlike the members of the Irrigation Community, that may or may not be active farmers, the Syndicate is generally composed of those who are engaged with agriculture and irrigation on a daily basis. Accordingly, there are two presidents: the President of the Community and the President of the Syndicate (Technical Report 2020).

It is important to note that a 'community of irrigators' is not the same as a 'community of farmers': while farmers might not be owners, the member of the Irrigation Community are necessarily landowners. In fact, the great majority of the Irrigation Community of Híjar is now composed of owners, many of whom are either retired or second to the third generation of former farmers, who are not directly or primarily engaged in agriculture (ibid.). The few active *farmers* in the irrigated area can either be tenant-farmers or owner-farmers, but those who were going to be mainly affected by the DGA/SIRASA project were the latter.

The *Direction of the Government of Aragón (DGA)* is the entity in charge of governing the Autonomous Community of Aragón. Consequently, rural development policies and agricultural modernization projects are carried out under its jurisdiction. In Híjar, the DGA has been promoting the modernization of irrigation through the installation of pressurized irrigation. For this purpose, in 2000 the DGA created the public company SIRASA which objective was to carry out the agricultural modernization projects in rural areas. The creation of this company implied that public works, previously carried out by public tenders and concessions, started to be managed following a business logic: the company itself decides and charges the execution and costs of the work, without being subject to any financial control over its public spending (Technical Report 2020). In view of this legal vacuum, in Híjar, both entities decided to present the land consolidation process and the irrigation modernization project as a single one.

The third actor of this story is *aQysta*, a Dutch high-tech start-up founded in 2013 at TU Delft, The Netherlands. Its main products are two hydro-powered pumps (Barsha pump and HyPump), irrigation technologies that harness the energy from a flow of a river or canal to pump water without necessitating any fuel or electricity to be run. The company also conducts research on the global tendencies of irrigation and the different problems faced within smallholding contexts, particularly in the Global South (aQysta 2018). The mission of aQysta is to contribute to the shift to renewable sources by delivering technologies that play a part in reducing the energy costs of irrigation (aQysta 2020). Unlike the Barsha pump, which is removable, the HyPump is build in an irrigation canal as a permanent infrastructure, which can be adapted to different irrigation systems, for instance, drip or sprinkle (ibid.). As it can

¹⁵ 4 for La Puebla de Híjar and 3 for Urrea de Gaén. During those days, Híjar cannot irrigate.

be observed in fig. 2, its main characteristic is a wheel that spins thanks to the water stream that gets then channeled and sent to a tank through a weir. This tank is used to filter the water that will later be transported to the fields. In order to do so, the filtered water is pumped to an elevated reservoir, from which the water is sent to the fields.



Figure 2 Model of HyPump in Híjar (Source: aQysta 2020)

In May 2020, aQysta installed a HyPump in the village of Híjar as part of a pilot project financed by the European Union. As already mentioned, this was related to the DGA/SIRASA project, which motivated a group of farmers to look for irrigation alternatives. To better understand the underlying drivers and dynamics regarding the introduction of this technology, the next section examines the local process of agrarian change. To do so, I will focus on three major issues regarding agriculture in Híjar: the structure of land ownership, the ongoing tendency of agricultural abandonment and the need for land consolidation.

3.2 The Political Economy of Agriculture in Híjar

In Híjar, and in Aragón in general, the *structure of land ownership* is highly fragmented. As a result of the demographic changes and land inheritance, land tenure and ownership have been significantly transformed in the village. In the irrigated area of Híjar, 680 ha are divided among 450 landowners, which makes the average ownership less than 1.5 ha per owner (aQysta 2020).

At first glance, this might suggest that the gap, in class terms, between the farmers and the *landowners* is narrowing down. However, there is still a sharp difference between them, considering that most of the landowners are not farmers. The great majority moved to the cities and have their lands abandoned or under-exploited, where minimum production is maintained to prevent them from becoming barren (Technical report 2020). This is in part related to the reduced size and high dispersion of the plots, which negatively affects their profitability. Some of the owners rent their lands to *tenant-farmers*, who may be owners in the dryland, but not in the irrigated area. They often rent these plots to generate extra revenue; however, most of their income comes from rain-fed farming.

According to the statistics of the Municipality, among the 450 landowners in the irrigated area, only 20 are active and titled *owner-farmers*. This means that only 20 farmers fill in the three characteristics of being landowners, farmers and irrigators. In their case, the excessive fragmentation of land becomes a major problem for irrigation, since it makes agriculture more labor-intensive. Especially when taking into consideration that they have to adapt their work-load to the irrigations shifts, which can occur in the earliest hours of the morning. Although the irrigated land is six times more productive than rain-fed agriculture (Maestu and Gomez 2010), most farmers make a living out of the dryland and collect the majority of their revenue thanks to CAP subsidies, which are only available for rain-fed agriculture. Despite the support these subsidies represent for the farmers, they also contribute to making agriculture highly dependent on external assistance, resulting in increased farmers' vulnerability and a constrain to their own autonomy (Van der Ploeg 2014).

Among the remaining farmers in the village, there is a general feeling that these subsidies are not sufficient, forcing them to constantly seek to expand to meet the CAP requirements, which, in turn, generates unequal land tenure patterns. Like in other parts of Spain, there is an internal process of concentration of the land that is taking place in the village. When a piece of land is offered for sale, the farmers with the most capital are often the ones who can purchase it. This places even more barriers for young people to enter agriculture. "*And another thing is that those of us who are still here are not going to let just anyone in. Here we are all boarders, a field comes out and we all want to take it*"¹⁶. Progressively, land is being concentrated among the few remaining farmers, condemning agriculture to an uncertain future (Soler y Fernández 2017).

According to the Irrigation Syndicate statistics, most of the owner-farmers in the irrigated area are older than 45, and many do not have generational succession. The phenomenon of immigration does not necessarily counteract this problem, since the purchase, sale and exchange of land is a slow process only occurring among farmers, or between farmers and landowners. Generally, the tendency is for farmers to buy land from the owners, but according to the secretary of Híjar farmers Cooperative, this process is taking place slowly. In this sense, the people who immigrated to the village and work in agriculture are only limited to being salaried agricultural workers. For example, they are usually hired during the harvest period to pack the peaches that are going to be sold to the Cooperative.

Although regional socio-economic processes and agricultural policies, such as the CAP and the Modernization of Irrigation, have historically built their social legitimacy as a strategy to settle population in the countryside (Lopez-Gunn 2012), the case of Híjar demonstrates that these policies have had little success on meeting the challenge of *land abandonment*. Particularly in the irrigated area, the land fragmentation is so substantial that landowners who do not live in the village have little incentive to take advantage of it. The problem of abandoned plots is also detrimental to irrigation, with the irrigation ditches that are improperly upheld that end up obstructing the water flow. This lack of maintenance and poor irrigation infrastructure generates additional burdens on farmers' workload.

In view of this gloomy scenario, many farmers perceived the *land consolidation* as a means to solve the main problem afflicting agriculture in Híjar; namely the extreme fragmentation of land ownership. This structural problem, which has direct consequences on the low profitability of agriculture, has contended to be solved by consolidating the land into larger plots. However, unlike other regions of the North of the country, in Híjar, land consolidation was never implemented. This is why, in 1999, the Village Council started the process to collect signatures to request the land consolidation. It was only ten years later, on February 26th 2008, that the DGA began the procedures for its execution, which comprised both the dry

¹⁶ 47-year-old farmer, interviewed August 13th 2021, village of Híjar.

land and the irrigated area (Irrigation Syndicate 2015)¹⁷. Later that year, the DGA communicated its decision to join the land consolidation with the installation of a pressurized irrigation system, an event that gave rise to the conflict between the DGA and the group of local actors that opposed this imposition.

3.3 The ‘Platform 0 cost’ and the struggle for the land

To understand the root of the conflict, it is important to portray the nature and differences between the two projects. On the one hand, land consolidation is a process whose cost must be borne entirely by the Regional Administration, and which is carried out in the entire agricultural surface of a particular locality. On the other hand, the irrigation modernization project only concerns the irrigated area. In Híjar, this implies transforming the whole irrigated surface, that currently has a flood irrigation system, into a pressurized irrigation system. The costs of this project are partly assumed by the affected parties, namely the owners in the irrigated area of the village. In this sense, the two projects are different and independent, both in terms of purpose and funding (Irrigation Syndicate 2015).

To this day, in Híjar, “the land consolidation of the two zones - irrigated and rain-fed - is paralyzed because those affected do not accept the installation of pressurized irrigation in the irrigated area due to its unaffordable high cost” (ibid. p. 1)¹⁸. As presented to the Irrigation Community, 65% of the initial cost of the project would be financed by the DGA, but the remaining part was to be borne by the Irrigation Community (Severino 2017). The plan of the project also stated that the modernization works were going to be subsidized for 25 years, but total project expenditures were never properly disclosed (Technical Report 2020). In the report prepared by the Irrigation Syndicate to expose the inconsistencies in the costs, it is evidenced that the technical documentation provided by the DGA is inaccurate. The extreme costs that the national irrigation modernization policy imposes on farmers have been denounced on several occasions. In fact, the General Secretary of the Union of Farmers and Cattle Ranchers of Aragón (UAGA) denounces that the costs of modernization, “together with the volatility of markets and the collapse of agricultural prices (which is becoming structural) and the liberalization of energy markets have left agriculture on the brink of disaster: it is impossible to afford the amortization of investments” (2015)¹⁹.

Those who were going to be particularly affected by this project were the group of owner-farmers who actively exploits the irrigated area and makes a living from agriculture. According to Irrigation Syndicate, the project's costs estimate was incompatible with farmers' revenues, making it unfeasible for those affected to cover the costs of pressurized irrigation. For example, while they produce on average 850 euros of barley (ha./year) on irrigated land, the fixed costs of the project would imply paying 1,250 euros per hectare for 25 years. This does not include the additional costs related to seeds and fertilizers, among others. Moreover, considering that most of the farmers had more than 45 years of age, there was not even going to be a demographic replacement to pay for the project costs over the 25 years. In addition, given the rising costs of electricity in Spain, the project would have contributed to the increase of their energy dependence, tying them to the rising costs of the energy market.

¹⁷ The document “Irrigation Syndicate 2021” refers to the contentious-administrative appeal that the Irrigation Syndicate of Híjar sent to the Superior Court of Justice of Aragón. It was sent to me by the Platforms' lawyer on a personal communication on the 15th of September, 2021.

¹⁸ Own translation.

¹⁹ Fragment of a newspaper article written by the General Secretary of the UAGA that was presented as part of the contentious-administrative appeal, of the Irrigation Syndicate (2015). Own translation.

Conversely, the group of tenant-farmers in the irrigated area were mostly in favor of the execution of the project, since they would have still benefited from the execution of the land consolidation without having to pay for it. As for the landowners, the installation of a pressurized irrigation system would have not required a major investment, as their plots were small, and their main source of income did not come from agriculture. In relation to the full-time owner-farmers, the costs they would have to assume were considerably less, including the electricity costs to be covered over time. These different visions and positions generated tensions in the village, dividing the people and placing barriers to reach a common agreement. In order for the project to be implemented, it had to be approved by the Irrigation Community in an Assembly voting process. Although there were several actors involved in the negotiations: delegates of the Department of Rural Development of the Government of Aragon, members of the DGA, representatives of the Híjar Village Council and the Irrigation Community, the final decision fell upon the judgment of the Irrigation Community.

To raise awareness about the cost overruns of the project and the injustice that this meant, a group of irrigators and owner-farmers, as well as some people that did not work the land directly created the 'Platform 0 Cost'. Under the slogan of '*Concentración YA*' ('Consolidation NOW'), they claimed the right to land consolidation without any cost. The Irrigation Syndicate played a key role in making the platform's demands visible. As explained, the Syndicate is the Board of Directors of the Irrigation Community, which is generally constituted by farmers who are engaged in the everyday issues concerning irrigation and agriculture, and who make their living from agricultural activities. In a document sent by the Irrigation Syndicate to the Hydrographic Confederation of the Ebro (CHE) to reiterate the reasons for their position, it is stated about the 'modernization project':

“The real modernization of agriculture is the process of land consolidation. The great dispersion and fragmentation of rural property in Aragón make the concentration indispensable for agriculture to become an economically viable activity [...] In short, MODERNIZATION IS CONCENTRATION [...] The essential, urgent and priority is to concentrate, and the concentration process is in no sense technically nor legally linked to the installation of pressurized irrigation or any other measure related to the crops” (Irrigation Syndicate 2012, p. 5).



Figure 3 Members of the 'Platform 0 cost' (Source: La Comarca 2017)

As part of its political repertoire, the Platform started mobilizing the population and making their struggle visible through alternative media. The goal was to inform about the inexistence of any legal norm that supports the execution of both projects together (Irrigation Syndicate 2015). They also utilized other strategies, such as writing political messages in different parts of the village and organizing manifestations, both in Híjar and in the city of Zaragoza, outside the office of the DGA. The aim of these protests was to denounce the ‘misinformation’ campaign that the DGA/SIRASA was carrying out to influence both the public opinion and the affected parties. Through diverse conferences and meetings aimed at convincing the people that “the important thing is to change the irrigation system and not to concentrate the plots” (Technical report 2020 p. 7). They also reaffirmed that if the modernization works were not carried out, the land consolidation was going to come to a standstill in both the rain-fed and irrigated areas.



Figure 4 “The plot parceling is at 0 cost; did you know it?” (Source: Fieldwork 2021)

Finally, on the 6th of June 2010, the Assembly voted to reject the project of the DGA/SIRASA, with slightly more than 50% of the votes against it. However, when the Irrigation Syndicate formally and definitively communicated the final decision to the DGA, the land consolidation process was paralyzed in both the dry land and the irrigated area, which was interpreted by the Platform as a measure of pressure. The main argument of the DGA to do so was that the consolidation without the integral modernization of the irrigation system was not technically nor economically feasible. In spite of this, the DGA still proceeded with the drafting of the preliminary project (El Periódico 2011) and with the implementation of the Environmental Impact Assessment (EIA), which was considered by the Platform as a waste of useless expenditure and a diversion of public resources. In response to this, the report of the Irrigation Syndicate states the following:

“It continues the procedures to execute the project for the installation of pressurized irrigation, and what is more serious, it even states something absolutely false and uncertain: that the Community has approved and requested the modernization project. How is the DGA capable of affirming such a falsehood? The manipulation and misrepresentation that the DGA is displaying are absolutely reprehensible” (2015 p. 9).

Despite this hiatus, the Platform continued to make several requests to the DGA for the continuation of the land consolidation without any cost and eventually started an exhaustive search for irrigation alternatives that would not compromise their financial situation. While researching on irrigation systems, the lawyer of the Platform found out about aQysta and its HyPump, which had won an award in the *Climate-KIC* of 2014 for the most innovative Clean-Tech Start-up. The HyPump seemed to be a proper alternative to the SIRASA’s irrigation project. That same year, the Platform prepared a proposal for the DGA, aspiring that they would be keen to subsidize the installation of the HyPump. The arguments to convince them were the low investment costs, the non-energy costs, the compatibility with the flood irrigation system used in Híjar and the low maintenance costs. Nonetheless, even when the environmental legislation of Spain requires to study alternatives, the DGA did not pay attention to their proposal, arguing that they needed to hire an engineer and conduct a more technically sound evaluation. The underlying reason, as explained by the members of the Platform, was that this alternative clashed directly with their interests and with the possibility of benefiting financially from the project.

After this denial and due to the unwillingness to listen to other proposals, in 2015, the Platform decided to sue the DGA to the Superior Court of Justice of Aragon (TSJA), claiming the right to the land consolidation without any cost and without the imposition of the irrigation modernization (Severino 2017). The arguments set forth to support the appeal were the disruption of the irrigation rights, covered in the Ordinances of the Acequia de Gaén Community, which by the application of the Water Law must be respected. They also argued that the implementation of the project “would lead to the abandonment and degradation of the irrigation of Híjar due to the high costs of installation, maintenance and consumption” (Technical report 2020, p. 9)²⁰. Moreover, in the interviews conducted with the members of the Platform, it was stressed that an additional argument was related to the potential conflicts over water that could have emerged between the Irrigation Communities of the different towns if the project was to be carried out. Also, considering the increase in water consumption and the energy dependence, it could have resulted in large electrical expenses that currently do not exist. Above all, the main concern was the economic impact on farmers. Added to the pressures they were already facing; this could have led to the abandonment of farms and agriculture.

Finally, in 2017, the TSJA ruled in favor of the plaintiffs²¹, declaring the linkage between both projects as illegal and ordering the continuation of the land consolidation by the DGA. However, four years have passed by and the consolidation is still paralyzed. It slowly started to run but it has been stalled again due to a new project initiated by a private investor that aims to build a photovoltaic park ([appendix 1](#)) in the dry land of the village. Although it will not directly affect the irrigated land, the land consolidation is still on hold, which only generates more uncertainty among farmers and irrigators, as it conditions the future of agriculture in Híjar.

²⁰ Own translation.

²¹ Sentencia nº 309/2017, de 14 de Julio (TSJA) Aragón, Sala de lo Contencioso-Administrativo, Sección 1ª, Recurso 110/2015.

3.3.1 Installation of the HyPump

In the meanwhile, with the legal proceedings underway, contact with aQysta continued. The same year of the appellate procedure, in 2015, a representative of the company made the first visit to Híjar. Together with the Irrigation Syndicate and some members of the Platform, they evaluated possible locations for the installation of the HyPump and afterward coordinated the logistics and bureaucratic arrangements. Examples of these procedures were the revision of the environmental proceedings, the constructions permit, and the applications for subsidy programs (EU and Regional), among others.

Besides the political divergences and uncertainties, the Platform continued to work with aQysta to install the HyPump in Híjar. Finally, in 2020, the pilot project was carried out. The process of the installation of the HyPump lasted three months and it was built on an irrigation canal in an accessible area of the village. The elevated reservoir was constructed 800 meters away and is used to store the water pumped by the HyPump to irrigate the crops.



Figure 5 HyPump in Híjar (Source: Fieldwork 2021)



Figure 6 HyPump's reservoir (Source: Fieldwork 2021)

The area chosen for the installation is adjacent to the land of two farmers, who volunteered to be users of this experimental phase (2020 – 2021). Currently, the pilot project occupies 7 ha, of which 5 are for peach trees, 1 for olive trees and 1 is for almond trees. This first phase of the project involves the transformation of flood irrigation to a drip irrigation system with no energy cost. As agreed with the Irrigation Syndicate, the results of the pilot project will be evaluated in 2022, but the aim is to expand it and eventually install more pumps in different parts of the irrigated area. Nonetheless, to make these plans effective, they argue that it is first necessary to execute the land consolidation.

Although the HyPump is still in use and is now part of the landscape of the village, it is not really part of the everyday life of most of the farmers, nor it is one of their main concerns. In the absence of an effective response from the DGA regarding the process of land consolidation, it appears that the HyPump is operating in parallel to the social, political and economic tensions that continue to exist between the DGA and some members of the village. While at first the HyPump was meant to support the Platform's argument against the irrigation modernization project, now that the judicial process is over, the HyPump does not occupy a central position in the village. Although it is the priority of the two farmers who use it, it occupies just a peripheral place in most irrigators and farmers' everyday life. As I mentioned in the methodology section, it was precisely for this reason that this study aims at going beyond the technology itself, because the current problems most farmers of the village face are related to other issues, particularly, as it will be exposed in the next section, to the problem of land.

Chapter 4

Analysis and conclusions: power, land and agrarian change

This chapter explores the interconnection between the HyPump and the conflict described in the previous section. Informed by a political economy perspective, I examine the social, political, and economic dynamics that underlie the introduction of this technology. To do so, the analysis will be carried out on two levels: local and institutional-structural. I begin with a critical analysis of the drivers that motivated the Platform to start the endeavor towards the installation of the HyPump; shedding light on the heterogeneity of positions and perspectives, as well as the changing patterns of social relations. Subsequently, I explore the ‘state-society’ relations and reflect on the role that the different actors played in a conflict, focusing specifically on their interactions with the changing agrarian context²².

4.1 Social drivers and perspectives

A political economy approach critically examines the role that the contexts play in defining people's interests and actions; it also evidences the ways in which political and personal histories related to the land can shape people's positions on specific confrontations (Hirsch and Scurrah 2015). As the story reveals, the DGA/SIRASA project would have had differentiated impacts on the local actors, if it was to be implemented. Because of this, not all the interested parties decided to organize and be part of the ‘Platform 0 cost’, the key actor of the conflict. What the foremost members of the Platform had in common is that they were ‘full-time’ farmers, landowners, and irrigators. Therefore, it can be inferred that the level of personal engagement and willingness to mobilize is determined by the position and role that one occupies in society, which is ultimately influenced by the relationship that one holds with the land.

The factors that led the Platform to mobilize, to both denounce the DGA and pursue the introduction of the HyPump, were a response to the problem of the land. The central role that land plays in the unfolding of the story, provides an entry point to explore the ways in which the actions and political stances adopted by local actors were influenced by their relationship with the land. In this sense, the Platform mobilized because the projects implemented in the territory affected them directly, as their main economic activity and social relations are constructed around land (Polanyi 2001). Therefore, decisions and projects regarding the use of the land and the control over it are experienced on a deeper level (Palmer et al. 2009). Even when the political role of the Irrigation Syndicate, a key member of the Platform, is connected to issues concerning water, its relationship and rights to water are still mediated by their relationship with the land. That is why, even though they mobilized against the imposition of the irrigation project, the constant, and underlying, demand is for the land: *“The main problem here has always been, and continues to be, the fragmentation. As long as this is not resolved, any project that comes along will not work. And this is only solved by consolidating”*.

Land consolidation is conceived as the necessary first step to solve what is considered to be the greatest problem that agriculture faces in Híjar: the excessive fragmentation of land ownership. The modernization project, in fact, represented a direct threat to the application

²² The quotes used in this chapter are extracted from two interviews conducted with two different groups of farmers on August 8th and 13th. They have been translated by me.

of this right. Hence, the need to mobilize is also rooted in a sense of justice. The legal documents prepared by both the Platform and the Irrigation Syndicate, reveal ideals of social and agrarian justice that go beyond the economic downsides that the project represented. Similarly, the intrinsic idea of 'justice' was always present in the interviews. Beyond the absurd costs of the project, an underlying concern was the illegal nature of the political strategy that was being designed. As a response to the intimidations perpetrated by the DGA of paralyzing the concentration in the town if the project was neglected, the Technical Report (2020) elaborated by the Platform members states: "The 'Platform' did not back down in the face of such threats and continued to insist that the only truly modernizing measure of the countryside is the land consolidation and not the installation of pressurized irrigation (which can be done by each individual if they wish) and continued with its activities of information, awareness and *defence of the legality in force*" (p. 13)²³.

Furthermore, people's lived experiences around the resources also inform the ideas and meanings that are given to the events. The conflict with the DGA/SIRASA reveals different visions and perceptions regarding the distinct actors involved, the landscape, and the agricultural activity itself. During the interviews conducted with some members of the Platform, in addition to the material differences between being a 'full-time farmer' and a landowner, contrasting visions regarding the 'lived' and 'imagined' experience of the countryside arose. Beyond the arguments of the owners in supporting the DGA's project, some members of the Platform believed that the landowners had lost contact with the 'agrarian world', and thus have a slanted understanding of the current problems faced by the farmers. *"They don't understand how difficult it is to be a farmer now. They don't understand that we are hung up by the neck"*.

During the conversations, the difference between 'experiencing' the lack of infrastructure and government support, the generational problem, the pressures of the CAP, and the internal process of land concentration, and the 'romantic' visions of the countryside and farming activity emerged constantly. *"They want to arrive on the weekend, open the tap and have water. When, in reality, irrigation is much more than that"*. There is a network of political and social relations around the daily practice of irrigation (Gelles 2020), which is not easy to understand if *"the visits to the countryside are only on the weekends"*. After leaving the village, the position of the landowners changed, and so did their relationship with the state, the market, and the land. *"They think the land is worth something here, but in reality, the land is worth nothing"*. While I acknowledge the limitation of having interviewed only two landowners, portraying the different positions and subjectivities that gave, and continue to give, meaning to the local processes is key to bringing about the diversity that exists. Although the landowners I interviewed no longer lived in the town, their actions are still rooted in past experiences. Thus, their emotional bond with the land can also be an important reason for not wanting to sell or rent it. As an example, for one of the interviewees the reason for not selling the land was that it is part of a 'family tradition', and it was better for it to be abandoned rather than sold to someone else. Similarly, peoples' actions are also grounded on expectations and ideals about the future, which ultimately conceive the land as a potential business opportunity.

Nevertheless, it is important to recognize that these positions are not static. Since the beginning of the struggle for land consolidation, more than ten years ago, land ownership patterns, and therefore social relations, have been changing in the village. For instance, some tenant-farmers that initially rejected the Platform's demands, changed their viewpoints as they became owner-farmers in the irrigated area. This is because the acquisition of more land in the irrigated area would come with additional and increased costs for the installation of a modern irrigation system.

²³ Own translation. Emphasis added.

In this sense, the determining factors that drive the Platform's mobilization are deeply related to the problem of land, and particularly to its high fragmentation. Land consolidation is perceived as a way of solving it, but the project of the DGA/SIRASA placed further barriers around the achievement of this objective. In view of this, the Platform mobilized, using legal and political resources, to denounce this illegal strategy. The HyPump was only one of the resources used to reinforce their position, but the underlying struggle goes far beyond the irrigation technology. In other words, the HyPump is a means to an end: the driving factor is not the need for a renewable energy irrigation technology, but the reorganization of the structure of the land. "Land consolidation is not only the real measure to modernize agriculture, but its implementation is a prerequisite for any other measure" (Irrigation Syndicate 2015, p. 6).

However, this does not mean that the benefits of the HyPump, such as its potential to contribute to alleviating some of the difficulties that agriculture faces, are not recognized. The willingness to chase alternatives for these problems is, therefore, genuine. By contacting aQysta and searching this technology, the Platform was also anticipating an issue that is becoming critical in Spain: the rise in energy costs. Nevertheless, this interest for alternative irrigation systems that do not demand any energy cost and contributes to water-savings seems to be driven by an economic logic rather than an ecological one. In this sense, it can be inferred that the relationship of the Platform with the HyPump is rather instrumental. It is functional in the sense that it helps to present a better defense to the Court, and provides an alternative of irrigation to the DGA imposition, but is, in the end, subordinated to material and immediate needs regarding the land. This can be evinced by the fact that it does not play a central role in the day-to-day life of farmers; their primordial concerns are, in fact, still linked to structural issues.

4.2 Unpacking the 'state-society' relations

The case of Híjar demonstrates that the links between political power and capital, in the way 'agricultural development' is being implemented, remain strong. The strategy of making a public process (the land consolidation) dependants on a high-cost hydraulic project, puts in evidence social, political, and economic relations of power. It evidences the way in which land is used to attain specific economic interests to the detriment of the individuals (Hirsch and Scurrah 2015). These strategies, and in broader terms the agricultural modernization programs, need to be allocated within the dynamics of social conflict (Díaz-Geada 2021). This means, in the web of social relations and subjectivities that intersect in a particular event. Far from being 'technical' projects, these programs are highly political and carry out ideas of progress and development (Palmer et al. 2009). The rationality with which agrarian environments and, therefore, farmers are conceived places further limitations to a democratic process of dealing with land-related issues.

The strained and tense 'state-society' revealed in the case of Híjar is further highlighted by the ways in which the DGA employed its institutional mechanisms to obtain economic benefits from the management of the resources; by coercing its citizens and crossing the barriers of its own legality. Even when the Superior Court of Justice of Aragón declared the linkage between the two projects as being illegal, the institutional context remains so adverse that this victory did not translate into concrete actions. More than 10 years have passed since the DGA approved the land consolidation (2008) and it is still on hold. What is worse, is that not only this process is currently paralyzed because of political will, but also due to the external pressures of private investors ([appendix 1](#)). In this sense, the level of agency of the individuals is constrained by institutional structures, which perpetuate the ongoing commodification of agrarian localities (Akram-Lodhi 2013). Whether it is an irrigation modernization

project or the construction of a photovoltaic park, the fate of the farmers of Híjar seems to be driven by broader economic dynamics and capital flows, rather than by local demands. This situation aggravates the pre-existing vulnerable character of agriculture and perpetuates the subordination of land to the market (Van der Ploeg 2010). Thus, land consolidation, instead of being a mechanism of good governance, becomes an instrument that places public services at the service of economic interests, promoting the capitalization of agrarian environments (Díaz-Geada 2021).

This suggests that the modernist perspective that once characterized the state-driven agrarian development remains in force to these days. Although pressurized irrigation is presented as an example of efficient water management, the underlying modernist rhetoric has not yet fully changed. The agricultural modernization proposed through the installation of pressurized irrigation does not challenge the historical productivist logic, which portrays this project as ‘technical’. However, from a political economy point of view they are also political (Palmer et al. 2009). Nonetheless, this does not mean that the guiding of the Platform does not follow a similar logic. In both cases, concepts as growth, productivity, and competitiveness are frequently used. For the Platform, even the HyPump is conceived as an economic alternative, in the sense that it can contribute to lowering production and energy costs. This similar rhetoric can be grasped in the following fragment, where the Irrigation Syndicate expresses its opinions about the land consolidation:

“It is not only the less costly for the public administration but also the most efficient from all points of view: *economic, business, investment, agricultural, hydraulic, energy, social and environmental*. Through the strict concentration of plots of land, the foundations of true modernization are established by putting an end to the fragmentation and dispersion of the current property structure. In this way we will bet on the economic and social development of the area without major cost overruns or financial leverage that only led to ruin” [Emphasis added] (2012 p. 3).

However, while the arguments for implementing the project remain within the ‘market-technical’ framework, the ones from the Platform were not restrained to the economic impact that the project would have had on their lives; they were also driven by a sense of justice. The fundamental difference lies, once again, in the relationship with the land. While the ‘top-down’ processes evidence a fundamentally marketized relationship, in the case of the farmers the bond goes beyond the connection to the market and the conceptualization of the land as an asset (Palmer et al. 2009); it is instead permeated by deeper social, political, and cultural processes. Beyond the factor of the external interventions, the constant concern is what they refer to as “*the future of agriculture*”, which is ultimately the future of their own livelihoods.

Moreover, the form in which the state exerts its authority and political legitimacy to achieve certain outcomes (Wells-Dang 2013) evidences a continuation to the imposition of an ‘agricultural development’ conceived only ‘from above’, and that leaves no margin for demands that emerge ‘from below’. The DGA - and ultimately - the state apparatus, seem to continue the perpetuation of undemocratic traditions that do not consider farmers’ political voices. This becomes clear when it comes down to supporting an alternative to the irrigation modernization project. While the modernization program would have translated into concrete economic benefits, the HyPump did not bring any type of monetary return to the DGA. Besides the reasons that guide the actors to seek for the HyPump, the case demonstrates that the structural and institutional governance still reflects this top-down mechanism of relating with the citizens (Edelman and Wolford 2017), which does not leave room for the rise of alternatives.

The DGA's strategy to achieve its project also demonstrates how, from official power instances, the use of ideological mechanisms is often resorted to achieving the desired objective. The use of the ‘modernity narrative’ in the public sphere is also a way of imposing certain imaginaries to manipulate or influence the negotiations (Díaz-Geada 2021). This is

evidenced in the form with which the DGA, during the confrontation with the Platform, started a campaign to establish the idea that the modernization of irrigation was a necessary step to implement the land consolidation. These discursive mechanisms, even if commonly used by power instances, can also be owned by the citizens and endowed with meaning. In Híjar, the Platform did so by claiming the slogan *Modernize is to concentrate* ('Modernizar es concentrar'), an expression that was reproduced by local news and within the town. It also came up in many of the interviews and in informal conversations.

Above all, except for the common needs that unite the two most important actors involved in the conflict such as productivity and economic growth, there is a structural difference between them, that manifests at different levels, but is particularly marked when it comes to land. The nature of this relation is deeply unequal and evidences a disconnection between the local reality, demands and visions, with the way in which 'agricultural development' is conceived and implemented.

4.3 Final considerations

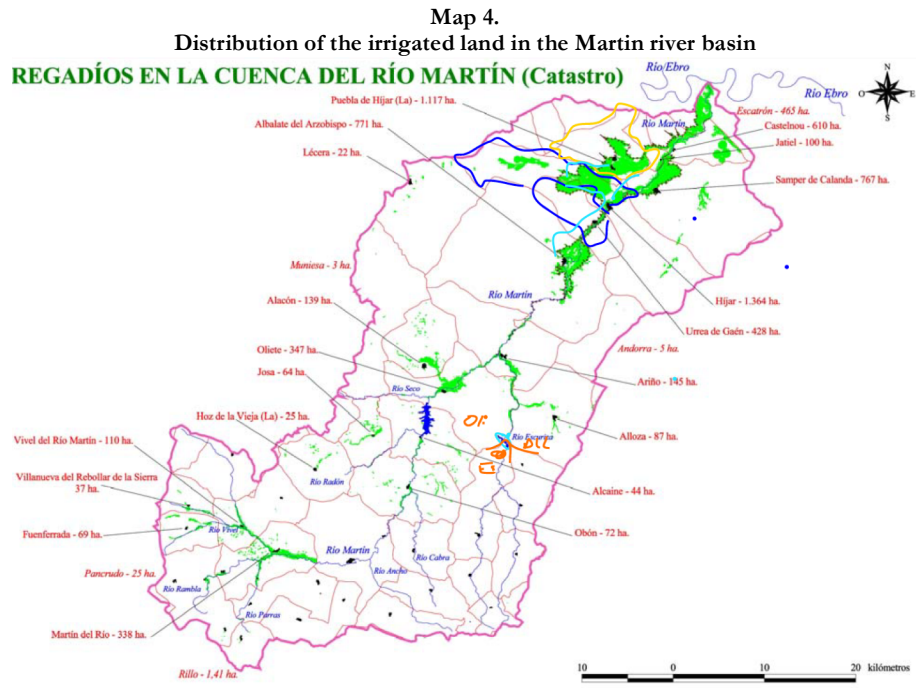
The case of the HyPump was useful to analyse how the interaction between the 'Platform 0 Cost' and the DGA finds its foundations in a social conflict; shedding light on the different visions and struggles regarding agriculture and irrigation that are encountered during a process of 'agrarian development'. As the story demonstrated, the social, political, and economic dynamics underlying the introduction of the HyPump have deep complexities and occur both at the local and structural levels.

At the local level, the social differentiation in terms of access, use and exploitation of resources, places the local actors in a critical position that influences their decision with regards to the DGA's 'proposal'. The external interventions are not the same for everybody; they are perceived and experienced differently according to the relationship that the actors have with the land, with the state, and with each other. Beyond political and economic arguments, their stances also respond to issues of social and agrarian justice. The role of 'Platform 0 cost' was precisely to bring those issues to the attention of the 'official' political sphere.

People's actions and standpoints are also shaped by institutions and structures (Borras 2009); this means that they have to be allocated within the larger framework of social relations patterns of which they are part. At a structural-institutional level, the role played by the DGA in the confrontation suggests a continuation of a vertical relation between the 'state-market' and the 'society'. The adverse framework in which the Platform demands are located is evidence of the fact that the line between political and economic power is blurred. It does not add to or engage with the processes emerging 'from below', but rather it imposes new-fangled constraints and compulsions (Akram-Lodhi and Kay 2010; Akram-Lodhi 2013).

Rethinking these structures of power, authority and capital, as well as their relationship with how top-down 'agricultural development' projects are lived and experienced in particular localities, is the first step to expose and tackle the unequal relations that prevail around the resources.

Maps



Source: Hydrological plan Martin river

Appendices

Appendix 1 Photovoltaic park

The project of the photovoltaic park is being undertaken by the private company Forestalia. In 2020, the registration phase was carried out, as well as the administrative procedures with DGA and Municipality of Híjar. Although it has not started to be implemented, some landowners and farmers have already signed contracts to lease their lands. In the national news, it is presented as a project that will contribute to economic growth and generate employment in the region. However, the 'Paisajes Teruel' platform, an organization that oversees the protection of the territory and citizenship from renewable energy megaprojects, has expressed its opposition to the project. In view of the results of similar projects in other villages of Teruel, they argue that those projects do not contribute to achieving sustainable and equitable development model. Among the farmers with whom I spoke, there are mixed feelings about the project. On the one hand, they acknowledge that the money offered by the company could not compete with their current agricultural income. On the other hand, they distrust mega-projects. If this was to happen, they would be left without land to farm.

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