

All-terrain experts: Land surveyors, remote mapping and land alienation in Mendoza, Argentina

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Global Change - Local Conflicts

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Abstract

There has been recent growing interest in the role of expert knowledge around land politics. One area that has often been overlooked is how land-related expert knowledge has fostered the transformation of the regime of land control, access and ownership. This paper aims to capture the distinctiveness of contemporary mapping politics in relation to the commodification of land by corporate and state actors. I analyse how remote mapping practices influence the transformation of land regimes. The main research question is how and to what extent land surveyors and their cadastral mapping practices facilitate and legitimate market-led land commodification, and at the same time contribute to de jure and de facto peasant land alienation.

Resumen

Recientemente, ha habido un creciente interés en el papel del conocimiento experto en torno a la política de la tierra. Un aspecto que a menudo se ha sido pasado por alto es la forma en que el conocimiento experto relacionado con la tierra ha fomentado la transformación del régimen de control, acceso y propiedad de la tierra. Este artículo tiene como objetivo captar las características distintivas de las políticas cartográficas contemporáneas en relación con la mercantilización de la tierra por parte de los actores corporativos y estatales. Al hacerlo, analizo cómo las prácticas remotas de cartografía, es decir, las operaciones tecnológicas y cartográficas que buscan (re)hacer un mapa catastral de una determinada área de tierra desde un punto físicamente distante, influyen en la transformación de los regímenes de la tierra. La pregunta principal es cómo y hasta qué punto los agrimensores y sus prácticas de mapeo catastral facilitan y legitiman la mercantilización de la tierra al mismo tiempo que contribuyen a la enajenación de la tierra por parte de los campesinos.

Zusammenfassung

In jüngster Zeit rückte die Bedeutung von Expert_innenwissen für Landpolitik vermehrt ins Blickfeld der akademischen Debatte. Bislang wird hierbei jedoch die Rolle von Expert_innenwissen bei der Transformation von Kontrolle über, Zugang zu und Besitz von Land oftmals übersehen. Ziel dieses Beitrags ist daher, die Besonderheiten und die Bedeutung gegenwärtiger Kartographie von Land hinsichtlich dessen Kommodifizierung durch Unternehmen und staatliche Akteur_innen herauszuarbeiten. Ich analysiere, wie *remote mapping practices* die Transformation von Landregimen beeinflussen. Die zentrale Forschungsfrage lautet wie und inwieweit Landvermesser_innen und deren Kartierungspraktiken für die Katasterämter die Kommodifizierung von Land erleichtern und legitimieren und gleichzeitig de jure und de facto zur Veräußerung von Land von Kleinbäuerinnen und Kleinbauern beitragen.

Keywords: Critical cartography, land politics, experts, cadastral mapping

Palabras clave: Cartografía crítica, políticas de tierra, expertos, mapa catastral

Schlagwörter: Kritische Kartographie, Landpolitik, Expert_innen, Katasterkartierung

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1 Introduction

There has been recent growing interest in the role of expert knowledge in the politics of resource control and access, and, more generally, in land politics. Most of this literature focuses on historical cases exploring the role of expert knowledge through the lenses of Science and Technology Studies, Environmental History, and History of Science and Technology (Edelman/Wolford 2017; Fogelman/Bassett 2017; Goldstein/Yates 2017; Jørgensen et al. 2013; Li 2017; Pritchard et al. 2015; Rasmussen/Lund 2017). Concerning recent land rush debates in the agricultural and extractive sector (Le Billon/Sommerville 2017), one area that has been often overlooked is how land-related expert knowledge and contemporary land surveyors' practices, particularly the use and institutionalization of geospatial technologies (such as GPS and GIS), have fostered the transformation of the regime of land control, access and ownership. By land regimes, I understand the stabilization, over a period of time, of certain rules concerning who controls land, the ways in which land is accessed, and for what purposes land is controlled.

This paper aims to capture the distinctiveness of contemporary mapping politics in relation to the commodification of land by corporate and state actors. I analyse how remote mapping practices – that is, technological and cartographic actions which seek to (re)make a cadastral map of a certain land area from a physically distant point – influence the transformation of land regimes. Land surveyors are supposed to act as public officials in land market transactions. In Mendoza, Argentina, the case discussed in this paper, the buying and selling of any piece of land requires that a land surveyor makes a (new) cadastral map of the piece in question, which then has to be approved by and registered at the *Land Registry Office* (LRO). I look at how surveyors' knowledge of land is constructed and asserted by technology, and what effects this has concerning the regime of land control and access.

The main research question is how and to what extent land surveyors and their cadastral mapping practices facilitate and legitimate market-led land commodification, and at the same time contribute to *de jure* and *de facto* peasant land alienation. Cadastral mapping is defined as a broad set of spatial practices aimed at producing an official and registered document that defines precise locations, boundaries, ownership and tenure of property rights, finally resulting in a cadastral map. In contrast with peasants, who mainly *use* land regardless of its legal status, agribusiness companies mostly seek to *own* land as private property. In this sense, a cadastral map is a legal condition in land market operations, while, from a political perspective, it contributes to rendering land investable (Li 2017).

My analysis is based on ethnographic research on land surveyors' practices around a land conflict which began in 2004 in Las Heras in the province of Mendoza, Western Argentina. The actors involved in the conflict are an agribusiness company, *Agropecuaria Elaia S.A.*, a resistant peasant community and the local LRO. The land under contestation is located in an area characterized by the introduction of an irrigation system in the 19th century which initiated a process of land and water commodification resulting in the dispossession of native and peasant groups from their traditional land and water rights. The land was mainly appropriated by European migrants, who rapidly made it “productive” through an expansive agroindustrial model based around wine grapes. By 1970, this model collapsed due to economic structural adjustment, which imposed market restrictions and led to groundwater

overexploitation and wine overproduction *vis-à-vis* a dramatic decrease in wine consumption. As a consequence, most of the irrigated land was abandoned by mid-sized farmers and companies. By 1980, peasants had returned to occupy the lands and were using it mainly for breeding and herding goats, sheep, cows and horses. At the beginning of the 21st century, however, in a national context of economic growth and political stability, these former “marginal lands” returned to the sights of capital investors, who saw the area as potentially highly profitable. *Agropecuaria Elaiá* and others invested in the land, as well as irrigation and olive tree plantations, with the aim of producing “premium” olive oil for the global market.

Land surveyors played a critical role in facilitating and accelerating the commodification of the land in Mendoza for these agroindustrial purposes. The extent and velocity of this process was possible due to the versatility of land surveyors’ mapping work. One core issue in this story is that traditional (and legally obligatory) fieldwork by surveyors has become “redundant” in the current mapping process, due to the increasing incorporation of remote sensing technologies over the past 15 years.

In this paper, I argue that the introduction of remote sensing technologies in land surveying and cadastral mapping has enabled the acceleration of legal and illegal land control and ownership by agribusiness companies in Mendoza. Moreover, this has resulted in the loss of land rights and partial displacement for peasants. The analysis reveals that remote mapping has major implications for land politics due to two operations: technicity and (in)visibility. The first refers to the power of technology to solve fieldwork mapping problems. This results in a techno-dependent work and auto-justification (“good” because it is made with “advanced” technology), in opposition to the traditional “accuracy” mapping principle. The second – (in)visibility – occurs when land surveyors, wittingly or unwittingly – due to their physical distance from the terrain to be mapped – neither perceive nor register the actual land users and the ways in which they are using the land. Meanwhile, peasants are not even aware that they are being measured/surveyed and – formally – expropriated. Theoretically, the analysis is based on critical cartography and space theory. Key concepts used are land commodification, remote and cadastral mapping, and land regime transformation.

The paper is structured as follows. In the following section, I develop my analytical framework. I then carry out a critical historical investigation into the changing logics and practices of land surveyors. In part four, I analyse how the public land registry office and the “remote” surveyors performed the ex-situ expropriation of ancestral land users in Las Heras, Mendoza. In the conclusion, I reflect on the politics of remote mapping and the emergence of a new land control and access regime.

2 Critical cartography

In recent years, a growing body of literature focuses on the relationship between land politics and knowledge (cf. Blomley 2017; Dwyer 2015). At the same time, another body of literature points at the territorial dimensions of property regimes, comprising not only the *de jure* dimensions of land control but also the social, political and territorial processes that commodification and capital accumulation are based upon (see special issues in *Geoforum*,

82 on “Rendering land investable” and *Environment and Planning, A* 48(4)). Both debates have contributed to a more sophisticated understanding of the connection between expert knowledge and land politics, thereby drawing upon insights from the field of critical cartography, particularly the idea of the “power of maps” (Crampton 2001; 2009 Gavish/Kark 1993; Harley 1989; Kain/Baigent 1992; Kitchin/Dodge 2007; Lupton/Mather 1997; Wood 1992).

Contrary to positivistic cartography, critical cartography argues that maps do not only represent the territory but also produce it (Fogelman/Bassett 2017). The idea of “map effectiveness” was coined by Arthur Robinson et al. (1995) to highlight the fact that maps need to capture and (re)present relevant information. Based on critical social theory, critical cartography scholars scrutinize the foundations and logics of map effectiveness. The question for critical cartography is what is relevant, from what point of view, for whom and to what political effects.

According to Charles Fogelman and Thomas Bassett (2017), authors in the field of critical cartography differ regarding their views on how maps work. Three main theoretical perspectives can be distinguished: representational, inscriptional and processual. From a representational perspective, scholars emphasize the representational accuracy of maps and argue that maps always demonstrate a certain truth about reality (see Harley 1989; Robinson 1952). The inscriptional perspective focuses on the effects that maps produce (e.g. commodification, taxation, dispossession, etc.). It is argued that maps have specific and inherent power effects. As Fogelman and Bassett (2017) state, James Scott’s book “Seeing like a State” (1998) is one of the most cited works that is based on the inscriptional perspective. Maps, in Scott’s view, have a prescriptive role in both simplifying and altering the world around us. He argues that state cadastral maps are created to designate taxable property holders. A cadastral map “does not merely describe a system of land tenure; it creates such a system through its ability to give its categories the force of law” (Scott 1998: 3).

Another influential work that seeks to go beyond the representational view is John Pickles’ 1995 published book “Ground truth,” in which he claims to pay attention to “the work that maps do, how they act to shape our understanding of the world, and how they code that world” (1995: 12). This represents well the very idea of maps as “inscription devices”: they do not only represent the world but create it. Furthermore, a created world is not neutral, but is adjusted to the individual map-makers and their sponsored interests. This is particularly evident when analysing cadastral maps, which basically transform land into an economic good governed and secured by the state and transferrable through the market, and thereby negating pre-existing social control and access rules in a given territory.

Proponents of the processual perspective in cartography criticize the other two approaches (representational and inscriptional), calling instead for an understanding of maps not as products but as processes (Fogelman/Bassett 2017). From this perspective, it is argued that maps have no ontological security or stability. They are not “final” products, but are constantly being remade in a context-dependent and relational way. Authors from this perspective call for attention to be paid to the “spatial practices enacted to solve relational problems” (Kitchin/Dodge 2007: 342).

In sum, there are mapping practices and there are uses of maps. I agree with Jeremy Crampton (2003: 51), who calls for a “contingent and relational” understanding of cartography. Maps, from this perspective, are more historical products operating within “a certain horizon of possibilities” (ibid.) than finite representations of land. Thus, the analysis of remote mapping practices and their territorial and political effects becomes feasible through the understanding of cadastral maps as both inscription devices and processes. This allows me to consider cadastral maps as concrete and effective in certain realms, contexts or arrangements. Actors with more or less power and access to or within the state – including public LROs – operate between maps and mapping. They literally (re)make the cadastral maps as much as they need to in order to increase their effectiveness. For example, in the case discussed, the LRO in question made diverse observations on previous versions of the cadastral map of the area, which led the surveyor to rearrange a new map to make it more effective in terms of being “approved” by the LRO. This dialectic relationship between map and mapping takes the form of a process of processes, in the sense that it is an encompassing process of several overlapping and specific processes (mapping and remapping, buying the land, titling, negotiating, etc.). Such a perspective maintains a processual comprehension of cadastral mapping, with a focus on the surveyors’ recursive practices, while at the same time it takes advantage of the specific moments and effects when the product (the cadastral map) operates as a clear and effective inscription device. In other words, it is a continuous process of mapping practices that remake inscription devices. However, to date studies conducted by critical cartographers say very little about the technical aspects of creating or using maps (Crampton 2003). In what follows, I demonstrate that both inscriptional and processual perspectives are productive for understanding the issues of invisibility and technicity in cadastral mapping and land regime dynamics.

3 Land surveying – changing logics and practices

While cartographic knowledge and devices have always been, and continue to be, effective in placing and displacing rights and people, the concepts and practices of surveying have changed over time. Nicholas Blomley (2017) shows that when cartographical land surveying emerged in the 17th century, it was use-right centred. Based on empirical and proximal knowledge of land use, the product of cartographical activities was not a map but an authorization to use land. The land registry at that time represented a bundle of localized relationships between land and people, rather than an accurate and precise map with clear property demarcations.

This use-rights-centred cartography changed when land surveying became a domain of expert knowledge, centred around geometry, accuracy and space delimitation. The result of this “expert turn” was the (scaled) map, which contributed to the idea of “property” as a space where the owner could act (Blomley 2017). From then on it, was possible to spatialize social relations of property based not on traditional uses and knowledges but on scientific knowledge.

In recent years, the incorporation of geospatial technologies (such as satellite imagery and informational tools) into land surveyors’ everyday practices has dramatically changed their

professional routines, and especially their traditional embeddedness in the terrain through “fieldwork.” Two decades ago, it was necessary to invest in expensive and hard equipment and to conduct long-lasting and exhaustive fieldwork in order to achieve the “waypoints” (GPS markers), which were then translated into a cadastral map. Today, in contrast, it is sufficient to have a computer with internet access and the necessary software in order to “simply” draw a decent map from one’s desk.

Current mapping practices rely on the use of cartographic instruments (GPS, computers, software, etc.) by people (surveyors, technicians), whereby the product is inherently dependent on the interaction and its particular context. Mapping practices are contingent and (dis)embedded from both the terrain and fieldwork interactions. The dislocation of mapping practices – from the terrain to the desk – exacerbates the invisibility of both physical and legal facts. Peasants’ use of land and their land rights can be easily erased by changing previously mapped property boundaries or by the displacement and misplacement of natural markers (rivers, forests, mountains, etc.) on the maps. At the same time, and due to the physically distant and technologically mediated position of the work, surveyors are released from uncomfortable professional and ethical contradictions.

Once powerful actors, such as private companies, have the cadastral map approved by the relevant LRO, they often take control of the piece of land, hiring “security services” if needed to achieve this. Then, even though there are human and natural markers still on the terrain which do not coincide with the “official” cadastral map, land control and access have nevertheless changed. Proponents of critical cartography thus argue that the claims of accuracy and neutrality of geospatial technologies are, if not naive, then at least deeply biased. The task of doing effective cadastral maps has to do more with technicity and opportunity than with territorial accuracy and transparency. Thus, the question is not what a map is but what a map does, and how it emerges and operates through contingent, relational, context-dependent and techno-dependent practices (Kitchin/Dodge 2016).

4 The conflict around the Domínguez family farm

The Domínguez family was a well-known peasant family dedicated to cattle, goat and horse breeding, living in the suburbs of Jocolí, a rural village located in Las Heras, northern Mendoza. They had been living quietly on a farm which had been abandoned by its former owner three decades earlier. In 2004, however, their livelihood and routine work were disrupted when their land came into the sights of various agroindustrial investors. *Agropecuaria Elaia* started an ambitious project in the olive oil industry in Mendoza. The company is part of a Spanish holding whose agricultural production and livestock branch represents one sector of a wide range of activities spreading from real estate to biotechnology, with representation in many countries, especially Europe. The shareholder bought around 32.000 hectares of land in Jocolí, a section of which was on the Domínguez’s grazing lands. On part of this land, the company installed the *Doña Carmen* estate, with the objective of becoming one of the largest olive growers in the world, for a market focused primarily on the United States. The project was supposed to cover the whole production

process, from groundwater wells and pumping to drip irrigation, through to the pressing and commercialization of premium quality oils.

In 2007, the company began to build wire fences surrounding the grazing areas of the Domínguez family farm. In May 2011, during a “gathering” work day at a neighboring farm, where the peasants who shared common breeding lands had gathered their cattle to check, vaccinate and trade them, the company took advantage of the peasants’ absence from their land. In order to enforce their claim to parts of the Domínguez grazing lands, the company constructed wire fences on the family’s lands, five kilometres beyond the boundaries of company’s property. On the same day, they also destroyed – without prior notice or a court order – one of the family’s houses and farmyards that had been standing there since 1944. This act of destruction and illegal land appropriation via physical demarcation attracted public attention, and thus marked a turning point in the land conflict in the area. The company was denounced, both formally in the local court and publicly in the national media (La Nación, 11.06.2011). The family recovered its land and rebuilt the facilities that had been destroyed, while the company removed the fences and put them back up at the former boundary. In 2015, the judiciary ruled in favor of the Domínguez family, consolidating their ancestral possession of the land.

The crucial role of mapping, and especially remote mapping, in the conflict around the land inhabited and used by the Domínguez family becomes evident when we focus on the actions of the provincial LRO and the surveyors in relation to the appropriation of the peasants’ lands by *Agropecuaria Elaia*. Cadastral maps are a key inscription device used to register and secure private property rights over land, and can therefore lead to the commodification of communal lands. As mentioned in section two, through cadastral maps, land surveyors define precise locations and boundaries and thus create the foundation for property rights. In Mendoza, every purchase and sale of a registered piece of land requires, according to the LRO, the (re)making of the cadastral map. The state thereby formally enforces the process of permanent mapping in order to guarantee a working land market. When the conflict over the Domínguez family farm arrived at the courts, which brought to light the chaotic state of the land registry, the court ordered an independent cadastral assessment, which concluded that the company had indeed been grabbing other people’s land. The maps I analyze in the following section are the product of this study.

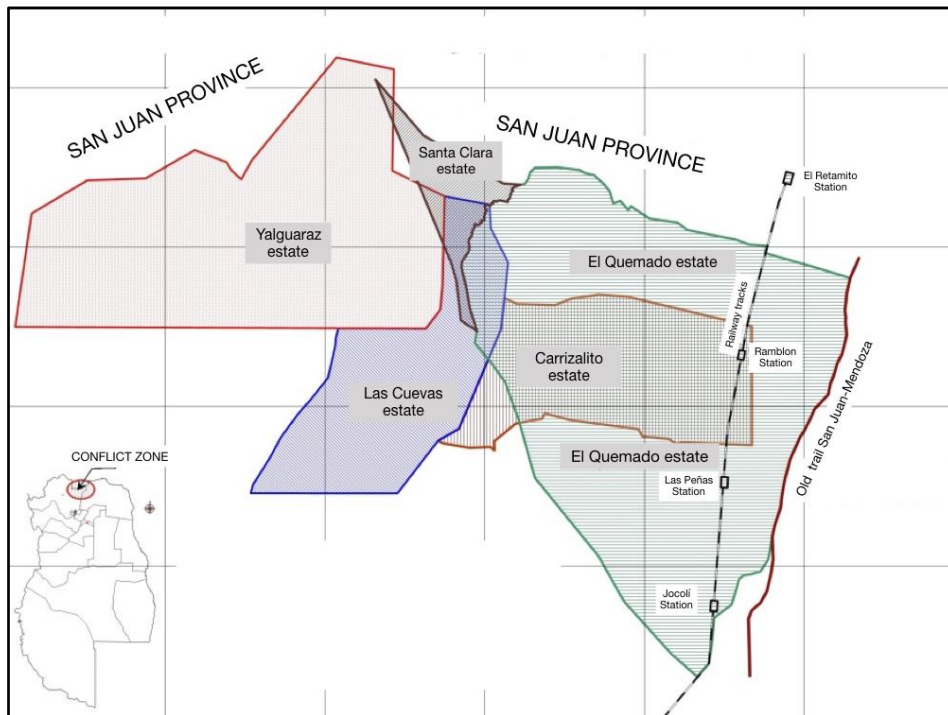
5 Mapping practices and changes in land control

The land that *Agropecuaria Elaia* bought is part of a large antique estate called *El Quemado*. It was first surveyed by Roberto Guevara, a land surveyor who was hired in 1908 by the provincial government to conduct the first official land survey of the province of Mendoza. In an official communication, he refused to recognize the local peasants’ right to land and stated:

“I call the special attention of the excellent government to this state of affairs, in order to claim the public land held in the hands of private individuals based merely on the fact that they own a miserable ranch. Lacking the particulars of legal

documents that accredit the right to land, no transmission is possible. That zone therefore remains for years and years in the same state of backwardness. The majority of the inhabitants are very poor people, barely owning but a few animals and living in insignificant ranches [...].” (Guevara 1908; translated by the author).

This quote reveals a particular bias in Guevara’s beliefs, one that has characterized surveyors’ attitudes for a long time, in different ways and with a variety of political effects. Furthermore, it shows that since its consolidation as a provincial state, the territorialization of property in Mendoza has been entangled with mapping in a wide sense.

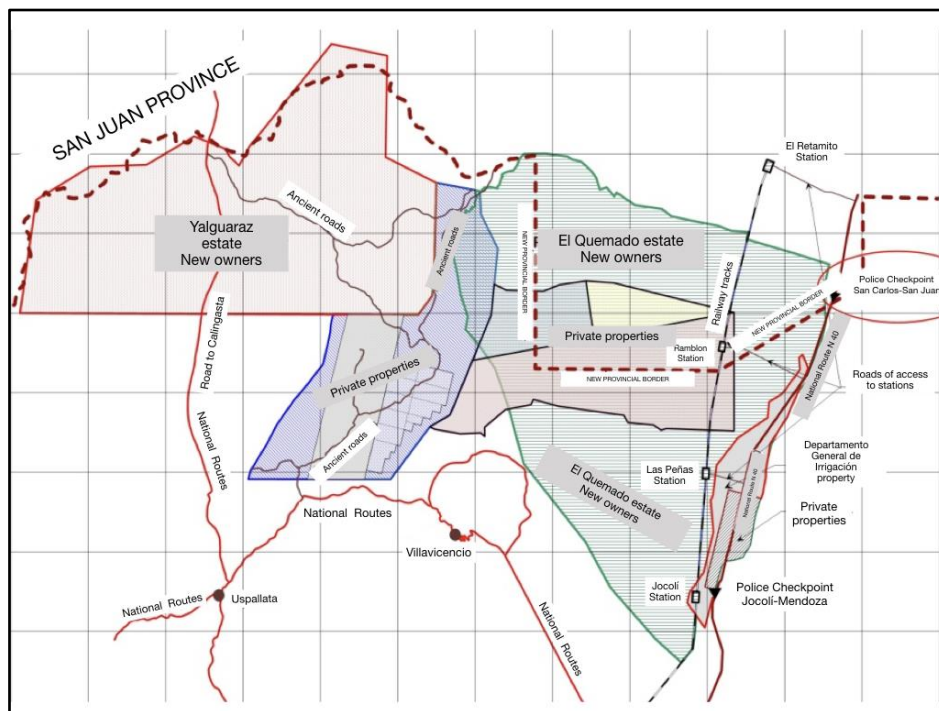


Map 1. Cadastral mosaic in the early 20th century

Map 1 is based on the aforementioned first official cadastral survey issued by Roberto Guevara between 1910 and 1915. There has, therefore, long been a cadastral registry for this area. At the same time, we can appreciate the overlapping of different cadastral maps all claiming the same piece of land (see Campo El Quemado and Estancia Carrizalito). These two elements are key for understanding the ways in which the company and remote surveyors operated to disenfranchise peasants from their right to land. Roberto Guevara’s measurement of El Quemado yielded an area of 183.762 hectares. Furthermore, following

his survey there was a considerable and dynamic market for property titles claiming for “acquisitive prescription.”¹

During the 1950s, these lands were subdivided and new roads were built, which were then added to the cadastral maps. By 1967, a new border between the provinces of Mendoza and San Juan was established, impacting El Quemado. The formally huge area of the estate was now divided by the border between Mendoza and San Juan (see Map 2). This interprovincial border was used later on by *Agropecuaria Elaia*’s surveyors to circumvent regulations and legalize land appropriation for the company. The two provinces have a few important differences regarding their cadastral regulations and procedures, which were exploited by the company in its favor.



Map 2. Cadastral mosaic and interprovincial boundaries around 1970

According to Argentinean law, when a property is sold, the buyer is supposed to hire a registered surveyor to make a new cadastral map, which they must register, together with the property title, at the relevant LRO. The LRO must check the validity of the map and archive it in the provincial land registry. In order to clearly establish the validity of a new cadastral map, the public authorities need to carry out a technical and legal review, including the examination of existing or previous maps for the same area using the land registry archive.

¹ A legal institution by which ownership can be gained by possession of land after the lapse of a certain period of time.

The first relevant action of misappropriation was carried out in 1971, when a new cadastral map corresponding to a property title, which would later be purchased by *Agropecuaria Elaia*, was registered by the then owner at the LRO without recognizing the other existing properties and intentionally – and falsely – specifying that in this area there were “no previous” properties registered in the Mendoza office. In other words, a new map was validated by the LRO for a supposedly “empty” space, which was in fact not only being used by peasants but also had other registered cadastral maps and titles (see Map 2). The LRO basically ignored the other existing properties – not to mention the peasants’ physical presence – by inscribing a title without antecedent (something that is a legal and procedural requirement). This resulted in an “erasure” of the previous land titles. Furthermore, with this new cadastral map registered at the LRO, future operations could take advantage of the “clean” image and officiality of the title.

In sum, the property title procured by *Agropecuaria Elaia* was originally registered in Mendoza in 1971, when it was inscribed as pertaining to an empty space, though in actual fact there were other registered property titles (see Map 2) and people living there. According to the law, it is feasible to register in the LRO cadastral maps of overlapping titles, but this must be always consigned in the maps registered. This is relevant to our argument, because in just one formal operation, a physical property can be erased from the cadastral registry simply with the appearance of a new map. According to the cadastral assessment requested by the court in 2011 following the controversy over the grabbing of the Domínguez family’s land and destruction of their property, it became evident that the surveyor for *Agropecuaria Elaia* had committed intentional omissions and falsifications of information in order to clean and extend the boundaries of the purchased titles beyond those established in the plans prior to the purchase of the property. In addition, the LRO officers approved this new cadastral map without verifying its veracity and the adjustments made to it.

Typically, mapping a large area such as the one in question (32.000 hectares, consisting of two sections, one of which is located on both sides of an important mountain range of 3.000 masl², with extreme points 50 kilometres distant from National Route 40 and without vehicular access) requires about six months of intensive fieldwork. According to the archive records, the company’s survey was performed in only 15 days. Regarding the legal obligation for surveyors to make cadastral maps based on fieldwork, the validity of this new map can be contested. The case also makes evident the role of geospatial technologies, not just in assisting the work of the surveyor but also replacing it. This has serious consequences for peasant rights.

In 2007, another survey of the land was carried out by *Agropecuaria Elaia*. But when the company presented its new cadastral map to the LRO for endorsement, the LRO made several remarks and requested that the map be reviewed due to inconsistencies and overlaps with other property titles. The company’s surveyor rejected these critical remarks and insisted upon the veracity of the cadastral map that had been created. Nevertheless, the LRO requested for a second time that the map be improved. The surveyor responded by presenting a totally (re)made map, without justifying the changes and completely erasing the previous presentation. This new map, with the only requirement that the surveyor mark

² Meters above sea level.

some of the overlays with other existing titles, was formally approved and registered by the LRO.

In 2008, *Agropecuaria Elaia* ordered yet another new survey, after they had sold off a part of the land area to a twin company. In this new cadastral map, the surveyor “moved” the title boundary in such a manner that it resulted – at first, just in the map – in a clear appropriation of 500 hectares of new land beyond the effective boundary of the company’s title. Map 3 shows in yellow the areas that do not match the original title, but which were included in the new map. Again, in just one movement – or trace – a considerable piece of land was incorporated into the company’s property title. This new piece of grabbed land was part of the Domínguez family’s grazing lands. With the title approved by the LRO, the company started to build a new wire fence, which naturally led to resistance by the peasants. This new episode came to an end in 2017, with one peasant being gravely injured by the police due to his refusal to abandon his position obstructing the building of the wire fence.



Map 3. Overlap (in yellow) between the company’s most recent cadastral map and its original property title

Evidently, cadastral mapping is a core part of land commodification. In line with Blomley, we confirm that “[i]ncreasingly, property became disentangled from a localized nexus of collectively organized relations and became situated within wider networks of calculation and commodification” (Blomley 2017: 1). Throughout the conflict in Mendoza, we can see very different moments where mapping practices have been used with important effects for land politics. The conflict was also clearly triggered by a process of mapping and re-mapping due to recursive mistakes and omissions by the surveyors, who rather than working towards the goal of representing better, simply sought to accomplish formal administrative requirements. In keeping with the earlier surveyor Guevara’s arguments, the previous occupants were labeled by the investors, as stated in the court declarations, as useless and

historical usurpers with no land rights. Through cadastral mapping, the “documents” and other “proofs” of land ownership were made and remade alongside a process of dispossession. However, due in part to the local peasants’ resistance, the consolidation of spatial control through physical means, such as erecting a fence, did not always follow the formal and legal appropriation of land.

In 2007, a renowned and retired surveyor for the Mendoza provincial government was interviewed by the Surveyors’ Association Magazine on professional issues and challenges (Territorio, 01.06.2007). He argued that in recent map-making practices, the “physical fact” –the territory – is corresponding less and less to the “legal fact” – the cadastral map. In his view, the LRO has a serious problem when it comes to the handling of the cadastral maps of surveyors, because it incorrectly assimilates the survey with the property title. Rather, the map is merely a representation of the piece of land, which could legally be owned by the person who required the map to be made. The renowned surveyor added that it has currently become usual practice to “invent” a cadastral map without ever going to measure the land itself. The traditional function of the surveyor was to record the *de facto* situation and the *legal* situation. Due to the increasing use of Google Maps and other geospatial technologies by surveyors, however, the practice of registering who effectively lives on the land is losing its importance and is being increasingly abandoned.

6 Conclusion: The politics of remote mapping

In this paper, I have argued that changes in the practices of cadastral mapping brought about through the use of geospatial technologies, condensed in the notion of “remote mapping,” have dramatic political effects in terms of land control and access. Both the commodification of and processes of land grabbing in relation to communal lands are accelerated and facilitated by cadastral mapping.

I stated that understanding maps as a process of processes involves the use of two critical frameworks regarding the power of maps: inscriptional and processual. As inscription devices, maps appear to be effective in terms of consummating economic transactions and making them official and formal through public registration at LROs. At the same time, through this formal registration, powerful agents can claim and/or occupy the mapped piece of land, and in doing so they have also been effective in displacing and disenfranchising peasants from land which was previously occupied and controlled by peasant communities. Furthermore, mapping practices appear to be deeply processual; as shown in the case study, several mapping practices were developed and several maps inscribed throughout the course of the dispute.

Here emerge some differences to previous land control and access regimes. Remote mapping produces as one of its main effects a “mutual” (in)visibility. On the one hand, the surveyor, when doing his work remotely, has little or no chance to see the people who actually use and dwell on the land/area she or he is surveying. Thus, they are easily erased from the map and formally disenfranchised from their current or future land rights. On the other hand, peasants, whose lands are being mapped in such a way that the land appears empty and suitable for appropriation by private interests, are unaware that the mapping

process is even taking place. Thus, they often have no chance to resist their formal dispossession before it has been legally acknowledged. This impacts the way in which land conflicts unfold, and in a general way how land control and access are negotiated and contested. Peasants practice direct, daily and collective control over their lands, and they react to the presence of strangers or activities on their lands. The presence and visibility of land surveyors in an area in question were necessary in order to make cadastral maps prior to the use of geospatial technologies and remote mapping. However, now that maps are drawn at a desk and at a distance from the actual area, peasants have no time to react and organize – both in a political and legal sense – any resistance.

Cadastral maps are neither accurate nor precise. Remote mapping becomes a standardized and everyday practice, which often entails the erasure of peasants' land use. Cadastral offices *de facto* facilitate and legitimate the process of remote mapping. The accessibility and affordability of the geospatial technologies used by surveyors are highly compatible with the bureaucratic political culture of many LROs. This has paved the way for the institutionalization of these new remote mapping practices within state domains. Two elements related to technicity and opportunity have driven the process: the legalization and significant use of geospatial technologies and the decreasing economic costs of surveying brought about by these technologies.

The land dispute between the Domínguez family and *Agropecuaria Elaia* illustrates that both peasant and company territory was simultaneously consolidated and limited/alienated through a variety of process which were always entangled with mapping practices. Geospatial technologies have changed the everyday practice of land surveyors and land registration. Thus, they have become not only part and parcel of resource commodification and dispossession, but have also radically changed the way in which land politics are negotiated.

Remote and cadastral mapping will continue to play a relevant role in land commodification and will foster the transformation of land regimes in general. In contemporary land grabbing struggles and changing land regimes, maps and mapping are deeply processual. Map making is becoming increasingly politically effective when it asserts opportunity and technicity – before, during and after land conflicts – rather than when it seeks for accuracy, geometrics and representation. Maps are clearly performative, shaping the face and pace of the conflicts, and in so doing they are deeply involved in the politics of land.

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