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The Political Role of Date Palm Trees in the Jordan Valley: The Transformation of Palestinian Land and Water Tenure in Agriculture Made Invisible by Epistemic Violence

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Introduction

How does the ongoing transformation of agriculture in the Jordan Valley entail a transformation of society? In the West Bank, plantations of date palm trees have been sweeping over the Valley at an accelerating rate since the 2000s. When agriculture changes, livelihoods are transformed. This usually has a political impact. Livelihoods include both monetarized and non-monetarized processes. Agriculture is enmeshed in both types of processes as well as in land tenure and water tenure. Characterizing these interactions is crucial to understand the political ramifications of agricultural transformation. This is necessary to inform agricultural policy.

This article examines the forms of water tenure and land tenure that predominated throughout the part of the Jordan Valley lying in the West Bank before the arrival of date palm trees. It explores their transformation once this new crop either replaces former crops or spreads over previously uncultivated land. It assesses the impact of this transformation on the livelihoods of local inhabitants. The current literature on date palm cultivation in the Jordan Valley hails it as sustainable economic development. Combining an appropriations approach with an exploration of land and water tenure allows identifying categories of actors, such as sharecroppers, who have not yet been discussed by this literature. Yet, their livelihoods are deeply impacted by this agricultural transformation. Date palm tree cultivation requires seasonal laborers, effectively displacing sharecroppers. This article maps and quantifies the spatial progression of Israeli and Palestinian date palm trees between 1999 and 2016. It assesses the number of sharecroppers displaced by date palm trees during that period and demonstrates a Valley Clearance is now occurring, akin to the Highland Clearances that took place in 18th century Scotland. It identifies the new political constellations now emerging from this transformation.

The article starts with considerations of epistemic violence within the scientific process deployed to study agricultural transformation. It finds a compound epistemic violence contributed to blind spots within the present scientific discourse on date palm in the Jordan Valley. The most vulnerable actors involved have not been considered nor even been identified by the current literature. Interdisciplinary research gains from harnessing social sciences in a meaningful manner. This article proposes a method to achieve this. The second section summarizes the mainstream scientific discourse on the emergence of date palm agriculture in the Jordan Valley as it exists currently. It examines the reasons this article depicts date palms as sustainable economic development. The third section harnesses theoretical contributions from social science and the results generated by qualitative research to reexamine this scientific discourse. The fourth section details our methodology to assess quantitatively the number of sharecroppers that have been displaced by date palm trees. This leads us, in the final section, to discuss the social and political impact of agricultural transformation presently occurring in the Jordan Valley. Dates generate foreign currency whereas previous crops did not. Thus, date cultivation increases the Palestinian gross domestic

product. But the transformation of land and water tenure entailed by this new crop means the housing security, food security and livelihoods of those practicing family farming are compromised. The political consequences are important, especially in terms of water tenure. Whereas donors, the Palestinian Authority and Palestinian date palm investors refer to the Palestinian water law, those practicing family farming rely on legal pluralism to secure their access to water. Meanwhile, the Israeli Water Authority and Israeli settlers are furthering a network of wastewater reservoirs which stands as the only reliable source of water for date palm cultivation in the foreseeable future.

Conceptualizing Agricultural Transformation

The concept of epistemic violence initially designated the process whereby elite classes disregard the ways of knowing developed by the poor. The 'subaltern' is not heard because he, more often she, is silenced, misinterpreted or essentialized (Spivak, 2009). Even when she speaks, Spivak argued, the subaltern's voice is not heard because her ways of knowing are considered flawed compared to more credible epistemologies. Spivak was concerned with disenfranchised people studied by middle class researchers. Yet, within the academic community, subaltern disciplines also exist, the epistemology of which is disregarded by other disciplines. A review of research projects on water management purporting to be interdisciplinary, demonstrated they systematically relegate social sciences to secondary roles, usually excluding them from the process of formulating the research questions (Fustec and Trottier, 2016).

Research on agricultural transformation that impacts indigenous peasants as well as water and land tenure usually combines two types of epistemic violence, each silencing a distinct subaltern. First, the poorest farmers are not heard. Second, neither are the social scientists within the elaboration of the scientific discourse describing this transformation. The arguments and quantitative methodologies deployed by hydrologists, geologists, climatologists, agronomists and economists shape the mainstream discourse that is put forward as 'evidence based'. The arguments and qualitative methodologies of anthropologists, political scientists and sociologists are disregarded as if qualitative research was not, also, evidence based. This process has contributed to important flaws in the elaboration of global food production models, making family farming invisible (Leblond and Trottier, 2016). It has also contributed to a flawed portrayal of water flows in agriculture and international food trade (Trottier and Perrier, 2017). It leads the scientific discourse on date palms in the Jordan Valley to neglect the co-production of agriculture and society occurring through land and water tenure, through the various forms of appropriation they entail and through the representations of space that are linked to them.

Critical political ecology has demonstrated that the construction of the scientific discourse on the environment is never independent from the struggles to control this environment (Forsyth, 2003) (Davis, 2016). Science and technology studies demonstrated that social and political choices are systematically embedded in a scientific discourse (Latour, 1987). We always produce a discourse on the environment that is influenced by the manner we manage, or wish to manage, that environment. This led Jasanoff to elaborate on the concept of co-production initially put forward by Latour. The social order, i.e. the set of interactions and power relations among human beings, and the natural order, i.e. our representation of the environment, are systematically co-

produced (Jasanoff, 2004). Davis coined the term *environmental orientalism* to describe the manner the environment in the Middle East was narrated by imperial powers as defective compared to Europe's normal and productive environment (Davis, 2011). An inaccurate narrative of degradation and a concomitant valorization of technological fixes was later incorporated in education and research within Middle East states emerging from colonialism, leading Davis to call for research on "how many people in the region have internalized such environmental imaginaries, to what degree, and with what results." (Davis, 2011, p. 13)

Political ecology approaches have long insisted on the necessity of analyzing human-environmental relationships at different scales of enquiry as well as the influence of state intervention in rural economies on land-use patterns. (Bassett, 1988) Yet, Woodhouse and Muller demonstrated how conceptual approaches of water management since the late 1990s were dominated by a characterization of water as a sector to be governed by technical criteria, legitimated by a narrative of water scarcity. They showed how this gave rise to governance norms based on environmental and economic efficiency criteria that ignored many priorities of social development (Woodhouse and Muller, 2017). Recent political ecology work on irrigation in sub-Saharan Africa noted the importance of farmer-led irrigation development while also observing the heterogeneity of the peasantry when facing the social dynamics of accumulation or impoverishment (Woodhouse et al., 2017). Such dynamics are often rooted in the existing forms of resource tenure as was demonstrated by studying farmer-led irrigation development in the West Bank (Trottier and Perrier, 2018). Critical environmental justice studies emphasize the need to focus on multiple forms of inequality, instead of focusing only on race, class or gender. It also emphasizes the need to explore the expendability of human and non human populations. In other words, it insists on the fact that various human populations are treated and viewed as inferior and less valuable to society than others. They "are marked for erasure" (Pellow, 2018, p. 17) Following these approaches from political ecology and critical environmental justice allows overcoming the epistemic violence embedded in the present scientific discourse on date palm cultivation in the Jordan Valley.

Land tenure has long been studied by anthropologists and legal experts (Le Bris et al., 1982). The term *tenure* designates the relationship, either legally or customarily defined, between people, as individuals or groups, with respect to a resource (Hodgson, 2016). Land tenure is necessarily coproduced in interaction with a representation of space. This is coherent with the fact the social order is systematically coproduced with the natural order (Jasanoff 2004).

Our representation of space may result from different construction processes. Within a geometric representation, space is surveyed, measured and mapped, enabling the assignation of a unique exchange value to land (Le Roy, 2011). This is the sort of representation constructed by a geographic information system. This representation predominates among donors and scientists. Within a topocentric representation, however, spaces are linked to and organized around points (*topos*) performing functions which may be political, economic, or religious. In a topocentric representation, space consists of a set of more or less contiguous and overlapping patches (Le Roy, 2011). Irrigating farmers typically adhere to this representation of space. To them, space is structured according to its physical and institutional relation to the well or spring

used to irrigate their lands. Within an odologic representation, space consists of a series of points linked by a path. (Le Roy, 2011) This is typically the representation of space within nomad societies.

The literature produced by the Commons Property movement theorized common property regimes and the manner they could enable environmentally sustainable and economically profitable management of natural resources. (Ostrom, 1990) (Ostrom et al., 2002) The Commons Property Movement focused on bundles of rights and the manner a community of right holders elaborated them. However, the literature on land tenure focused on appropriation instead of bundles of rights (Le Bris et al., 1992). The term appropriation may designate what is reserved for a given use or what is reserved for a given user. Appropriation may consist of a right of way through a piece of land, for example, or a right to collect weeds on land one doesn't own, a right to collect fruit from a tree one doesn't rent or own, a right to exclude users from a piece of land, a right to decide how to manage this piece of land or a right to destroy the resource. The concept of appropriation largely overlaps with the concept of access later elaborated by Ribot and Peluso. (Ribot and Peluso, 2003).

Focusing on appropriation instead of property allows understanding land tenure through all possible spatial representations. (Le Roy, 2011) A regime of land tenure means a regime of appropriations that gathers a complex set of solutions among actors interacting about various aspects linked to land. This includes (1) specific norms concerning the interactions among humans concerning the objects being appropriated, i.e. the legal regime, and (2) norms concerning other aspects of existence, whether social, economic or legal, that interfere with these specific norms. This second set of norms ensures the adaptability, the implementability and the replicability of the legal regime. These are the adjustment modalities (Le Roy 2011). An appropriation based approach allows understanding the complex land tenure regimes that developed to accommodate social groups with drastically different representations of space. For instance, sedentary farmers often coexist with nomadic herders. Their land tenure regime includes specific norms and adjustment modalities that accommodate both the topocentric representation of space of the farmers and the odologic representation of space of the herders. (Le Roy, 2011)

Water tenure has only recently been studied as such (Hodgson, 2016) The social science literature on water has mostly focused on water rights and property regimes. It highlighted the legal pluralism that often exists in water management. This occurs when a variety of actors refer to a variety of (sometimes contradictory) norms that are spelled by a variety of sources of authority. (Boelens and Vos, 2014) The theoretical categories elaborated by the land tenure literature are highly relevant to study water, yet this literature has rarely integrated water in its considerations. Farmers who develop irrigation networks simultaneously develop regimes of appropriation for the water they use. These regimes are necessarily interacting with the land tenure regimes.

The mainstream water management literature has rarely integrated considerations of coproduction, land tenure and representations of space. Usually, it attempts to represent all such considerations through commensuration. This is a practice whereby a great variety of objects are measured along the same metric (Espeland and Stevens, 1998). When practicing commensuration, disparate

considerations such as economic profitability, the beauty of a scenery, biodiversity, river flows and much more, are all integrated within feasibility sets, each with a weight that reflects the value it has for its user. Espeland (1998) demonstrated that only instrumental values can be commensurated, i.e. we can use this type of practice to compare things that we value only for their capacity to allow us to attain a given goal. Any attempt at commensurating substantial values necessarily distorts them. This practice is not valid to compare things we value in and of themselves, without any consideration for their utility. Yet, since the 1980s, an abundant water management literature arose, purporting to produce models that integrated every aspect of water, whether this was an instrumental value or a substantive value. (Espeland, 1998) The problem, according to this literature, lies in developing calculations that determine the optimum feasibility set, not in the impossible task of measuring such disparate elements along the same metric to constitute a given feasibility set. The predominance of quantitative models in water management research is a direct consequence of the epistemic violence resulting from the subaltern position of social sciences in relation to natural sciences.

Within research on the Jordan Valley, a compound epistemic violence has shaped the scientific literature. Small scale Palestinian farmers as well as social science have both been silenced. As a result, the mainstream discourse on the present agricultural transformation makes the fate of Palestinian sharecroppers and the political impacts of this transformation invisible.

This article proposes to explore land and water tenure in the Jordan Valley, as well as the underlying representations of space, through an appropriations approach. This uncovers actors and mechanisms that remain undetected by the mainstream scientific discourse on date palm agriculture. A triangulation of the results using geospatial analysis then allows a quantification of the phenomenon of sharecropper displacement. Such a method allows overcoming the compound epistemic violence that has dogged studies on agricultural transformation. It is useful anywhere in the world and is an important contribution to the critical political ecology of agricultural transformation.

The Mainstream Discourse

The rapid expansion of date palm cultivation in the Jordan Valley, carried out both by Israeli settlers and Palestinian farmers, is usually portrayed as an economic opportunity on the basis of agronomic, environmental and climatic arguments. Remote sensing tools and geographical information systems (GIS) have spurred the development of indices such as the normalized difference vegetation index, the normalized difference moisture index or the salinity index to study the sustainability of date palm plantations as a tool against desertification (Mihi et al., 2017). Date palm trees survive in salty soil in hot climates and require little irrigation water compared to other crops such as bananas. This fuels a literature estimating the potential for such crops on the basis of crop water requirements and water quality in areas endowed with the right climate for a given cultivar.

Kalbouneh argued that Palestinian farmers were forced to abandon agriculture in the Jordan Valley because of increasingly saline soils (Kalbouneh, 2011). The

socioeconomic hardship of the residents in these areas led him to identify potential locations for cultivating date palm trees as a development option within these conditions. He did this on the basis of the crop water requirement and the total volume of water abstracted from licensed wells in his study area. Abu-Qaoud (2015) also devoted much attention to climatic and agronomic variables when discussing the meteoric rise of date palm trees cultivated by Palestinian farmers in the Jordan Valley. This crop, he emphasized, benefited from the fact very few countries can produce the medjool cultivar while it fetches a much higher market price than other cultivars (Abu-Qaoud, 2015). Indeed medjool dates can only grow in exceptionally dry and hot conditions and can tolerate high levels of water salinity. Sonneveld & al. (2018) went further, developing an integrated approach that evaluates the possibilities for medjool date expansion in a cost-benefit analysis that included the diversity of land quality and salinity levels of the water deemed available.

Econometric studies portray medjool dates as a promising economic opportunity for the Jordan Valley (Zawahrah, 2016). With a long shelf life, they are ideally suited for exportation. The construction of several freezers in Al Auja and Jericho allows conserving the dates until they are sold abroad. This generates foreign currency and contributes to Palestinian economic development. Russo & al (2018) consider “that the date chain in Jericho represents an entire economic district with high potential for targets of social equity and economic development in Palestine.” However, they voice a rare note of caution about a biodiversity poor model and the soil salinization that the present date palm agriculture entails. Sonneveld & al. (2018) concluded that over 2700 jobs could be created by expanding date palm trees in the West Bank. We reexamine this claim in the last section of this article and find that this estimation is overly optimistic.

Abu-Qaoud observes that a date palm tree requires only one third of the water needed for a banana tree, concluding “(...) so when Medjools are substituted for banana and orange trees, 2/3 of irrigation water formerly required can be applied to other crops.” (Abu-Qaoud, 2015)(p.435) Dates replacing banana trees are supposed to “free up water” for other crops. In a water scarce environment such as the Jordan Valley where agriculture can only be carried out via irrigation, this is deemed very useful. We reexamine this claim in the last section of this article and find that empirical evidence invalidates it.

The Palestinian Ministry of Agriculture has promoted date palm cultivation in the Jordan Valley, providing farmers with seedlings and trying to direct some of the donor funding to the palm sector (Nofal, 2018). It notes a fivefold increase in the number of trees planted by Palestinians between 2010 and 2016, from 1600 dunums to 9300 dunums. This is driven by the high economic return more than by the Ministry’s efforts. The ministry concluded that dates needed, in 2017, 18 million cubic meters of water per year. Over 12 million cubic meters were destined for irrigation. The demand for the remainder stemmed from uses, for date palm cultivation, other than irrigation.

The Epistemic Violence in the Mainstream Discourse

Our research characterized the livelihoods, the forms of water and land tenure that have existed in the Jordan Valley long before the arrival of date palm trees. This

was possible through field work deploying qualitative methodologies such as semi-structured interviews and field observations. These were carried out in 2018 throughout the portion of the West Bank where date palms can be grown, from the Israeli settlement of Kalia in the south to the Palestinian village of Jiftlik in the north. This work was building on previous field work carried out over the entire Jordan Valley, up to Ein el Beida, Kardala and Bardala, from 2013 till the end of 2017. (Trottier, 2015)(Trottier and Perrier, 2018) Our results, in light of the contributions of political ecology, science and technology studies and the literature on land and water tenure, allowed us to produce a critical assessment of the mainstream discourse.

First, this discourse could be enhanced by a contextualization of the scientific reasoning that underlies it. For instance, when Kalbouneh notes that large agricultural areas in the Jordan River Valley have saline soils and that this problem worsens with time (Kalbouneh, 2011), he “naturalizes” this phenomenon. Yet, the drying of the Jordan River and the ensuing drop and salinization of the aquifer is a human made process dating back to the construction of the National Water Carrier in Israel in the 1950s and 1960s and the King Abdullah Canal in Jordan in the 1960s. Soil salinization in the Jordan Valley results from irrigation using increasingly salty water. This human made process could be reversed. Moreover, the “worsening socioeconomic status of the residents” remains unexamined. Studies calculating production yield gaps have yet to include social variables such as the complexity of the residents’ livelihoods, or the forms of land tenure and water tenure in which they are embedded (Leblond and Trottier, 2016). In other words, growing date palm trees is promoted as a solution for the residents without consideration for the fact that the manner this crop is grown may entail ending many of these residents’ livelihoods, maybe even entailing their forced displacement. Specific constructions of crop water requirements, of water as a stock and of commensuration all contribute to this epistemic violence. Each of these constructions is examined in turn.

Crop water requirement data are used to calculate the number of trees that can be cultivated with a given quantity of water as if climatic and agronomic variables alone determined the quantity of water that is consumed in growing a crop. Yet, social variables have greater influence on the quantity of water that is consumed in the process of growing a crop than either agronomic or climatic variables (Trottier and Perrier, 2017). This appears clearly in the communication made in June 2018 by the Director General of Agricultural Water and Irrigation in the Palestinian Ministry of Agriculture, Issam Nofal. He notes a 6 million cubic meter gap between the water that is needed for the area planted in date palm trees and the quantity that is necessary for irrigation. These 6 million cubic meters are consumed through practices such as spraying the trees in February against mold. They are not evapotranspired by the date palm trees and are not counted in the “crop water requirement”. In other words, the crop water requirement of date palm trees is a misleading argument when promoting the expansion of date palm trees on the basis of their water efficiency.

In the mainstream scientific discourse, water is only considered as a yearly stock. Kalbouneh calculates a yearly stock of brackish water that is not presently used because no other crop resists such salinity. He reaches this figure by adding the quotas of the wells that are no longer used because they are considered too saline. He doesn’t

consider the access modalities farmers deploy to reach this water. Investors in date palms may seek access to new sources of water, or may attempt to modify existing forms of water tenure to secure their investments, making it impossible for other farmers to keep accessing water as they used to. The development of such a good cash crop may also spur the drilling of illegal wells which may impact the recharge of older wells used for other crops. Introducing a crop that consumes one third of the quantity of water previously consumed by the former crop may also spur investors into planting much more of the new crop, ultimately generating an overall water demand higher than existed previously, when a more water hungry crop was farmed.

Arguments in favour of the sustainability of date palm plantations as a tool against desertification such as are put forward in Mihi & al. (2017) rely on an epistemology where increasing vegetal cover and vegetal mass over a surface area is necessarily good. Davis (2016) coined the term *accumulation by desertification* to designate the many ways the narratives of deserts as worthless and ruined have long abetted the dispossession of indigenous peoples' lands and use rights. Assessing water only in terms of yearly quotas without consideration for the access modalities farmers deploy to reach it and combining such an assessment with indices such as the normalized difference vegetation index constitute a modern form of accumulation by desertification. This process constructs a representation of nature as presently worthless, ruined land that is potentially fruitful. This representation ignores the present interactions locals have with land and water. As a result, date palm plantations appear as a beneficial form of development. Whether locals' use rights would be impaired by such development becomes invisible.

The numbers of jobs expected from date palm expansion are based on the expectation of 170 working days/year/hectare. (Sonneveld et al., 2018) This figure originates from a publication of the FAO (Zaid, 2002) that concerned all cultivars everywhere on the planet. This figure does not reflect the situation of medjool dates in the Jordan Valley. In this document, Zaid and Klein, the authors of chapter 11, specify that they used their experience in Namibia to develop this technical calendar.

Finally, the present literature on the rapid expansion of date palm trees systematically relies on specific constructions of commensuration. For instance, when comparing bananas, that were widely cultivated in Jericho and Al Auja up to the 2000s, with date palm trees, authors compare costs and revenues for the crops, evapotranspiration or remote sensed indices. Comparing the costs and revenues linked to bananas and date palm trees measures quantities of dollars lost and gained. Money measures an instrumental value. This commensuration distorts the substantive values embedded in each type of crops. In Palestinian farmed areas of the Jordan Valley, bananas were usually farmed by sharecroppers carrying out family farming, often living on the land they cultivated but did not own. These bananas were entirely sold on the local market. Date palm trees, however, are often farmed by agribusinesses employing seasonal male labourers two months of the year in the orchard and female labourers 5 months of the year in the packing house. The replacement of bananas with date palms thus entails a negative impact on housing security and food security for the local population. Date palm investors show the jobs they create. They cannot keep track of the livelihoods they undermine.

A variety of water tenure

Commensuration of crops in terms of evapotranspiration may distinguish between brackish and fresh water. Otherwise, it treats all water as if it was the same. Yet, irrigation water in the Jordan Valley originates from a variety of sources: wells, springs or wastewater. Each implies widely differing access modalities for the farmers. Each form of water tenure entails different constraints for the farmers. A first distinction needs to be made between Israeli controlled water and Palestinian controlled water. Israeli farmers of date palms rely on wastewater managed through a public property regime whereby the Israeli Water Authority carries wastewater over long distances. The reservoirs and wastewater treatment plants they use in the Jordan Valley are represented in Map 1. The settlements of Kalia, Bet Arava and Na'ama use wastewater originating from Maale Adumim, Bethlehem and Jerusalem and collected in treatment plants next to their plantations which they use as reservoirs. Israeli farmers in the Jordan Valley access treated wastewater that is managed by Israel as a public good according to rules it sets even though these Israeli farms are located in the West Bank.

Palestinian farmers have long relied on springs managed by common property regimes. These have either dried up in recent years or have become much less reliable. Palestinian farmers have also long relied on wells. These may be licensed or not. They may be managed through a common property regime or through a private property regime. Palestinian farmers mostly use fresh water to irrigate date palm trees. They secure their water through a great variety of tenure. Their water tenure depends in part on whether they draw water from a licensed well, an unlicensed well, a spring or the wastewater treatment plant located in Jericho. Palestinian reservoirs are much smaller than Israeli ones and are all managed privately by the farmers owning them. They are represented in Map 1.

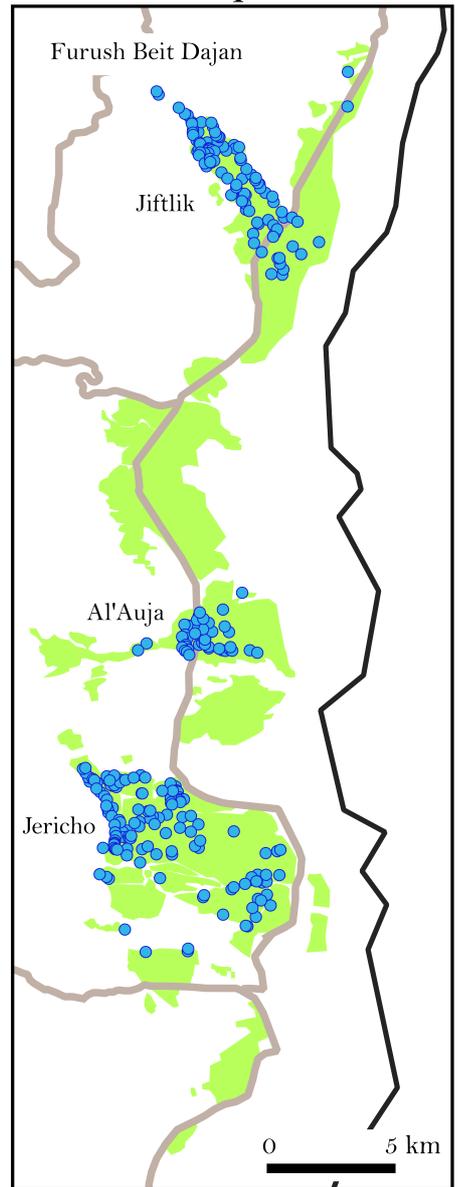
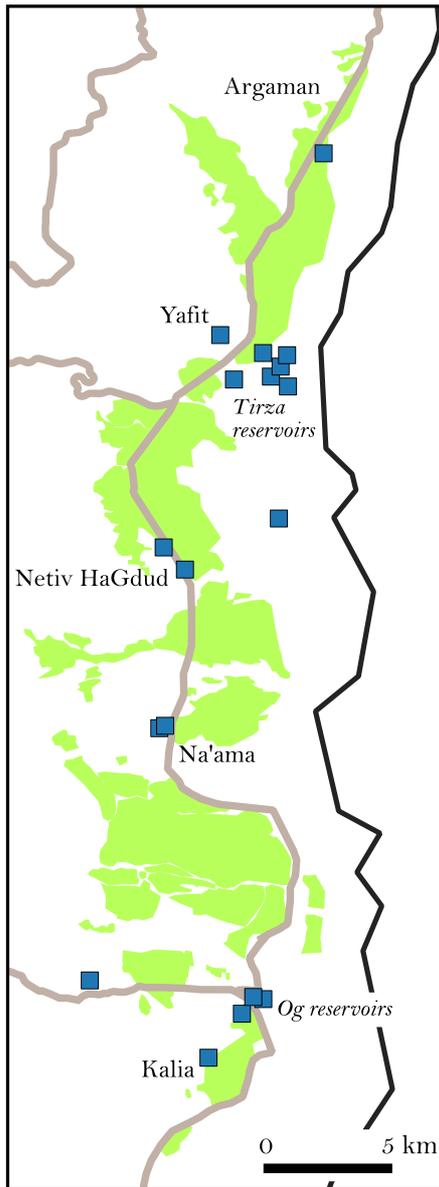
Israeli water reservoirs

Palestinian ponds



Legend

- agricultural areas (2015)
- Israeli reservoir
- Palestinian pond
- main road
- border



Og-1 reservoir
600 000 m³
417 m x 400 m



Tirza reservoir
2-4 million m³
730 m x 270 m



Ponds in Jiftlik
40 m x 40 m

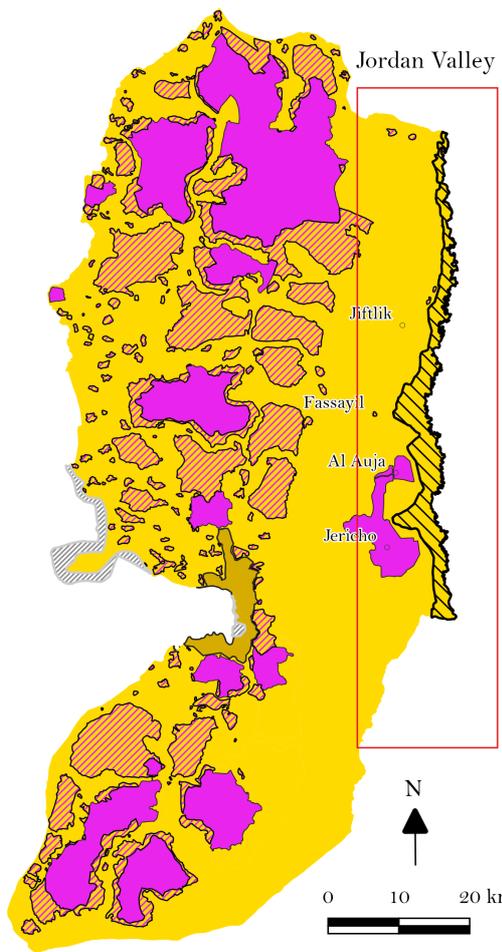


Ponds in Al'Auja
50 m x 40 m



Map 1

The drilling of unlicensed wells depends in part on the zoning of the West Bank into a patchwork of A, B and C areas. These are depicted in Map 2. Within A areas, the PA is responsible administratively and in terms of security. In B areas, it is responsible only administratively and Israel remains responsible for security. In C areas, the PA has no responsibility and the Israeli authorities rule. Jericho farmland straddles A and C areas. Drilling an unlicensed well in area C here is simple as, in past years, Israeli authorities have turned a blind eye to such activity. However, drilling an unlicensed well in area A of Jericho is far more difficult. This pattern is reversed sometimes, elsewhere in the West Bank, in the northern and western aquifers where drilling in area C is impossible while it is rampant in area A and B. An unlicensed well is a typical form of resource capture. The author of the well appropriates its water and is under no constraint other than that imposed by the quality of the water.



Legend

- Oslo Agreement areas in the West Bank:
- Area A
- Area B
- Area C
- Israeli Declared East Jerusalem
- Military Exclusion buffer in the Jordan Valley

Map 2

Large scale Palestinian investors relying on loans from development banks refrain from using illegal wells. They must convince their lenders of the viability of their investments. This includes demonstrating a legal access to a sufficient flow of water throughout the year. Date palm farmers using unlicensed wells tend to be small Palestinian farmers who sell their crop on the local market or within outgrower schemes¹ developed by the large investors. These may develop a business plan that combines direct production using licensed wells and an outgrower scheme where small farmers use a variety of water sources, including unlicensed wells. In 2018, Company A, the largest date palm company in Jericho relied on 21 wells, 6 of which it owned fully. Its arrangements concerning the 15 other wells ranged from a rental contract over the full yearly quota of a well near Na'ama guaranteeing its monopoly use for 15 years, to rental contracts over 3 years of part of the quota of other wells. In 2017, another Palestinian export oriented agribusiness, Company B, produced only 30% of its dates directly, using land it rented and purchasing water from a private well belonging to the land owner. It purchased the remaining 70% of its dates from small farmers. These relied on a variety of licensed and unlicensed wells which they either owned or purchased water from. Palestinian agribusinesses thus depend only indirectly on unlicensed wells.

Palestinian licensed wells were mostly drilled before 1967. Israel granted them a license and a yearly quota after it occupied the West Bank. Such wells often abstract a yearly quantity far lower than their quota. When their water has become too salty to sustain present crops, farmers use them only if they can mix their water with fresh spring water or with better quality water from another well. Their small reservoirs are often connected to a spring and a well or to two wells for this purpose. When the well needs refurbishment but cannot obtain the necessary permit, it may fall into disuse. A well owner may use water from his well or may sell it in part or entirely to other farmers. Older licensed wells are often managed as commons, but, in the Jordan Valley, many wells are private. If used as a common, the well is shared by farmers cultivating land statutorily linked to the well. However, if the well is private, its water is sold on a negotiated basis between the owner and the user.

Springs, such as Ein Sultan spring in Jericho or Al Auja spring in Al Auja, supply the best quality water available to Palestinian farmers in the Jordan Valley. They have systematically been used in Palestinian agriculture as commons. Those who developed the irrigation networks simultaneously developed the system of water turns that governed the distribution of the resource. (Trottier, 2013) In the 1990s, a development project transformed the open canal network linked to Ein Sultan spring into a pressurized pipe system, forcing the users to switch to a distribution of volume (in cubic meters of water) instead of time (in hours of water). This created great stress among the irrigating farmers at the time. They were intent on conserving the proportional distribution that prevailed under the time system. This distribution was unequal,

¹ 'Outgrower scheme' and 'contract farming' are sometimes used as synonyms. For the purpose of this article, we define an outgrower scheme as a practice whereby a locally implanted agribusiness purchases the production of many small farmers and then sells it to national or foreign buyers. We define contract farming as a practice whereby a farmer or an agribusiness signs a contract with a purchaser, such as a foreign supermarket chain for instance. This contract specifies exactly which variety will be cultivated, which fertilizers will be used, according to which calendar and when the crop will be picked.

ranging from a few minutes to over 24 hours depending on the user. But it was considered equitable.

The right to a spring's water within a common is usually linked to the land it irrigates. Purchasing or inheriting a plot of land usually means simultaneously acquiring the water time linked to that plot. Examples exist, however, in recent years, of land owners selling farm land to real estate developers (who don't need irrigation water) and conserving the irrigation time. They then rent their water right to the highest bidder. One of the plots rented by Company A gives it the rights to 5 hours of Ein Dyuk spring. The company is reluctant to use this water to cultivate date palm trees, however, as its quality allows cultivating any other crop. Spring flow fluctuates naturally through the year. Since about 2008, however, the flow of many springs has systematically declined. Once a perennial stream, Al Auja spring interrupted its flow in 2018 at the beginning of April. Further north, Fassayil spring has dried out entirely. When this happens, the common property regime managing the spring disappears.

The Palestinian operated Jericho wastewater treatment plant generated, in 2018, between 600 and 700 cubic meters of treated wastewater a day. This was entirely used to irrigate date palm trees locally. Farmers paid 0.5 NIS/m³ to the municipality and an additional 0.4 NIS/m³ for the electricity to pump water to the orchard. This makes the price of wastewater slightly lower than that of water purchased from licensed well owners. This price, ranging from 1 to 1,5 NIS/m³ is determined by the negotiation with the well owner on the basis of several factors such as the salinity of the water, its distance from the irrigated land, the competition of other potential purchasers and the set of social and family ties linking the renter with the well owner. Only a fraction of the buildings in Jericho are connected to the wastewater system. Further use of wastewater remains possible through the construction of additional wastewater treatment plants in Jericho and Al Auja. The Palestinian National Water Strategy of 2013 aimed to increase the reuse of treated wastewater in irrigation from a target of 4,2 Mm³/year in 2017 to 93,0 Mm³/year in 2032, mentioning that most of it would be used in the Jordan Valley (Palestinian Water Authority, 2013). Projects already propose to bring treated wastewater to the Valley from afar. The Al Bireh-Al Auja trunk line project proposes to take the treated wastewater from Al Bireh treatment plant to Al Auja (*Environmental and Social Impact Assessment for Al-Bireh Reuse Trunk Line to Al-Auja Area*, 2016)

Palestinian date farmers range from small owner operators and sharecroppers practicing family farming and entering outgrower schemes to large agribusinesses who rent the land they cultivate using laborers, owning only their trees and packaging facilities. Their strategies to access water vary according to their constraints.

An owner operator or a sharecropper may have a well on his own land providing salty water. He may be able to access a neighbor's well and purchase water from him. He may be able to drill an illegal well if his land lies in area C in the Jericho area. He may have access to a spring's water. The unreliability of Al Auja spring in recent years means its users tend to use its water in combination with the saltier water supplied by a well.

A large agribusiness seeks to secure its water supply differently. It may lobby for donor funded infrastructure bringing treated wastewater such as the Al Bireh-Al Auja trunk line, or for donor funded wastewater treatment plants, for example. In both cases,

this would involve a public property regime over the treated wastewater, managed by the Palestinian Water Authority. Landowners benefit or lose greatly from the choice of endpoints of such projects. But agribusinesses rent the land they cultivate. They don't own the land. They only own the trees. They can plant additional trees wherever the treated wastewater is delivered so long as they succeed to rent this land. A Palestinian agribusiness may also consider a connection to the Israeli wastewater treatment plant/reservoir located meters away from one of its farm to be the most profitable option. This would entail purchasing treated wastewater managed by the Israeli Water Authority according to a public property regime. This is not currently possible because the Israeli Water Authority only sells the treated wastewater to Israeli settlements. The Kushner proposal, released in June 2019, suggests this could change.

The greatly diverging strategies to secure irrigation water means water tenure needs to be considered when discussing evapotranspiration. Growing an additional 1000 date palm trees doesn't only mean generating increased evapotranspiration in terms of volume of water. It means an increased pressure to further a certain form of tenure, whether it be open access, private, common or public, Palestinian or Israeli. The commensuration of water only in terms of evapotranspiration per crop does not allow doing this.

A variety of land tenure

The current literature on date palm cultivation does not integrate considerations of land tenure either. This means we have very little understanding so far of the profound transformation of Palestinian society entailed by the rapid expansion of dates in the Jordan Valley.

The export oriented agribusinesses investing in dates and the literature advocating date palm plantation as sound economic development rely on a geometric representation of space. Small farmers, whether owner operators or sharecroppers, rely on a topocentric representation of space. Local Beduin herders rely on an odologic representation of space. Accordingly, several forms of land tenure have been developed simultaneously in the Jordan Valley, each concomitantly with the representation of space that seems natural to its champion. For instance, customary law compels all farmers to allow access to their fields to anyone asking to pick weeds, such as *Khubbezeh*, a very nourishing weed that grows wild. This is justified in Muslim law by the fact such weeds are not the product of the farmers' work, they are the product of God's work. In the Jordan Valley, however, their growth also depends on the leaks of the irrigation network. This is typically an adjustment modality which allows the poor to access food on land they neither own nor cultivate. Similarly, customary law preserves the right to water to whoever irrigated with it first, no matter where his land is located. Thus, flat land lying several kilometers from a spring may have a priority right to its water. This fits a topocentric representation of space. Nomads have long circulated with their herds. Their right of way, embedded in local land tenure, fits their odologic representation of space.

Nowadays, the Palestinian Authority (PA), date palm agribusinesses and foreign donors seek to implement a form of land tenure that corresponds to a geometric representation of space. This entails an upheaval in the manner humans manage their

interactions with land. Agribusinesses fence their farms. This curtails access for weed pickers and herders, thereby impacting local food security and pastoral livelihoods. Attempting to reconcile the protection of its trees and the need of the neighboring Beduin family to circulate with its sheep and donkeys, Company A fenced a linear, two-meter wide road on the land it rents. To the company, this is a sacrifice because it could have planted trees on that area. It offers this as a generous neighborly practice. To the Beduin family, however, this has constrained its freedom of movement and has lengthened the distance it needs to walk. This is typical of local populations being relegated into interstitial spaces by large land acquisitions elsewhere in the world (Leblond, 2017) (Chouquer, 2012) To secure its farms, the company employs local Beduins as security guards. Such practices are widespread among large foreign investors in Africa. In the date palm case, the agribusinesses are Palestinian. However, their executives rarely originate from the Jordan Valley. They usually commute daily from cities such as Ramallah or Rawabi.

Palestinian agribusinesses enter 30 to 40 years leases on land on a sharecropping basis ranging from 12.5/87.5 to 25/75 deals, where the bigger proportion of the crop's revenue goes to the agribusiness and the smaller proportion to the land owner. Companies' executives are aware of the falling water table and the increasing salinity of the soils. Date palm trees are replaced after 40 years, essentially because they become too tall at that point for the machinery to reach the tops. These companies only own the trees, the facilities and the machinery. Once the trees reach 40 years of age, they can move to a different location to plant new trees. Soil salinization is not so worrisome to the company within this perspective. However, the falling water table is of great concern.

As opposed to the areas lying over the western and northern aquifers of the West Bank, the Jordan Valley has a high proportion of sharecroppers among its farmers. This results from the history of the portion of the Valley where dates can grow. Jerusalem and Bethlehem families started buying land in Jericho and Al Auja areas at the end of the nineteenth century. (Trottier, 2013) By 1948, they owned most of the land in this area while residing elsewhere. The remaining lands mostly belong to local Beduin families whose upward social mobility has led them to secure jobs in cities such as Ramallah where they now live. Further north, all of Fassayil land belongs to Al Masri, a Nabulsi family. While most of the land belonged to owners residing outside of the Valley, the area hosted a great influx of refugees in 1948. Moreover, as depicted in map 2, much of the land was declared military exclusion zone after the 1967 war. Families owning land and farming in these areas, such as the Saideh clan, were suddenly deprived from access to their land. The combination of landless refugees, displaced families and absent owners led to the predominance of sharecropping. Within a sharecropping arrangement, the tenant receives a portion of the crop's revenue, traditionally 50% for open land cultivation, with the land owner receiving the remainder. This form of land tenure is compatible with the springs' water tenure. The water turns from the spring were linked to the plots of land and both land and water were appropriated by the tenant for the period of his sharecropping contract.

Sharecroppers work as families, with children joining their parents after school or university classes, in the field or in the greenhouse. A one dunum greenhouse typically occupies a sharecropping family of 8 persons all year long. Field work shows

that one dunum cultivated with date palm trees by a Palestinian agribusiness requires 0,307 labourer in the orchard two months of the year and 0,123 labourer in the packaging house 5 months of the year. Sharecroppers usually had renewable five-year contracts. They lived on site and were mostly food self-sufficient. Sharecropping is a form of land tenure that entailed housing and food security for the tenants. Until the springs dried up. No agriculture can occur in the Valley without irrigation. Open air agriculture did not require as high a ratio of manpower per dunum as greenhouse agriculture, yet relied heavily on local sharecroppers who lived in the Valley year-round. The flagship Palestinian cash crop of the area in the 1980s and 1990s was banana, mostly cultivated by sharecroppers using spring water accessed free of charge through common property regimes. These bananas were sold on the local market, thus did not generate export revenue. However, one dunum of bananas allowed a sharecropping family “to keep two children in university”, as farmers assess themselves. Moreover, bananas generated a steady revenue throughout the year. The export revenue generated by one dunum of dates is infinitely greater than that generated by one dunum of bananas because these were not exported. However, the local revenue generated by one dunum of bananas was far greater than that generated by the jobs created by one dunum of date palm trees. The housing security and the food security linked to banana cultivation were also priceless to the sharecroppers.

Date palm trees may appear as a solution from a technical point of view because they can grow using the brackish water of the wells which still supply water. But they involve a different form of land tenure and require far less labor than previous crops. Land owners switching to date palm trees lay off their sharecroppers. They hire seasonal laborers, most of whom are only required for two months of the year. When replacing a previous crop, date palm trees thus displace sharecroppers in the same manner sheep displaced agricultural tenants in Scotland during the Highland Clearances of the 18th century.(Richards, 2008) The literature on date palm plantations in the Jordan Valley cited above does not discuss considerations of land tenure. Consequently, this phenomenon has gone unnoticed.

Quantitative methods can be associated with qualitative methods differently. The mainstream discourse on date palm trees has so far ignored an important aspect of this agricultural transformation because it didn't integrate social sciences in the formulation of its research questions. The same quantitative methodologies deployed within this discourse lead to very different results when they are harnessed to answer a question formulated by social science. Qualitative research methods allowed observing the displacement of sharecroppers by date palm trees and the processes driving it. Quantitative methods then allowed assessing the magnitude of this phenomenon.

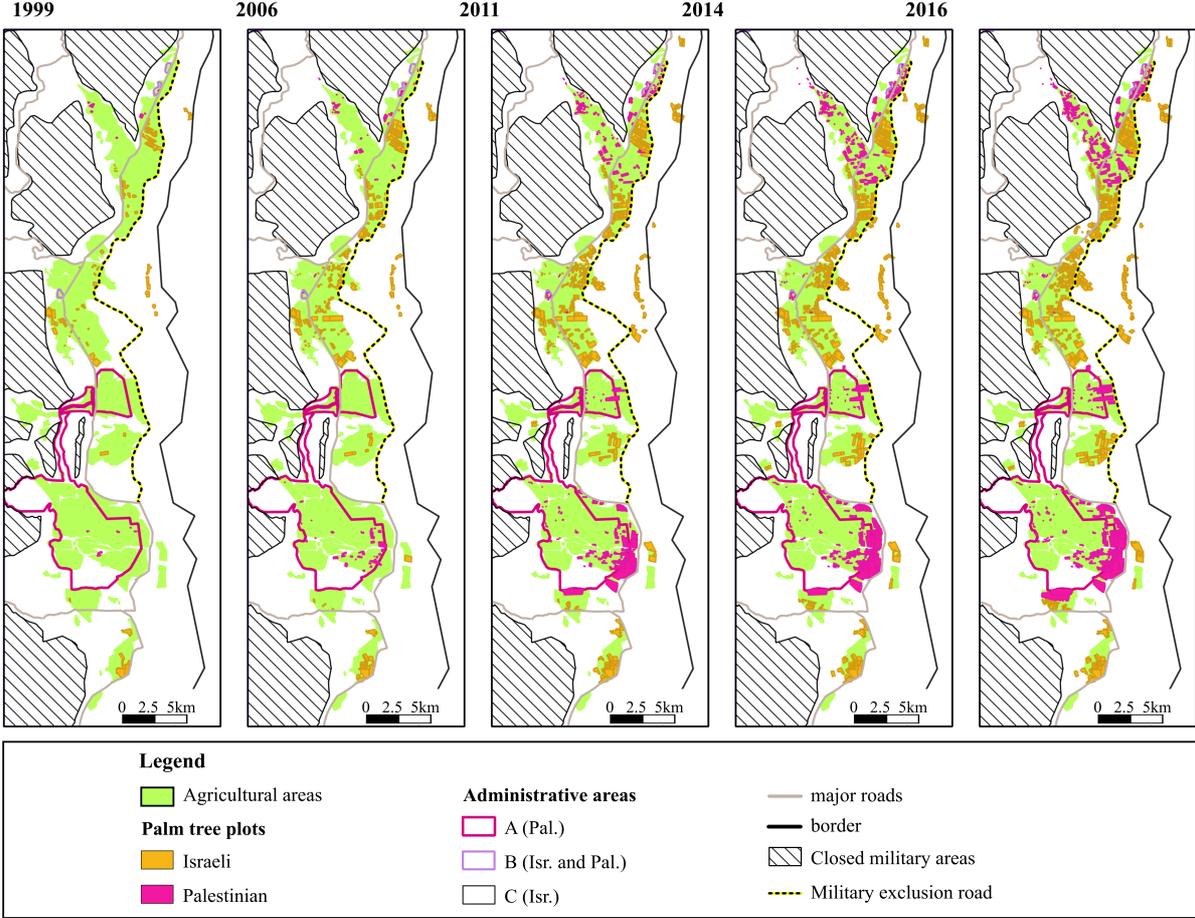
We used a time series of orthophotos and satellite images of the valley dating from 1999 to 2016 to map the appearance and the spread of date palm trees. We distinguished four categories: desert land, land covered with greenhouses, open land cultivated with crops other than date palms and land covered with date palm trees. Field visits allowed us to confirm the tighter planting practiced by Palestinian farmers (13 to 14 trees per dunum as trees are planted 8m apart spaced by 9m) compared to Israeli farms (12,3 trees per dunum). This, as well as field visits allowed distinguishing precisely Israeli and Palestinian date plantations year on year. The progression of the areas covered by date palm trees is depicted in Figure 1. The overall trajectory of land

from desert, open land agriculture or green houses to date palm cultivation is depicted in the Sankey diagram in figure 2.

Figure 1

Figure 2

The spatial progression of date palm trees is depicted in Map 3.



Map 3

Assessing the area covered with greenhouses and the area of open, cultivated land that was replaced with date palm trees allowed us to estimate the minimum number of displaced sharecroppers. We can safely suppose that Palestinian land converted from greenhouses to date palm trees would have formerly hosted sharecroppers. Indeed, field interviews reveal that a small owner operator systematically prefers conserving a one dunum greenhouse rather than converting it to date palm trees. The predominance of sharecropping in open air cultivation in Palestinian agriculture of the Jordan Valley before the arrival of date palm trees means that an estimate of 50% of that open air cultivated land converted to date palm trees most probably underestimates the area of land formerly farmed by sharecroppers. Considering that a one dunum greenhouse required one sharecropping family averaging

8 members and that four dunums of open air cultivation required a family of the same size, we can estimate the minimum number of Palestinian sharecroppers displaced by date palm trees through equation 1.

Equation 1

Equation 1 – Number of Palestinian sharecroppers displaced (N_{sd})

$$N_{sd} = A_{oa} \times p_{soa} \times n_{soa} + A_g \times p_{sg} \times n_{sg}$$

A: area converted to date palm trees

p: percentage of area farmed by sharecroppers

n: number of sharecroppers per dunums

oa: open air cultivation

g: greenhouse cultivation

$$N_{sd} = 7055 \times 0.5 \times 2 + 64 \times 1 \times 8$$

$$N_{sd} = 7567$$

Equation 2 – Number of jobs created for Palestinians on previously cultivated land (NJ)

$$NJ = A_{c \rightarrow p} \times J_p \times n_p + A_{c \rightarrow p} \times J_{pack} \times n_{pack}$$

$A_{c \rightarrow p}$: cultivated area converted to date palm trees

J_p : months of employment in palm tree orchards per laborer

n_p : number of laborer in palm tree orchards

J_{pack} : months of employment in packing house per laborer

n_{pack} : number of laborer in packing houses

$$NJ = 7833 \times 0.3067 \times 2 + 7833 \times 0.1227 \times 5$$

$$NJ = 9611 \text{ person month}$$

Thus, a minimum of 7567 Palestinians belonging to sharecropping families have been displaced by date palm trees since 1999. This is a significant number in comparison with the total population of 51410 of the Jericho and Al Aghwar

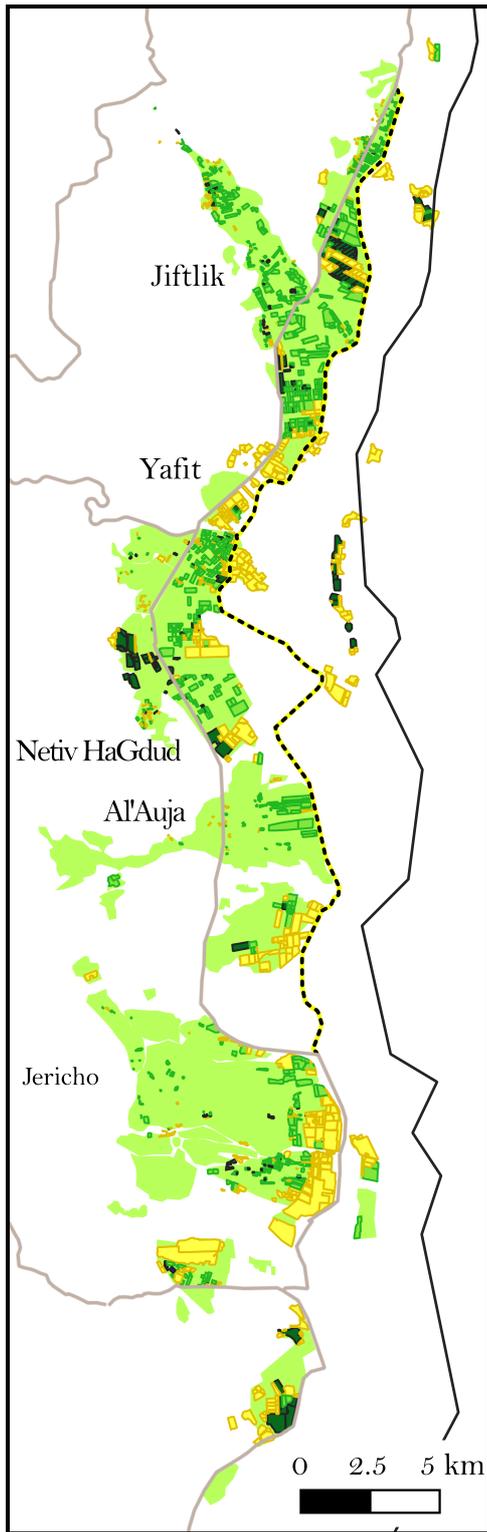
governorate which contains the area suitable for medjoul dates.² Jobs have been created in the meantime. We can estimate their number using equation 2.

Equation 2

The areas where sharecroppers cultivated up to recently now provide a yearly total of 9611 person months of employment. These person months are evenly spread over men and women. However, the jobs for men last only two months of the year, from mid-August to mid-October, during picking season, while the female jobs last five months of the year, when dates are sorted and packaged. Similar seasonal employment has been created on previously desert land that is now cultivated with date palm trees. Thus, a total of 19435 person months of yearly employment has been generated by Palestinian date palm trees. If such employment lasted through the year, it would amount to 1619 full time, year-round jobs. However, the seasonal character of these jobs needs to be considered. Sharecroppers previously lived in the Jordan Valley because they lived on the land they cultivated. The families of seasonal workers cannot do so. Sharecropping families loose both their housing security and their capacity to gather and grow their own food when their tenancy ends because date palm trees displace them.

When date palm trees are planted on desert land, sharecroppers are not displaced but the pressure on water resources increases as land that used to lie fallow is now irrigated. Assessing the surface area of desert filled by date palm trees allowed estimating the additional demand for water. As we distinguished Israeli from Palestinian trees, we could assess which type of resources was targeted by this demand. This allowed us to verify whether the optimistic possibility of 2/3 of the previous water demand now being allocated to other crops was verified. Map 4 illustrates land use in 1999 on all plots cultivated with date palm trees in 2016 using four categories: desert (uncultivated) land, open air agriculture, greenhouse agriculture and date palm trees. Table 1 shows that a similar overall quantity of water is now consumed by Palestinian date palm trees planted on previously cultivated land compared to those planted on previously desert land. Date palm trees did not “free up” two third of the water previously consumed by other crops. This “freed up water” has been devoted to planting more date palm trees.

² Palestinian Central Bureau of Statistics, http://www.pCBS.gov.ps/site/lang_en/803/default.aspx, last accessed on 11 April 2019.



Legend

Land Use in 1999 of areas converted to date palm trees in 2016:

- Grazing and uncultivated land
- Cultivated (annuals or perennials)
- Greenhouses
- Palm trees
- Farmed and built areas (2015)

Map 4

Table 1

Table 1 : Water consumption for date palm cultivation (based on the areas planted in 2016, supposing all trees are adult trees, so in fact it is a projection).

Types of trees	Total area (dunums)	Number of trees/dunum	Total number of trees	Water consumed/tree/ year (m3/tree/year)	Total yearly water consumption (million m3)
Israeli trees planted on desert land	12942	12.3	159187	122	19.4
Israeli trees planted on previously cultivated land (greenhouses or open air)	7119	12.3	87564	122	10.7
Palestinian trees planted on desert land	7754	13.5	104679	100	10.5
Palestinian trees planted on previously cultivated land (greenhouses or open air)	7833	13.5	105746	100	10.6

Within the military exclusion zone, Palestinians are not allowed to farm even when they have deeds proving ownership of the land. This zone is especially propitious to dates because it lies at the lowest altitude, thus benefiting from the hottest

temperature. Dates are grown here by Israeli settlers using Thai laborers. The large Israeli built wastewater plants and reservoirs in the Valley will supply a sustainable and growing flow of wastewater in the future. Israel has embarked on a policy of mass desalination since 2000 to supply domestic water, which in turns, supplies wastewater. The high demographic growth rate will lead to an increase in domestic water consumption and, consequently, wastewater production. Israeli grown trees benefit from a secure supply. Palestinian date farmers occupy a more vulnerable position.

The Political Impact of this Transformation

Previous studies on date palm cultivation limited their analysis to the costs and revenues entailed by this crop. They depicted it as income and job generating. However, comparing the present date palm agriculture with what preceded it on the same land allows assessing the impact this transformation is having on food security, housing security, job security, labor relations and income security in the Jordan Valley. Overall, this allowed exploring the political transformation entailed by the transformation of agriculture in the Valley. As donors, companies, the PA, settlers, sharecroppers, small owner operators involved in family farming are interacting, they are simultaneously developing, consciously or not, a new polity. Our study sheds light on which strategies are developing an independent Palestinian state and which are furthering a “one state solution”. It also sheds light on the inadvertent interactions these processes have with each other. It allows understanding how this transformation is affecting the coproduction of water management. In short, our methodology allows to question whether the tidal wave of date palm trees in the Jordan Valley constitutes a form of development or not. If so, which type of development? Development benefiting which social groups and which form of political organization? Development that can be labeled “sustainable” or not?

Palestinian farming of date palm trees involves two types of production. Export oriented agribusinesses carry out a vertical integration of the production activities while relying on outgrowers in case their clients order more than their own production can supply. Small growers carrying out family farming sell their production on the local market and to these agribusinesses within outgrower schemes.

Palestinian agribusinesses have interactions with the PA, with the Israeli authorities in order to export, with foreign donors and development banks to secure loans in order to build and expand their facilities such as freezers. Their business plans rely on securing a sufficient supply of water, a goal that appears compromised over the long term. Their executives often live in Ramallah and are able to lobby in favor of infrastructure projects such as wastewater treatment plants or trunk lines carrying treated wastewater to the Jordan Valley. This is the sort of projects donors contemplate funding as part of their effort to support a two state solution whereby an independent Palestinian state would exist side by side with an Israeli state.³

³ The 1948 war that took place when the UK withdrew from the British Mandate over Palestine led to the creation of a state, Israel, and to the annexion of the West Bank by another state, Transjordan, which became Jordan. In 1967, Israel occupied the West Bank, including East Jerusalem, as well as the Golan, the Sinai and the Gaza Strip. In 1988, Jordan's King Hussein relinquished all administrative claims over the West Bank, paving the way for the Palestinian Liberation Organisation to claim a Palestinian state over that area. The Oslo Accords, signed in 1993, 1994 and 1995 led to the creation of a Palestinian Authority.

Agribusinesses engage in forms of land and water tenure whereby the access modalities to water are independent from the access modalities to land. They rely on licensed wells and shun unlicensed wells. They support large infrastructure projects that could carry treated wastewater to the Jordan Valley over long distances. The location of the endpoint of such trunk lines is irrelevant to them as they will rent the land from whichever owner is lucky enough to secure the project's outlet. Palestinian agribusinesses would also benefit from accessing the large Israeli reservoirs of wastewater lying close to the land they cultivate. Accessing Israeli wastewater reservoirs will remain impossible, unless Israeli and Palestinian water management are merged into one over the West Bank. This might occur if a one state solution was developed, whereby the West Bank would be annexed by Israel and no independent Palestinian state would exist, providing, of course, equal rights were granted to Palestinians within that one state. Some Palestinian agribusiness executives openly admit that they are working towards a "one state" solution, which might allow them to access this resource.

In June 2019, the "Kushner peace plan", put forward by the American government, stated it aimed to "unleash" the Palestinian economic potential, empower the Palestinian people and enhance Palestinian governance. Its goals did not include the creation of a Palestinian state. However, they included doubling the Palestinian gross domestic product, increasing Palestinian exports as percentage of the gross domestic product from 17 to 40, increasing the foreign direct investment share of Palestinian GDP from 1.4% to 8% and doubling the potable water supply per capita available to Palestinians. It specified it aimed to "grow the capability of Palestinian farmers to shift their efforts to producing higher-value crops and afford them the opportunity to use modern farming techniques [...]" ("Kushner Peace Plan," 2019) The Kushner proposal announced it would facilitate over \$50 billion in new investments over ten years using an implementation mechanism analogous to the Marshall Plan. It detailed these projects in a separate list worthy of examination. 8% of its total budget is intended for water and 3% for agriculture. Half of its agricultural projects are of direct interest to date growers over the next three years: \$60 mm in grants to develop cold-storage facilities, a necessary infrastructure to store dates throughout the year, \$75 mm in loans to support food processing and packaging facilities, also a necessity to export dates, and \$200 mm mostly in loans to increase irrigation in the West Bank and Gaza to increase the capacity of farmers to grow high value crops. ("Kushner Peace Plan List of Projects," 2019) Dates being the highest value export oriented crop, date agribusinesses appear as the most likely candidates for such funds.

Many in the international community and among the Palestinians expected this interim agreement covering a period of 5 years to lead to the creation of a Palestinian state over the West Bank and the Gaza Strip. The donor community constructed the projects it supported in the West Bank and Gaza Strip within the perspective of building an independent Palestinian state. This is called the "two state solution". On 29 November 2012, the General Assembly of the United Nations granted Palestine the status of a non-member observer state. But the Israeli occupation persists to this day and the Israeli settlements in the West Bank keep growing, making the possibility of a two state solution more difficult to achieve year after year. Settlers have long promoted a "one state solution" whereby Israel would annex the Occupied Territories. During the 2019 election campaign, leading Israeli politicians championed the annexation of a large part of the West Bank. None of the Israeli politicians promoting a "one state solution" have proposed to grant Israeli citizenship to the Palestinian population.

The water projects foreseen by the Kushner proposal are just as relevant to date farmers as the agricultural projects: \$50 mm to increase drinking water imports from Israel (which generates wastewater that could be used to grow dates), \$40 mm in wastewater and reuse infrastructure and \$600 mm to complete wastewater infrastructure, sewage networks and “critical connections”. A budget clearly exists to carry wastewater over long distances to the Jordan Valley. And “critical connections” could mean merging the Palestinian and Israeli wastewater networks.

On 25 to 27 June 2019, the United States gathered Israeli and Palestinian business people in Bahrain for a conference without any official Israeli or Palestinian representatives. Jared Kushner stated, “For too long the Palestinian people have been trapped in a framework for the past. This is a framework for a brighter future. It is a vision of what is possible with peace.” (Landau, 2019) The Kushner proposal states that it seeks to use market principles and actors. It furthers an approach that was already followed over the past 25 years by donors to the Palestinian Authority. For instance, the Palestinian Water Authority’s water purchase from Mekorot increased from 53 million cubic meters in 2011 to 69 million cubic meters in 2016. (Trottier et al., 2019)

Small producers engage in different forms of land and water tenure. They often rely on family or good neighborly relations to purchase water from a given well. If their land lies in area C, they might drill an unlicensed well. Their land may be entitled to water turns from a spring and they may benefit from that flow, however intermittently. Such small family farmers access water through legal pluralism. While agribusinesses constantly refer to the Palestinian water law, family farmers rely on a mixture of neighborly agreements, customary law, common property regimes and Palestinian water law. Neither a one state solution, whereby Israel would annex the West Bank, nor a two state solution, whereby an independent state of Palestine would seek to implement its water law, would further small producers’ access to water. The plural legalism they have been developing since the occupation started in 1967 is part of a coping strategy that has allowed their resilience.

The peace proposal put forward by former US secretary of state Kerry aimed to reduce the number of farmers in Palestinian territories. According to this plan, “successful” farmers, ie those producing export oriented crops through contract farming, deserved to be supported (*Initiative for the Palestinian Economy Agriculture*, 2014, p. 46) Springs dry up, weakening sharecroppers and small owner operators carrying out family farming thanks to water accessed through common property regimes. Meanwhile, new actors in agriculture, Palestinian agribusinesses, are emerging. They rent large tracts of land, rely on private wells and plan to rely increasingly in the future on PA managed or Israeli managed treated wastewater. The agricultural scenario foreseen in the Kerry Plan seems to be unfolding even though the plan itself was not adopted. This is unsurprising because the Kerry Plan gathered the tools deemed valid by the existing scientific discourse and policies to construct economic development. The present Kushner plan follows the same course.

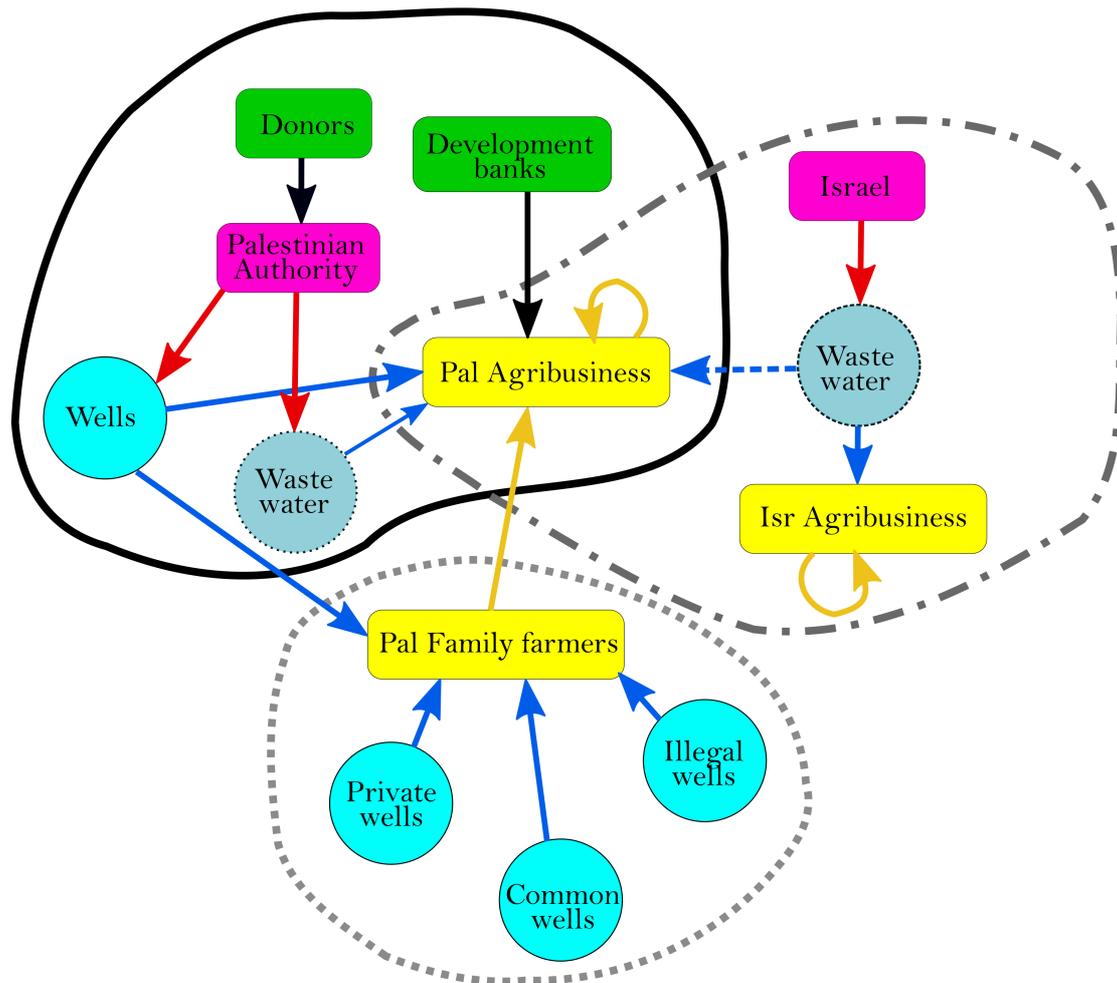
Three sets of interactions with land and water thus emerge, leading to three different polity constructions as illustrated in figure 3. The PA, donors and development banks labor towards a two state solution. They seek to establish a public property regime managed by the PWA over Palestinian used water. For instance, the French

development bank PROPARCO, affiliated to the French aid agency, granted a \$10 million loan to the biggest Palestinian agribusiness growing dates in the Jordan Valley. This allowed the company to rent and cultivate a 900 dunum plot next to the settlement of Beit Arava. When discussing this loan, a French official said “If the Palestinians don’t plant date palm trees, then the Israeli settlers will.” The loan officially aimed at developing Palestinian export oriented agriculture. It seemed to also answer a strategic logic: hampering the expansion of Beit Arava settlement. The actors and interactions furthering a two states solution are circled with a solid black line in Figure 3.

Agribusinesses themselves, however, needing to secure water and their capacity to export, may work towards a one state solution, which is presently the favoured option of the Israeli government. The actors and interactions furthering a one state solution are circled with a broken grey line in Figure 3.

Family farmers need to maintain the present legal pluralism in order to maintain their access to land and water as well as the variety of livelihoods that sustain them. The actors and interactions furthering legal pluralism are circled with a grey dotted line in figure 3. Small producers are presently useful to the agribusinesses as they provide them with a possible top up when their own production is insufficient. Whether the business model relying only on vertical integration or mostly on outgrower schemes proves most successful will largely determine the fate of these small producers. The nomadic herders appear even less advantaged as the new forms of land tenure, which involve fencing, relegate them into interstitial spaces and prevent them from accessing nourishing weeds, a staple of the poor’s diet in Palestine. Beduin herders also rely on legal pluralism to maintain their grazing activities and their food security.

Figure 3



Legend			
Actors	Water source	Flows	Polity
Grower	Ground water	Money	Two-state solution
State or protostate	Waste water	Control	One-state solution
International actor		Water	Legal pluralism
		Dates	

Tracking the social migration trajectories of the formerly sharecropper families would be worthwhile. Did they join the migrant agricultural workers that move up Al Farrah valley as the harvesting season moves higher in altitude through the spring? Did the male members seek work in Israel? If so, how did the rest of the family achieve housing security?

The displacement of sharecroppers represents only one aspect of the impact of date palm trees on livelihoods. Using wastewater to irrigate may lead to pollutants bioaccumulating in date palms and other species. Workers may also be exposed to sanitary risks. This remains to be investigated. As new actors fence large tracts of

irrigated land, the remaining residents lose access to the weeds that provided them with their staple food.

When planted on desert land, date palm trees do not displace sharecroppers directly. But they create a demand for water where none had existed before. 7754 dunums of date palm trees planted by Palestinian farmers on desert land have generated a new demand of 10.5 million cubic meters/year. In the meantime, other date palm trees had replaced other crops on a total of 7833 Palestinian farmed dunums, many of which had never hosted banana trees, the notoriously water hungry crop in the area. Clearly, the 2/3 of previously used water that could now be allocated to other crops has not materialized. Dates grown in the desert have prevented this. Developing a more water efficient crop ultimately increased water demand.

Conclusion

The transformation of agriculture in the Jordan Valley is causing a Valley Clearance. Sharecroppers are being displaced by date palm trees in a manner similar to Scottish tenants displaced in the Highlands in the 18th century. Displaced sharecroppers lose simultaneously their livelihoods, their housing security and their food security. The political consequences are important. What is happening to this population? And what sorts of polities are being constructed by the new coalitions of actors emerging from this transformation? Donors and the PWA try to pave the way for a two states solution. But Israel, its wastewater infrastructure, settler agriculture and some Palestinian agribusinesses, whether inadvertently or not, interact in a manner that constructs a one state solution. Family farmers strive to maintain the present legal pluralism as their very existence relies on it. They are, like sharecroppers, the most vulnerable actors involved.

A growing body of research has explored the need for a renewed set of principles and relationships for integrating indigenous water governance around the world, be it in Canada (Simms et al., 2016) or Latin America (Boelens, 2009)(Boelens and Vos, 2014). Earlier work in the United States had recognized native people's rights to water and developed principles for the state to negotiate with them (Sly, 1988). Current research goes further and explores the complexities involved in integrating native people in a participatory governance of water. Our research contributes to this literature. It shows the usefulness of studying land and water tenure simultaneously through an appropriation based approach. This allows identifying the actors who need to be integrated in such a process.

Simms & al (2016) noted the difficulty of reconciling the claims to land and water of 203 First Nations in British Columbia within one set of governance structure. In the Jordan Valley, Israeli settler agriculture has long been recognized as a colonial interaction with land and water. Existing literature has tended to portray Palestinians facing them as a homogeneous social body, as the occupied facing the occupier. Yet, the land and water tenure they deploy is complex. The Palestinian Water law does not reflect this complexity. Neither does the approach that donors have to develop Palestinian agriculture. The approach presented here, whereby water tenure and land tenure are first investigated, allows exploring the political interactions and power imbalances among a population that has either been historically dispossessed by a colonizer or is still occupied. This is crucial in terms of policy development.

The approach developed in our study is also useful for the development of interdisciplinarity. Much water research and agricultural research claims to be interdisciplinary. Yet, social sciences are rarely involved in the formulation of the research questions. (Fustec and Trottier, 2016) The approach developed here upends this tendency. Social science research using extensive field work and qualitative methods first took place and identified the phenomenon of sharecropper displacement by date palm trees. It identified the new political configurations emerging from this agricultural transformation. It then turned to geospatial modeling to triangulate this finding and quantify it. The results stand out in sharp contrast with those emerging from studies based on agronomy or economics considerations. This shows the usefulness both of an interdisciplinary approach and of integrating social sciences in the formulation of research questions within such approaches.

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