



HAL
open science

The Persistent Appeal of the California Agricultural Dream in North Africa

Marcel Kuper, Pierre-Louis Mayaux, Ahmed Benmihoub

► **To cite this version:**

Marcel Kuper, Pierre-Louis Mayaux, Ahmed Benmihoub. The Persistent Appeal of the California Agricultural Dream in North Africa. *Water alternatives*, 2023, 16 (1), pp.39-64. hal-03996836

HAL Id: hal-03996836

<https://hal.science/hal-03996836v1>

Submitted on 20 Feb 2023

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution - NonCommercial 4.0 International License

Kuper, M.; Mayaux, P.-L. and Benmihoub, A. 2023. The persistent appeal of the California agricultural dream in North Africa. *Water Alternatives* 16(1): 39-64



The Persistent Appeal of the California Agricultural Dream in North Africa

Marcel Kuper

University of Montpellier, Cirad, UMR G-Eau, Montpellier, France; kuper@cirad.fr

Pierre-Louis Mayaux

University of Montpellier, Cirad, UMR G-Eau, Montpellier, France; pierre-louis.mayaux@cirad.fr

Ahmed Benmihoub

Center of Research in Applied Economics for Development (CREAD), Algiers, Algeria; ben_mihou@yahoo.fr

ABSTRACT: The development of intensive irrigated agriculture in arid California has inspired many governments and people around the world. In the paper, we show how 'California' as a social imaginary influenced North Africa's irrigation policies. We trace the influence of this imaginary at two very different and critical junctures: in Morocco under the French Protectorate from the 1930s to the 1950s and in the contemporary Algerian Sahara. We argue that the influence of the 'California' imaginary persisted because of how it appeared to be the perfect embodiment of capitalist modernity while at the same time exhibiting two crucial sociopolitical ambiguities; the first ambiguity concerned the proper role of the state and the second had to do with the California imaginary's overall implications in terms of social equity. These ambiguities enabled governing actors to naturalise and routinise this imported imaginary even as they used it to forge distinct types of political settlements that were in line with local historical circumstances. We thus argue that the notion of imaginary, inherently visual and polysemic, is usefully distinguished from alternative notions such as paradigms, narratives and frames. We also contend that imaginaries do not function independently from other social forces, but rather that they are embedded in the wider political economy. This leads us to conclude that any transformation of agricultural policies in North Africa will require the diffusion of an alternative imaginary that is as effective in forging powerful social coalitions as the Californian dream proved to be.

KEYWORDS: Social imaginary, ambiguities, irrigation policies, Algeria, Morocco

INTRODUCTION

The (relatively) autonomous role of ideas in politics is both well established and perennially debated. Not surprisingly, the influence of ideas on public policy in particular has been the subject of much theorising in political science. In this field, scholars tend to differ on the types of ideas that matter most and on the specific mechanisms through which ideas are meant to exert their influence on policymakers and on the general public (Mehta, 2010; Berman, 2013; Parsons, 2016). One assumption that appears to be commonly held by political scientists, however, is that ideas are more powerful if they are clear and internally consistent, that is, when they provide simplified guidelines for how to think about, and respond to, complex situations (Hall, 1993; Jenkins-Smith et al., 2014).

In this paper, we challenge this assumption by tracing how the development of intensive irrigated agriculture in arid California influenced policy-making in North Africa as a social imaginary. In contrast to alternative notions such as policy paradigms, ideologies or narratives, a social imaginary is much less clearly articulated and more ambiguous. We will show, more specifically, how the enduring appeal of

'California' as an imaginary was due to an effective combination of clarity and ambiguity. On the one hand, it was a perfect embodiment of 20th century capitalist modernity and a particularly striking illustration of how the mastery of nature could be put at the service of capital accumulation (Scott, 1998; Sneddon, 2015). On the other hand, it was flexible enough to be adapted to local circumstances by governing actors and was hence able to be used to forge different types of political settlements.

A social imaginary should thus best be thought of as a "cultural humus" (Kagan, 2019: 161) from which different kinds of more specific ideational constructions (such as paradigms, ideologies, narratives and frames) and different types of more or less inclusive/exclusionary political settlements may emerge. A single social imaginary can exert influence on policy-making in fairly distant geographical contexts and, notably, over long time spans; indeed, the influence over time should be emphasised, as the ideational notions commonly used by political scientists tend to be more restricted in time. Much intellectual energy has been devoted to understanding, for example, the enduring grip of the neoliberal paradigm in the aftermath of the great financial crisis of 2008 (Crouch, 2011; Schmidt and Thatcher, 2013; Plehwe and Fischer, 2019). While extremely valuable, this line of investigation does not address the capacity of certain ideas to influence policies at more distant points in time and in what appear to be very dissimilar historical settings (for an exception, see Blyth, 2013; see also Davis, 2007 on how the French colonial 'story' of Morocco's environmental history persists till today). Because of their potential effect over considerable distance and time, however, these types of ideas are likely to have a profound influence on long-term policy and development trajectories; it is therefore important to understand exactly what makes them attractive to governing actors across multiple decades or even centuries. We provide some insights by tracing the influence of the California imaginary at two very different critical junctures in two different countries in North Africa: ¹ in Morocco under the French Protectorate from the 1930s to the 1950s and in contemporary Algeria since the 1980s. In Morocco, the main protagonists involved in agricultural development made explicit references to California, and in the case of Algeria, the western United States (Arizona, California) was specifically referred to. The great diversity among these contexts in terms of time, agro-ecological settings, and other aspects makes it possible to illustrate that a single process is taking place wherein an imaginary plays a central role in the formation of sustainable social coalitions around a certain type of public policy.

In the following sections we argue, first, that the Californian agricultural model is best described as a social imaginary; we contrast the notion of imaginary with more commonly used notions in political science such as policy paradigms and narratives. We then trace the main pathways through which the California imaginary inspired agricultural policies in Morocco and Algeria; we show how this took place in a combination of policy emulation (due to its forceful clarity) and bricolage (because of the ambiguities that allowed for distinct types of political settlements). We end by documenting the growing tension between the persistent appeal of the California imaginary and the accumulation of material evidence that the farming practices it upholds are fundamentally unsustainable. In the process of contemplating a fundamental transformation in public policy and in the political settlements they structure, we highlight the need for an alternative imaginary as attractive as the Californian one. At this point, such an alternative imaginary is only incipient; it is discernible in fragmented and disjointed pieces and lacks the condensation that makes a social imaginary powerful.

¹ There are examples of the influence of the California imaginary in other countries in North Africa. Fautras (2021), for instance, reports that the area of Sidi Bouzid in Tunisia, where the development of intensive agriculture (mainly arboriculture) is possible because of its access to groundwater, is referred to as 'little California'. Libya is known for the development of desert agriculture through centre pivots imported from the western US (Pérennès, 1993), as developed below.

SOCIAL IMAGINARIES, POLITICAL SETTLEMENTS AND AGRICULTURAL POLICIES: AN ANALYTICAL FRAMEWORK

Political science has produced a plethora of notions that capture what types of ideas matter most in the policy process and exactly how they matter. Thus, for example, Campbell (2004) distinguished ideas that are deliberately manipulated in the foreground of political debates, from ideas as underlying – and largely taken for granted – assumptions in the background of political agency. The former includes notions such as programmatic ideas, narratives or frames that, because they are contested and often used to challenge the status quo, tend to facilitate or enable change (ibid: 93-94). The latter includes notions such as ideologies, paradigms and the 'deep cores' of policy beliefs (Hall, 1993; Jenkins-Smith and Sabatier, 1999) which, because they are so often taken for granted, tend to constrain change.

What all these types of ideas have in common, however, is that they provide simplified and internally consistent representations of a complex reality. Ideas, aside from generally appearing useful to powerful interests, influence political action (whether of a reproductive or transformative kind) by enabling decisionmakers to chart a clear and specific course. Traditional notions such as 'road maps' and 'focal points' best capture this role of ideas as reducers of complexity to a single meaning (Goldstein, 1993).

Within political science, only a minority strand emphasises how ideas can derive their power as much from their ambiguities as from their consistency. Béland and Cox (2015: 4) draw attention to the importance of what they call "polysemic ideas"; these are clusters of ideas that "all fit together", though "they can be inconsistent, even contradictory". They argue that some sets of ideas are particularly powerful because they subtly combine a forceful clarity with key ambiguities. Polysemic ideas are especially influential through their propensity to aggregate different – and even contradictory – interests on the basis of different, and sometimes contrasting, interpretations of the consequences of implementing a certain course of action. At their most effective, they can even crystallise what Palier (2005) and Jenson (2010) call an "ambiguous consensus", that is, a political coalition so broad that it does not meet any meaningful opposition (Palier, 2005: 131).

We consider an imaginary here to be a particular instance of a polysemic idea, in so far as it is particularly wide-ranging, and hence more likely to travel across space and time than most ideas. The notion of imaginary has already been richly conceptualised by different social sciences, including critical geography, political anthropology and cultural theory (see Davis and Burke, 2011; Eggen, 2012; Harris, 2014; Browne and Diehl, 2019). It has generally been mobilised to account for broad processes of social and cultural reproduction or change, rather than for specific state policies (Adams et al., 2015; Gilleard, 2018). It is our contention, however, that imaginaries influence the action of policymakers as much as that of any other social actor and that they should therefore form part of the ordinary conceptual vocabulary of policy analysis.

Drawing from the foundational work of the French thinker, Cornelius Castoriadis (1975), the philosopher Charles Taylor defined social imaginaries very broadly. According to Taylor, they encompassed "the ways in which people imagine their social existence – how they fit together with others and how things go on between them and their fellows, the expectations that are normally met and the deeper normative notions and images that underlie these expectations" (Taylor, 2004: 23). In much the same vein, Kagan (2019: 161) defined the imaginary as a "cognitive and cultural humus from which more articulate cultural constructs such as visions, narratives, discourses and utopias can grow and where they can take root". Against any too-radical version of social constructivism, however, he cautioned that imaginaries are not just made up and imposed on the world by humans; rather, he said, they are the result of an imaginative encounter with the human and other-than-human world. In so doing, he echoed the work of Bruno Latour, who insisted that human agency and imagination depend on the constraints and affordances provided by the environment and material artefacts (Latour, 1994).

Conceiving the idea of California as a social imaginary carries two benefits. First, it captures the visual appeal through which the model has gained influence in North Africa, a key source of attraction that is foregrounded by the very etymology of the term. Rather than neatly separating cognition from

aesthetics, it highlights how it is precisely when these dimensions are intimately interwoven that geographically remote practices and arrangements become most influential (Scott, 1998). In this regard, we concur with Atasoy (2017: 93) that, in sustainability studies, notions of policy discourses and narratives have too often been defined without reference to any sensory underpinning and that this constitutes a serious limitation. By contrast, the imagining of landscapes is key to what she conceives of as 'farming imaginaries'; for example, if summoned with sufficient regularity to become culturally familiar, images of centre pivots under a wide blue sky or of remote sensors and high-flying drones over a mono-cropped field can powerfully convey a certain imaginary of agricultural modernisation (Kaika, 2006). This echoes Kanna's analysis of landscape aesthetics in the development of Dubai (Kanna, 2011; see also Harris, 2014).

The second benefit of the California imaginary is that, as a social imaginary, it allows for more ambiguities and much less internal consistency than do alternative notions. Kagan (2019) rightfully emphasises that there are usually different and coexisting ways to relate to the dominant imaginaries, and Atasoy (2017) uses the word 'ambivalence' to highlight the existence of mixed and contradictory associations in farming imaginaries. Policy paradigms and narratives, by contrast, are generally deemed powerful precisely to the extent that they give coherence to an initially eclectic set of policy positions and representations, transforming them into relatively coherent and powerful causal stories and story lines (Stone, 1989; Wood, 2015). It is by way of simplification and rationalisation – by conferring a mythicised consistency on a messy reality – that they are deemed influential. Imaginaries, on the other hand, are a much more heterogeneous assemblage of causal statements, powerful aesthetics, mantras, imagined futures, and future-oriented emotions such as hope, excitement or fear. Unlike narratives, they do not necessarily have clearly defined villains, neatly defined obstacles to overcome, nor a plot ending.

We thus argue that the Californian agricultural imaginary has displayed an effective combination of clarity and ambiguity that explains its recurring influence at different historical junctures. It is profoundly multivocal, combining shared and unshared interpretations.

Its clarity lies in its perfect embodiment of capitalist modernity in the way it exhibits a confidence that even the most seemingly barren environment – the desert – can be productively harnessed through science, (irrigation) technology and infrastructure to become an orchard. This faith in the mastery of nature and the triumph of productivity rests, first, on a belief that efficiency can be achieved in any territory through the standardisation of cropping patterns and agricultural practices (de Raymond, 2011). It is also based on the conviction that there will always be a way to secure more natural resources (especially land and water) to increase production – a belief that the American myth of the frontier powerfully captures (Reisner, 1986). As for the capitalist dimension, 'California' evokes a large-scale capitalist agriculture capable of generating considerable profits and durable economic growth (Worster, 1992). This profitability was materially evidenced by the capacity of the US to lead the postwar international food order (Friedmann, 1982). The hopes of high growth and high profit that were attached to it made it hugely popular with governing actors and landed elites worldwide, including in North Africa; as such, the California imaginary was instrumental in forging political settlements around some form of agrarian capitalism. Following a growing body of literature, we define a political settlement, here, as an "ongoing agreement among a society's most powerful groups over a set of political and economic institutions expected to generate for them a minimally acceptable level of benefits" (Kelsall et al., 2022: 27). A political settlement is thus an interdependent arrangement of political power and institutions on which a regime is based (Ingram, 2014: 5). The California imaginary helped forge a certain political settlement between contending elites in Morocco and Algeria; it was thus the subject of policy emulation whereby North African political and economic elites saw themselves as close followers and imitators of Californian practices.

At the same time, however, two key areas of ambiguity allowed the imaginary to garner support from different social groups and to be flexibly adjusted to the prevailing balance of forces. By ambiguity, we mean the quality of being open to more than one – but not an infinite number of – interpretations.

Ambiguity is a potential for plurivocity that, in turn, generates a certain plasticity for creative actors. Plasticity is the necessary corollary of (structural) ambiguity for human agency. It designates the capacity of any ambiguous statement to be creatively interpreted by purposeful actors.

The first ambiguity of the California imaginary concerned the proper role of the state. Capitalist modernity can rest on quite different types of state roles and state-society relations; for example, capitalist states can be more or less developmental (supporting agriculture to varying degrees through subsidies, price floors and the promotion of exports) and more or less authoritarian (seeking, or not seeking, the active collaboration and consent of large swathes of farmers). Lenin himself was fascinated by the technological prowess of American agriculture and by the accumulation of capital that it allowed, although he planned to put it at the service of a form of state capitalism (on the presumed road to a socialist state) that was wholly different from the American variety of agrarian capitalism where the state supported, without ever pretending to direct, large multinational corporations (Lenin, 1964 [1899]).

The second ambiguity of the California imaginary concerns its implications in terms of social equity. Here, the expansion of irrigation and the promotion of standardised cash crops can be envisaged either as a way to strengthen a competitive class of large-scale capitalist farmers or as a way to foster broad-based prosperity and an agricultural middle-class. This ambiguity is one that has always characterised the American West, that is, is 'California' fundamentally about accepting inequality or is it about furthering equality? Indeed, President Thomas Jefferson (1801-1809), in opposition to the proponents of land concentration, envisioned irrigation as a foundation for agrarian democracy (Worster, 1992).

This twofold ambiguity allows for plasticity, that is, for the bricolage of different ideational packaging by governing actors depending on the type of political settlement they seek to forge and maintain. In other words, we do not consider that the influence of an imaginary operates through purely symbolic means such as persuasion, rhetorical intimidation or ideological manipulation; rather, we ground it theoretically in a cultural political economy that "aims to explore the dialectic of the emergent extra-semiotic (material) features of social relations and the constitutive role of semiosis" (Jessop, 2010: 342). An imaginary thus becomes 'selected', to use Bob Jessop's terms, only if it allows for the formation or solidification of a political settlement that is sufficiently robust to reproduce itself and limit opposition. Moreover, once 'retained', the imaginary becomes embedded within the prevailing balance of forces and taken for granted ('sedimented'). Only when the existing political settlement crumbles – that is, only when excluded groups start coalescing against it or when included factions consider defecting – will the accompanying imaginary again be amenable to denaturalisation and repoliticisation (see Di John and Putzel, 2009; Sum and Jessop, 2013).

Finally, we will show how reflecting in social imaginary terms allows us to better think about the current predicament of agriculture in North Africa. Of late, there has been a proliferation of criticisms of modernist agricultural policies that accuse them of being fundamentally unsustainable; so far, however, this has not led to any policy bifurcation (Kuper et al., 2017). We argue that the formation of a new social coalition that is in favour of alternative policies will require an alternative imaginary that allows multiple groups to reinterpret their interests. As Castoriadis argued, radical imagination is required in order to detach from a given dominant social imaginary and the certainties it provides.

THE RECURRENT INFLUENCE OF THE CALIFORNIA IMAGINARY IN NORTH AFRICA

The California imaginary in Morocco during the French Protectorate

During his visit to Morocco in 1985, the former French colonial civil administrator Pierre Préfol, overlooking the Tadla large-scale irrigation scheme (which includes the Beni Amir and Beni Moussa irrigation schemes), declared:

It was (...) with a lump in my throat that I felt the shock of this panorama that I had often dreamed of, at the time when we were assembling the different pieces in the field. Before my eyes, the immense plain, criss-crossed with canals, rows of olive trees and service roads; the distinct colours of the different crops, arranged in parallel strips; the dark green quadrilaterals of the citrus orchards, and, unexpectedly, the distant fumes of the sugar beet factories (...) I could hardly articulate these words which were addressed to myself more than to my companions: this is California! (Préfol, 1986).

Préfol left Morocco after independence in 1956; the passage quoted above, from almost 30 years later, was when he came back to admire the agricultural development that had taken place in those intervening years. He clearly underlined the inspiration that had been provided by 'California' when the irrigation scheme was first being developed during the French Protectorate; he also appreciated how agricultural development had been pursued by "our successors" who had obtained "remarkable results" (Préfol, 1986: 211). At the same time, the reference to California, so widely publicised by the press when the Bin el Ouidane Dam was inaugurated in 1955, had, by the 1980s, become more a personal musing than something shared with the Moroccan engineers who accompanied him on his visit. In what follows, we will show how the California imaginary has been successful in inspiring the development of irrigated agriculture while disappearing as a clear-cut reference.

Figure 1. Overlooking the Tadla large-scale irrigation scheme in Morocco.



Source: Photo courtesy Jean-Yves Jamin, 2005.

A colonial agricultural impasse fostered by a classical imaginary

Agricultural development in French colonial North Africa was originally inspired by the region's perceived role in antiquity as Rome's granary (Davis, 2007). This imaginary conjured simultaneous images of a glorious (western) past and of a politically stable and peaceful prosperity before the Arab invasions

(Swearingen, 1987). It inspired agricultural policies that were centred on the rainfed production of cereals (Aït Amara, 2009). During the 1912-1956 French Protectorate in Morocco, the area of land under cereals that was being cultivated by European settlers and native farmers increased significantly, moving from 1.9 million hectares (ha) in 1918 to almost 3 million ha in 1932 (Swearingen, 1987). Yields, however, were low (less than 1 metric ton/ha) due to extensive agricultural practices on large-scale farms and because of climate variability. Moroccan agricultural products imported into France's metropolitan areas competed in price there with homegrown French agricultural products; they also had to be heavily subsidised to compete with world market prices. The 'granary of Rome' imaginary thus proved far too contradictory to endure. It privileged rainfed agriculture even though the potential for irrigation was already widely recognised in the late 19th century, as evidenced in the writings of the explorers Hooker and Ball (1878) who mentioned the promise of a million hectares of irrigated land supporting a wide diversity of crops. It was also an uneasy mix of images of Roman antiquity/modernity and images of subservience to, and competition with, the imperial centre. In short, the granary of Rome imaginary lacked the forceful clarity needed to convince policymakers to press on when circumstances proved challenging. The severe export crisis of the late 1920s put an end to this imaginary and encouraged the colonial administration to search for alternative agricultural development (Aït Amara, 2009).

It was widely felt to be the end of the 'classical era' in Moroccan agricultural development (Swearingen, 1987: 35); for some time, however, the lack of a unifying alternative imaginary precluded the adoption of systematic and far-reaching measures by French colonial authorities. It was in these unsettled times that a more effective imaginary, the 'California dream', came to inspire irrigated agricultural development in North Africa.

The politics of imagination: Promoting the California dream

Swearingen (1987) takes as the starting point of the California dream in Morocco the presentation on 15 April 1928 in Casablanca by M. Laguerre, the French commercial attaché to San Francisco.² His presentation on California's fruit industry described its million-plus hectares of fruit orchards (oranges, almonds, apricots and plums), which generated the equivalent of 16-18 billion francs per year; the presentation was based on a systematic analysis of key similarities between California and Morocco. According to Laguerre, California's success was based on its standardised crop production and packaging, its limited number of varieties, its powerful farmers cooperatives, and its aggressive export marketing around popular brands. Key similarities between California and Morocco related to the common Mediterranean climate combined with arid desert-like landscapes in the hinterland, rich water resources and soil fertility. California had shown how to harness abundant but unreliable water resources to achieve steady growth. More water had already been moved there for agricultural use than anywhere else in the western United States, through a vast network of dams, aqueducts and pipelines. Morocco was said to be blessed with additional advantages, including proximity to European markets and the availability of cheap native labour; however, given the prominence of cheap migrant labour³ in California's "factories in the field" (McWilliams, 2000 [1939]), the latter 'advantage' seems less well founded and rather can be seen as yet another similarity.

What followed, from 1929 to 1933, was a number of targeted agricultural study missions by government agents, fruit growers, journalists, entrepreneurs, engineers and agronomists; these were at times labelled "espionage" (Swearingen, 1987: 74). At that point in time, Californian fruit growers were already well organised through producer cooperatives, in particular the California Fruit Growers Exchange of 1905, which was qualified by Worster (1992: 217) as a "cooperation of capitalists in the pursuit of private gain" that relied heavily on a "tireless and cheap" workforce. California's producer

² In North Africa, there were even earlier comparisons with California; Pérennès (1993: 132), for example, mentions a 1925 newspaper article about the Chelif plain (Algeria) becoming "without exaggeration" a new California.

³ By the late 1920s, a third of the labour force in the Imperial Valley was of Mexican origin (Worster, 1992).

cooperatives were expertly developing and controlling agricultural markets and the model was carefully replicated in Morocco and also in Algeria and Tunisia (Worster, 1992). The California imaginary inspired systematic policy emulation, that is, a process of closely mimicking foreign models that were based on symbolic and normative factors rather than on a purely technical or rational concern with functional efficiency (DiMaggio and Powell 1991; Marsh and Sharman, 2009). All aspects of California's fruit industry were carefully studied, including the choice of varieties, agricultural practices, irrigation, sorting and packaging, transport and marketing. An example of this is Pierre Ducrocq, son of the first French citrus planter in Morocco, who studied for two years at the University of California and sent home many ideas, newspaper clippings, analyses, and even seeds and grafts of citrus orchards⁴ (Swearingen, 1987). Navel and Valencia varieties were introduced in Morocco, where experimentation by private nurseries far outstripped the research undertaken by government (ibid).

Appropriating and valuing water: The forceful clarity of a settler imaginary

The 1928 irrigation policy aimed to develop 250,000 ha of irrigated land, but uncertainties still abounded at this critical juncture. The financial crisis of the 1930s, followed by World War II, considerably slowed down the development of irrigation; for example, work on the El Kansera Dam started in 1926 but the dam was not completed until 1935 (Girard, 1954). There was also a lack of comprehensive planning around what to do with the water once the dam was constructed. This issue was raised repeatedly by the well-organised lobby of settlers, who understood that expensive dams could not be justified by the production of low-value crops. In these unsettled times, the California imaginary provided what was perceived as a solid economic basis for the emerging development of large-scale irrigation: settlers advocated that future water users grow "only citrus and other high-value crops" (Swearingen, 1987: 54). Citrus producers in Morocco who were sending their produce to France – in contrast with growers of other types of fruit – had the additional advantage of not being in competition with farmers there, while citrus production in Spain was suffering at the time from the civil war.

The California agricultural imaginary also justified increasing the water endowment for French settlers, established outside of traditional community-managed irrigation schemes, thereby restricting the water rights of native irrigators. At first, water reallocation was accomplished through a war of attrition and an exhausting series of skirmishes. The French administration lined canals to decrease water loss and reallocated the savings to settlers; they also froze the water rights of communities to prevent future development of their systems and engaged in "outright legal chicanery" (Swearingen, 1987: 46). It was much more politically expedient to create seemingly 'new' water resources through the construction of big dams; the water thus made available had no, or few, prior water rights attached to it, even though part of the water that was being collected in the dams had formerly been used by irrigation communities downstream (Pascon, 1977). The big dam policy therefore both required and 'created' available land and water resources.

The perfect embodiment of the California imaginary was certainly the 132.5 metre Bin el Ouidane Dam. Inaugurated in 1955, it was proudly compared to the biggest dams in the world; although smaller than the 1935 Hoover Dam (221.6 metres), it was comparable to the 1953 Pine Flat Dam (134.1 metres) in California's Central Valley (Girard, 1954). French engineers benefited from multiple exchanges with American engineers after the arrival of US Army engineers during World War II, and then in the context of the Marshall plan. From 1948 to 1953 a second series of visits took place, this time of French engineers and agriculturalists to the American West. The United States Bureau of Reclamation (USBR), founded in 1902 by Theodore Roosevelt to manage, develop and responsibly protect water resources, had by this time established itself as a prominent, in fact indispensable, player; it had thus much to show visiting

⁴ This was in line with Laguerre's recommendations, as Californian varieties were already adapted to climatic conditions in North Africa. North Africa would thus also benefit from the intensive advertising campaigns of the Californian fruit industry, for example the promotion of navel oranges in Paris (Swearingen, 1987).

French engineers. The latter "became acquainted with technological innovations and organizational methods in water management, geology prospection, port handling [and] roads techniques" (Vacher, 2019: 97). The first series of missions, taking place between 1928 and 1933, mainly concerned the fruit industry and provided an imaginary of profitable (golden) irrigated agriculture; the second series then expanded the sense of how to domesticate unreliable water resources through engineering feats; both of these contributed to irrigation development in North Africa. Incidentally, the expertise obtained in North Africa was subsequently solicited for the development of large-scale irrigation in France and elsewhere in the world (Marié, 1984; Pritchard, 2012).

Plasticity of a model: Laissez-faire for settlers and coercive developmentalism for native irrigators

Although the California imaginary inspired the development of irrigated agriculture in North Africa, the vision of what California's irrigated agriculture exactly was and how it should be translated to the Moroccan context depended on the worldview and relative power of different interest groups. California provided contrasting and ambiguous sources of inspiration; it allowed governing actors to 'play' with the imaginary through ideational bricolage, in much the same way that the European Commission, at a very different historical juncture, played with the general imaginary of the 'market' to justify policies in different sectors (Jabko, 2006). These travelling ambiguities would influence the creation of distinct irrigation patterns with different state-farmer relationships.

Resident-governor Steeg (1925-1929) promoted a policy of settlement that favoured non-corporate agriculture and took a keen interest in the development of irrigation. In his mind both ideas were closely related, as irrigated farms were smaller than rainfed farms, enabling more settlers on the same surface area (Swearingen, 1987). The settlers' reaction was ambivalent and they actively pressured the state to engage in irrigation development. The glowing articles on irrigation by journalist Louis following his 1931 visit to California, for example, were part of a far-reaching lobbying effort aimed at pushing the colonial administration to follow California's example. Settlers, however, were also reluctant to submit to stringent state control.

This complicated relationship closely echoes that between agribusiness and the Bureau of Reclamation in the development of America's hydraulic West. In both contexts, the relation was ultimately one of collusion; however, it also involved constant skirmishes and conflicting interests, in particular with regard to the societal model being pursued (Worster, 1992). Private settlers frequently contested the restrictions in access to land and water. Pascon (1977: 495) explains how settlers, after a mission to California in 1929, challenged state ownership of water, having observed how, in California, landowners could access water freely in proportion to their efforts, without state authorisation. Settlers had strategically chosen to understand the Californian model as having a laissez-faire relationship to land and water access. The colonial administration, however, was keen to maintain its authority over surface water resources; it provided the rather dubious argument that this in fact protected indigenous water rights. Settlers contested other restrictions more successfully, such as the resident farmer model that was being promoted; they instead appointed farm managers (Swearingen, 1987). They skilfully negotiated their relationship with irrigation authorities in order to loosen some of the imposed restrictions, managing to obtain a "laissez-faire pattern" in settlers' irrigation schemes (ibid: 101). As in many other contexts, ideational bricolage – the recombination of old and new ideas by policy entrepreneurs – made it possible to forge specific political settlements (Allain and Madariaga, 2020).

At the other end of the spectrum of state-farmer relationships, the Beni Amir irrigation scheme (which was to become part of the Tadla irrigation scheme) had also originally been planned for settlers, confining local tribes to a small portion of the future scheme. The forceful colonial administrator, Tallec, put much energy into promoting the idea of a native irrigation scheme; in the process, he overcame multiple objections from within his own administration, from the settlers' lobby, and from would-be irrigators all of whom were coaxed into the irrigation adventure (Préfol, 1986). Native irrigators had considerably

fewer resources than settlers to negotiate their relationship with the colonial irrigation administration. Beni Amir became a paternalistic showcase for irrigation development; it was characterised by an authoritarian regime that imposed cropping patterns, disbursed full assistance for farming operations and drew up mandatory contracts for producing industrial crops.

Swearingen (1987: 101) rightly contrasted the "authoritarian pattern" of the Beni Amir native irrigation scheme⁵ with the "laissez-faire pattern" of the Beht and N'Fis settler irrigation schemes. Importing the California imaginary could mean allowing French settlers to access land and water as they saw fit at the same time as imposing a rigid set of obligations on native smallholders. The 1938 national irrigation master plan maintained this flexibility by combining different and often contrasting objectives. It aimed to: (1) "make colonial agriculture more viable", focusing on the export of high added value produce; (2) increase food supply for the growing Moroccan population; and (3) attenuate urban migration and "fix the native to the soil" by promoting labour intensive crops such as cotton, sugar beets and flax (Swearingen, 1987: 103, 111). The ambiguity of the plan reflected the larger ambiguity of the French Protectorate, which was based on the supposed harmonious coexistence of Moroccan and colonial interests (Pascon, 1977); it continued to pervade Morocco's hydraulic policy after independence. The fundamental debates typical of a critical juncture lingered on for a few years; they quickly gave way, however, to the durable reassertion of Californian policies. As the social coalition underpinning it stabilised, the imaginary became naturalised and routinised. In the process, references to California largely disappeared as the imaginary was 'Moroccanised' within a larger process of nation-building.

The afterlife of an imaginary: Moroccanisation in a time of nation-building

The hydraulic society in Morocco at the time of independence is often described as modest, with only 54,500 irrigated hectares (Benhadi, 1975); large-scale irrigation development, however, would take root at the heart of the independent nation's construction. Unlike in Algeria, large-scale irrigation had not only concerned settlers; it had also involved Moroccan farmers practicing diversified cropping in the Beni Amir (20,000 ha), Beni Moussa (10,500 ha) and Boulaouane (1100 ha) irrigation schemes (Popp, 1984). These schemes projected an image of an independent Morocco that was able to feed its masses, provide inputs for its processing industry, and grow fodder for a modern dairy industry (Swearingen, 1987). In other words, the very modernist imaginary that had previously fostered submission to imperial authority was now imbued with national sovereignty. This was completed by the image of wealthy Moroccans in the Beht and N'Fis irrigation schemes taking over settler farms growing high-value export-oriented crops. In 1955, exports of citrus fruits and market vegetables contributed 20% of the country's foreign revenue (Swearingen, 1987: 145). Large-scale irrigation thus promised simultaneously to feed Morocco, support the agro-industry, and earn foreign currency through exports. This enduring and multifaceted imaginary of large-scale irrigation contributed to continued political support for many decades. While large-scale farms were favoured because they provided the best returns for state-invested capital, state and international donors did not want to see "uncontrolled dispossession" of the smallholders who constituted the social base of the regime (Benhadi, 1975: 287; Leveau, 1985).

A tentative departure from the California imaginary was initiated in 1960 by the National Irrigation Board (French acronym ONI). The ONI engaged in a comprehensive reflection on why and how irrigation

⁵ In the past, Tadla's authoritarian pattern had often been contested. During the Protectorate, there was continued resistance from farmers, which was supported by intellectuals and political parties. After independence, the nationalist leader Ben Barka visited Tadla. He advocated "a kind of democratic liberalism", which did not go down well with the French officers still present (Préfol, 1986: 201), who did all in their power to transmit the authoritarian irrigation regime to competent and, if possible, like-minded Moroccan officials. These officials upheld the authoritarian pattern, leading to contestation and passive resistance (Leveau, 1985). With time, irrigation administrators and farmers implemented informal adjustments to ease certain rules. During his visit in 1985, the former colonial administrator Préfol, a fine connoisseur of power relations in large-scale irrigation, noted the various negotiated "release valves". He further noted that cropping regulations and contracts with agro-industries had been relaxed and felt the water price to be generous towards farmers.

development should take place (Popp, 1984). The main idea was to "intensify production in the areas already equipped" rather than build additional dams (Benhadi, 1975: 278). Cropping patterns were to be organised around crops for national industries (textiles, sugar) and fodder to promote the dairy industry. The production of citrus fruits and vegetables was discouraged as these were being grown by settlers who depended on protected export markets. The ONI also promoted land reform to divide large (colonial) landholdings into a maximum farm size of 50 ha and to consolidate small and medium-sized farms (3-5 ha) into organised agricultural cooperatives. The ONI further proposed crop contracts between the state and farmers in order to share risks and to guarantee financing, technical support, and sale of the produce. These proposals amounted to a substantial departure from the high-modernist, export- and fruit-oriented California imaginary.

The ONI's project can be read as the process through which the political settlement characterising the Moroccan post-independence state emerged. The project was very coherent and had few ambiguities, but because it threatened rural elites it was never accepted (Benhadi, 1975; Leveau, 1985). In 1966, the ONI was quashed to make way for the Regional Offices for Agricultural Development (ORMVA), one for each large-scale irrigation scheme. Certain ideas that originated at ONI were incorporated into the 1969 agricultural investment code, including crop choices and crop contracts; these were now made wholly subservient to large-scale irrigation (Popp, 1984). From then on, very little reference would be made to California; the imaginary, although remaining the same in terms of its content, was thoroughly Moroccanised in a period of intensive nation-building. Moroccan engineers, in the beginning often trained in France (and a few in the USA), developed national standards for irrigation and became part of what Worster (1992) calls an international fraternity of engineers exchanging experiences and ideas.⁶ A review of the international cooperation of the USBR shows that North Africa was not an important focus for the US after its countries achieved independence (Ives and Bochar, 2008). There were practical interactions mediated by international donors, however, which yielded loans for developing large-scale irrigation in Morocco; there was also participation in international agricultural or engineering conferences on technological advances.⁷ These exchanges were abundantly cited and used to support arguments during national irrigation debates, for example on the shift to sprinkler and drip irrigation (Ababou, 1979).

After the liquidation of ONI, the 1968 Five Year Plan heralded a massive return of the 1938 big dam policy,⁸ which was justified by an accompanying agricultural intensification (Benhadi, 1975). In this plan, 50% of the budget was allocated to the development of hydraulic infrastructure and there was a reappearance of the slogan of "1 million irrigated hectares by the year 2000" (Popp, 1984). About 100 dams of different sizes were constructed in the period 1967-2000, bringing the total available surface water resources to nearly 12 billion cubic metres (m³) and the total irrigated area by large-scale irrigation schemes to 682,000 ha (El Gueddari, 2004). When the area of small and medium-scale irrigation schemes was included, the surface area of public irrigation schemes reached 1,016,700 ha,⁹ which achieved the 1938 target. The irrigated agriculture policies and the big dam policy, however, were largely oblivious of their Californian origins, illustrating the remarkable plasticity of the imaginary. The development of

⁶ Travelling engineers have been a constant through history. Garrido (2014), for example, analysed the travels of French and British colonial engineers to Spain, showing how irrigation institutions were not their primary concern. Similarly, Worster (1992: 151) showed how American engineers travelled to countries such as Egypt, India and Italy, where they closely observed the infrastructure but failed to see the "despotic social organization" and the "disastrous impact of technology on traditional cultures", and were "oblivious to the ecological problems".

⁷ In 1987, the 13th International Congress on Irrigation and Drainage was held in Casablanca, Morocco; it addressed questions of water management training and the rehabilitation and modernisation of irrigation and drainage projects.

⁸ Development through large dams in Morocco is a topic in its own right; it can be found in the well-established literature on the hydraulic mission; see Molle et al. (2009) for a general overview and Pritchard (2012) for an analysis focused on North Africa.

⁹ Kuper et al. (2016) estimated Morocco's total irrigated area to be 1,458,160 ha, of which 435,881 ha was qualified as private irrigation.

irrigated agriculture was by now a thoroughly national project; it was key to legitimising the monarchy, positioning it as forward-looking, as an important agricultural powerhouse, and as the great harnesser of national resources (Leveau, 1985). The embodiment of modernity had been transferred from California's capitalist farmers to the monarchy.

The construction of new Saharan agriculture in Algeria (1980-2020)

The colonial failure of the California graft in Algeria

The California agricultural imaginary arrived in Algeria at about the same time as it did in Morocco. This imaginary had appealed to the French colonial administration as it was of interest economically (ensuring the profitability of the citrus fruit sector) and territorially (encouraging colonisation by settlers); it was also of interest politically, as it was "a project aimed at disciplining the settlers" and transforming their agricultural practices and lifestyle (de Raymond, 2011). The surface area under fruit orchards cropped by American-influenced "innovators" slowly increased,¹⁰ to the detriment of "traditionalists" who were influenced by the Spanish model of improved cereal production (Pérennès, 1993: 143). Instead of the productive ambiguity and tension in Morocco, however, the government perspective in Algeria diverged too far from the economic interests and larger expectations of settlers (Arrus, 1985), who often continued their "land speculation and extensive agricultural production practices" (Amzert, 1992). More generally, water resources were less abundant, the plains were narrower, and the land was more populated than in Morocco. The coastal Algerian landscape and climate were thus less suitable to the California imaginary than they were in Morocco.

The colonial hydraulic legacy in Algeria is considered to be modest (Amzert, 1992). At independence in 1962, 23 dams of varying sizes had been constructed and there was only about 45,000 ha of land with functioning irrigation systems (Arrus, 1985). This was comparable to the situation in Morocco, despite a much longer French presence in Algeria. Amzert (1992) underlines some continuities in the hydraulic programme after independence. The approach based on technology and various innovations, which had till then been reserved for settlers, provided a fascinating imaginary of progress and modernity to the new ruling elite. After a harshly fought-for independence, this would now become accessible to all Algerians (Chaulet, 1987); the graft of large-scale irrigation, however, would not take. The dominant imaginary throughout has been that of development powered by heavy industry and oil (Bennoune, 1988), leading to a different composition of the political settlement. The lack of attention paid to irrigated agriculture was also due to lack of surface water. During the first decades of independence (1962-1977), surface water stored in dams was mainly used for agriculture; from 1980 on, however, it was increasingly used for household water use to meet the needs of fast-growing cities (Benmihoub, 2016). The development of irrigation in Algeria has thus taken place largely outside of large-scale irrigation systems. The lamentations over the poor performance of irrigated agriculture in public schemes should be compared to the dynamic small-scale irrigation sector catering to a variety of types of produce. With a surface area of almost 700,000 ha in 2008 (of which 85% was irrigated with groundwater), this sector represents almost 18 times the irrigated area of large-scale irrigation (Kuper et al., 2016).

A new Arizona? The dream of a state-manufactured American West in the desert

In the early 1980s, the attention of the Algerian Ministry of Agriculture turned towards the Sahara, shifting away from large-scale irrigation in the Mediterranean climate zone. Pérennès (1993: 548) mentions the 1988 speech of the then Minister of Agriculture, who saw in the Sahara a promising "new frontier" for irrigation development due to abundant groundwater resources; the Minister stated that,

¹⁰ Until 1945, cereals were predominant in large-scale irrigation schemes (40.5% of the irrigated surface area); by 1960, however, fruit orchards accounted for 44% of irrigated land use (30% of which was citrus), followed by vegetables (29%), and cereals (17.5%) (Pérennès, 1993).

"there is no doubt that we will reverse the tide: supplying the northern regions of the country with surplus production from the Saharan regions". The idea was not only to change the location; it was also to change the entire irrigation model by importing large-scale irrigation technology, especially centre pivots for the entrepreneurial production of cereals.

The story of centre pivots in the Sahara started much earlier in 1974 with a feasibility study by an American company under contract with the Algerian oil industry. It noted the remarkable similarity of climate conditions to "those of central Arizona where large areas of desert have been put under irrigation"; it further noted the proven existence of large groundwater reserves (Pérennès, 1993: 556). By mobilising a frontier myth, the Arizona imaginary captured both a thirst for development and a desire for genuine national sovereignty, as the large desert was perceived as a national treasure that had been left largely untouched by French settler colonialism.

No concrete action was taken for about 10 years; at that point, however, in the mid-1980s, two processes converged. First, declining oil prices and the accompanying acute financial crisis directly threatened food security, as most commodities were imported. At the same time, a remedy of sorts presented itself in the form of the 'American West' model; this model had passed through Saudi Arabia and Libya, in the process raising its perceived viability in the eyes of Algerian policymakers (Dubost, 1991). In Saudi Arabia especially, the exploitation of oil and groundwater resources in the 1980s, combined with overly generous subsidies, had enabled the Kingdom to become a net exporter of wheat within a decade (Elhadj, 2004).

In Algeria, through the influence of this model, 35,000 ha of desert were projected to be equipped to produce cereals, sugar beets, fodder and peanuts. To accomplish this, a strongly *dirigiste* (centrally planned) interpretation of the Arizona model prevailed. Following a 1985 visit to the US by the Algerian president Chadli Bendjedid and his Minister of Agriculture Kasdi Merbah, an agreement was signed with another American company based in Fort Collins to establish two pilot farms of 1000 ha each in Gassi Touil and Feidjet El Baguel (Pérennès, 1993). Built and implemented by American technicians and then transferred to Algerian technicians, the experience showed that wheat yields of 4-6 t/ha could be obtained with limited staffing.¹¹ Just like in Saudi Arabia, however, this large-scale agriculture turned out to be only feasible when massively subsidised, and the attention of Algeria's policymakers would only be activated whenever oil prices fell or when food imports became difficult.

Over the years, producer price subsidy schemes¹² were used in the Sahara to stimulate the production of so-called strategic produce,¹³ including cereals. Official statistics on the cultivation of hard and soft wheat in the five main Saharan agricultural departments of Biskra, El-Oued, Ouargla, Ghardaïa and Adrar over the period 1998-2007 reveal a stagnation in wheat production at around 52,000 t (2.2% of national production). Between 2007 and 2017, however, following the 2008 international food crisis, the area under wheat cultivation more than doubled (to 45,000 ha, or 2.1% of the national surface area) and production more than tripled (to 173,000 t, or 7.1% of national production).¹⁴ Between 2000 and 2017,

¹¹ The state imported more than 150 centre pivots, which were able to irrigate 5000 ha; of these, 40 were used for the pilot farms and the others were sold to private or public entrepreneurs (Dubost, 1991).

¹² The government increased the guaranteed producer prices of strategic agricultural goods; this was accompanied by multiple subsidies (inputs, quality, collection, transport, storage and processing), with the aim of boosting agricultural production and reducing the ever-increasing weight of the import bill.

¹³ In Algeria, agricultural products are 'strategic' in relation to the composition of the average food ration or the structure of average food expenditure. This concerns wheat, milk, pulses, potatoes, vegetables, oils, sugar, tomato concentrate (or industrial tomatoes) and white meat. Other agricultural products are considered strategic because they constitute essential inputs for the production of basic foods (seeds, and animal feed such as corn, sorghum and soya).

¹⁴ This domestic increase was importantly linked to the 2008 international food crisis, which had a serious effect on food-importing Algeria. The FAO food price index rose by 7% in 2006 and by 27% in 2007; this increase accelerated even further in the first half of 2008, being 24% higher than in 2007 and 57% higher than in 2006. Since then, prices have declined significantly, however they have remained above their longer-term trend levels.

the areas under maize and sorghum fodder crops almost quintupled in all nine Saharan departments; this supported dairy farming in the region and at the national level (powdered milk was another import product to be decreased). Claiming credit for this ongoing agricultural dynamism, during the second half of the 2010s the Algerian government decided to renew its commitment to the large-scale development of Saharan agriculture.

From state-led development to public-private partnership

The 2015-2019 Five Year Plan and its 'Filaha 2019' Programme¹⁵ envisaged the extension of the irrigated area by 1 million hectares by 2019; this included 600,000 ha of cereals and would occur mainly in the Sahara (Bessaoud, 2016). It called for the continued development of Saharan agriculture through the creation of new development schemes for intensive and modern agriculture in the form of crop production and animal husbandry. It also triggered a shift from state-led development to public-private partnerships with agribusiness. Despite many controversies surrounding feasibility, the quality of partnership, and the performance and environmental impact of these projects, this action plan was given strong impetus due to the involvement of the powerful Algerian Business Leaders Forum (FCE) and the US-Algeria Business Council (USABC). In a press release, the American embassy in Algiers announced the visit by an Algerian delegation of businesspeople from 30 different companies to California and Nevada from 4 to 11 March, 2017. This 'Road Show', as it was called, was focused on stimulating foreign investment in Algerian agriculture and in its agrifood industry; to that end, visits were made to dairy farms, corn and soybean farms, feed producers, dried fruit producers, oilseed producers, milk processing equipment manufacturers, and a livestock insemination centre in Fresno, California. The FCE, in partnership with the Ministry of Agriculture and the USABC, organised another economic mission from 14 to 17 January, 2019, to Washington, DC and Sacramento, California; this was jointly led by the Minister of Agriculture A. Bouazghi, and by the President of the FCE, A. Haddad. A number of these political figures and businesspeople got into trouble during the *Hirak* (the popular movement that began on 16 February 2019); however, the current government even more clearly displays its choice of promoting a private agro-industrial model for Saharan agriculture with its ambition to achieve, by 2024, "the coverage of basic food needs by increasing agricultural production and productivity; the development of a new agricultural and rural model, driven by private investment and the emergence of a new generation of producers" (RADP, 2020). In June 2020, the Ministry of Agriculture approved the creation of a National Office for Saharan Agriculture. According to the then Deputy Minister for Sahara Agriculture and Mountains, the main mission of this office was to offer support and supervision to major investment projects involved in the production of strategic agricultural commodities (especially wheat, corn, soybeans, sugar crops and fodder) in the Saharan region.¹⁶ The underlying objectives are to rapidly ensure food security and to reduce imports in the context of the country's decreased oil revenues.

These developments warrant two observations. First, they testify again to the remarkable plasticity of the reference to the American West. This plasticity is evident with respect to the proper role of the state, where state dirigisme gave way to a more business-friendly approach; this was in an effort to attract more foreign investment through a partnership between state and business actors. The plasticity is also apparent in that 'America' was this time synonymous with the production of cereals for the national and export market, rather than citrus fruits for export, as was the case in Morocco. The visual aesthetics of large irrigated circles in the desert, an unmistakable sign of human mastery and modernity, was also foundational in the Algerian desert, while in Morocco it was entirely absent.

The second observation concerns the unrelenting promotion of large-scale Saharan agriculture over three decades; this shows the grip that the imaginary of the American West has on Algerian policymakers,

¹⁵ According to this plan, in 2016 agriculture represented more than 12% of GDP and was also the economic sector providing the most employment in the country (RADP, 2020).

¹⁶ Interview on the *Algerian National Radio Channel 1*, published by APS (Algérie Press Service), Wednesday, 13 May 2020.

such that they sought to impose it without any regard for cost effectiveness. As early as 1988, the experiments in Gassi Touil revealed prohibitive investment costs, which were eight times the amount that was considered "reasonable" in the USA (Pérennès, 1993: 567); this resulted in highly subsidised cereal production with very limited results (Bisson, 2003; Otmane and Kouzmine, 2013). In fact, the story of state projects with large centre pivots, which is referred to as large-scale agricultural enhancement, has only been supported by "a few dozen large investors, business people, entrepreneurs or industrialists who are talked about and are often cited by the press as people of great merit" (Bensaad, 2011). In the western part of the country, for example, 280,502 ha were planned for large-scale Saharan agricultural enhancement schemes, of which only 25% found takers (Otmane and Kouzmine, 2013). When this paper's authors checked in 2003 and 2005, only 3861 and 2945 ha were actually being cultivated, which was about 5% of the equipped area. In other words, "all this is very modest (...) and does not testify to real vitality" (Bensaad, 2011).

The strength of the imaginary, therefore, does not appear to lie in any sort of functional efficiency. This is all the more apparent if we consider the fact that renewed agricultural development in the Saharan desert has been mostly instigated by Saharan peasantries (Côte, 2002), with little official recognition by the state or in public policies; this is discussed further below.

REMARKABLE ENDURANCE: THE INEFFECTIVENESS OF CRITIQUE AND THE ELUSIVE QUEST FOR AN ALTERNATIVE IMAGINARY

Challenging both the coherence and the ambiguities of the model

From the 1980s onwards, it became increasingly apparent that the existing hydraulic order in California was producing severe forms of environmental vulnerabilities (Worster, 1992). The fact that water use increasingly exceeded renewable water resources was a particularly crucial vulnerability that destabilised the imaginary whose core was the idea of unlimited expansion. Despite various water conservation programmes such as canal lining, pressurised irrigation systems and water tariffs, and despite (or because of) farmers massively turning to groundwater, water scarcity gradually became a permanent problem. As indicated in Lawry's 2017 postscript to Reisner's book (1986), there were "red flags everywhere"¹⁷ and the perspective of ever-expanding water resources was increasingly in doubt. Water scarcity was only one of many adverse effects; these also included land consolidation, coastal saltwater intrusion, massive pollution of land and water resources, siltation of reservoirs, and soil salinisation. After much procrastination and political resistance, these developments led to the adoption of California's 2014 Sustainable Groundwater Management Act (SGMA) and to the subsequent sustainability plans developed by local water managers (Stokstad, 2020). This development shows that while the 'California imaginary' dominated historically, it was also regularly destabilised and contested. The SGMA seeks to define sustainable long-term levels of extraction that take into consideration progressive changes in groundwater use and the amount of water that has already been extracted. It uneasily strives to make water use more sustainable without tackling either the material root cause of overexploitation (extractive capitalism) or the modernist imaginary that upholds it. Its implementation will thus likely prove wanting and it is probable that deeper sociopolitical tensions lie ahead.

The increasing cognitive dissonance between an imaginary of plenty and the material scarcity it has helped produce also emerged in Morocco. As mentioned above, Pierre Préfol, viewing the Tadla irrigation scheme during his 1985 visit, explicitly referred to California as a source of inspiration for the development of intensive agriculture in Moroccan large-scale irrigation schemes such as the Tadla or the Gharb (Préfol, 1986). The Tadla irrigation scheme was by then at the peak of its development and Préfol

¹⁷ Lawry argues that only in times of crisis is it possible to reduce water consumption, for example in the 2015/2016 period when 1.43 million acre feet (MAF) was saved by urban consumers (Reisner, 1986).

faithfully documented its impressive agricultural performance. In the aftermath of a severe multiyear drought, however, he also expressed nascent worries over the prospect of insurmountable surface water shortage. As an example of the pending decline, the official annual water allocation for Beni Moussa (one of the two irrigation schemes of the Tadla) was 710 million m³, but in 1983/1984 it received only 120 million m³, a mere 17% of its theoretical allocation (Préfol, 1986: 227). Farmers gradually realised that surface water shortage was not an occasional phenomenon; rather, it was a new structural condition.

Related to the environmental criticism of the California imaginary was the growing criticism of how 'modern' the state-led hydraulic society actually was. In the western US, economists took aim at its bureaucratic order (referring to it as 'monument syndrome') and at the unprofitability of state-sponsored irrigation development (Worster, 1992: 280). This debate spread internationally and weighed in on large-scale irrigation development in countries like Morocco. According to donors, the construction of new irrigation schemes was no longer economically justified. The image of modern and innovative irrigation schemes using advanced technology had given way images of sclerotic, "poorly managed" and "underutilized" irrigation schemes (Cleaver, 1982: 25). Regional irrigation administrations in Morocco, which were considered by donors to be oversized, only recovered 28-35% of their current expenditure from farmers; the state was thus significantly subsidising large-scale irrigation (Pérennès, 1993). This highlights the fact that nowadays criticism and conflicts are often focused on exactly what it means to be 'modern', that is, on alternative conceptions of modernity (Blitstein and Lemieux, 2018).

Although farmers were faced with severe surface water shortages and the irrigation bureaucracy confronted harsh criticism, neither called into question the sustainability of the intensification model; instead, they turned to the massive use of groundwater. In Morocco, 42% of the irrigated area is now totally or partially irrigated with groundwater and the vast majority of aquifers are overexploited (Kuper et al., 2016). In Algeria, overexploited groundwater sustains 88% of the total irrigated area (ibid). Especially in the Sahara, aquifers are generally non- or minimally renewable and agriculture that depends on these aquifers is typically compared to mining.¹⁸ The shift to groundwater was obviously motivated by the prospect of short-term economic gains; however, a strictly materialistic reading would ignore the way economic strategies under capitalism are themselves the product of certain social imaginaries. Imaginaries render farmers' strategies meaningful and desirable to them, convince them that they are indeed the most feasible and viable, and even make alternative strategies inconceivable (Atasoy, 2017). The smooth transition that occurred from surface to groundwater was thus made possible by the absence of a non-modernist imaginary, or rather of an imaginary that suggested a different definition of modernity. The recent Green Morocco Plan (2008-2020) consecrated a modern and "excessively intensive" agricultural model; it acknowledged a limited number of "high value-added, high-productivity 'growth sectors'", including fruit trees and market gardening (Akesbi, 2014: 29). This has resulted in increased pressure on, and overexploitation of, groundwater aquifers, as groundwater "tallies perfectly with such agricultural productivity ambitions" (Kuper et al., 2017: 731).

In Algeria, the many state attempts to promote large-scale desert agriculture have overall proved disappointing, as documented by agricultural services¹⁹ and researchers. Critics routinely target many features of state intervention; their focus includes: predatory 'mining' practices that may compromise the future of younger generations; the enormous economic cost of heavily subsidised agriculture; and the extremely poor overall performance of such agriculture (Dubost, 1991; Bisson, 2003; Bensaad, 2011; Otmane and Kouzmine, 2013). In June 2020, the Minister and Deputy Minister of Agriculture were

¹⁸ In the US, the centre pivot is often associated with the High Plains and the great Ogallala Aquifer. It is tempting to draw parallels between the large Saharan aquifers and one of the largest aquifers in the world. The Ogallala Aquifer is (over)exploited through powerful pumps and centre pivot irrigation technology; it has little renewable water resources with less than an inch of annual recharge, and it supports a considerable surface area of wheat and corn (Hornback and Peskin, 2014).

¹⁹ According to a 2018 assessment by the Algeria Ministry of Agriculture, Rural Development and Fisheries, only 150,354 ha had been developed out of 1,259,812 ha allocated under the concession schemes (11.9%) (MADRP, 2018).

dismissed during a cabinet reshuffle; this came in the wake of a number of opinion papers by intellectuals and members of civil society published in national newspapers, which opposed the emerging agribusiness model in the Sahara.²⁰ This capitalist modernist model (see Daoudi, 2018) was constantly promoted and subsidised by the state while at the same time delivering underwhelming achievements (and ignoring existing oasis peasantries). This can be read as the political settlement of a state bureaucracy in alliance with the agro-industrial complex. The state uses the legitimacy provided by the objective of food security to join forces with large private entities; the latter are interested in direct government incentives to invest in modern agriculture and/or to deliver the equipment and inputs it requires. The exploitation of little-renewable groundwater thus becomes politically and socially acceptable.

A final criticism relates to the ambiguity of the California imaginary in terms of social equity. Public intellectuals in the western United States called the model a "shabby house of private desires" in which government resources and power had been captured by agribusiness at the expense of family farmers and harshly exploited farmworkers (Worster, 1992). This was of course a recurrent critique; it came particularly to the fore during regular debates on the acreage limits that were embedded in the 1902 Act that had formed the US Bureau of Reclamation. As long as these limits remained enshrined in law, reclamation would benefit from moral legitimacy; this legitimacy was derived from its appearance of pursuing the Jeffersonian ideal of agrarian democracy, even though many ways to circumvent the limits were found by a coalition of agribusiness, policymakers and USBR engineers (Worster, 1992). However, when this limit was ultimately formally abolished, no more federal development project would be sanctioned in the absence of a moral legitimacy for federal irrigation water.

The ineffectiveness of critique

Is the imaginary strong enough to adapt yet again?

In Morocco, there has been an attempt to modernise the image of large-scale irrigation schemes by introducing drip irrigation. The promotion of drip irrigation around a contemporary global productivity narrative ('more crop per drop') carried with it the promise of modernising irrigated agriculture and, through that, the image of large-scale irrigation schemes themselves (Venot et al., 2017). In Morocco's 2007 National Program for Water Savings in Irrigation (PNEEI), the conversion to drip irrigation in large-scale irrigation schemes took centre stage. Farmers in these schemes would benefit from generous subsidies through individual and collective projects at considerable cost to the state (almost US\$9000/ha).²¹ Collective projects in particular, however, were pejoratively portrayed as social projects where small-scale farmers would benefit from the state's vision and finances; they would otherwise "risk remaining on the fringes of this program" due to "financial difficulties" and fragmented landholdings (AGR, 2007: 31). These collective drip irrigation projects have run into many operational problems and it is not sure that drip irrigation will enhance, once again, the image of large-scale irrigation as a technologically advanced modern development hub (Boularbah et al., 2019).

In Morocco, it can be argued, the California imaginary has played as important a role outside of large-scale irrigation as inside, particularly since the 1980s. Private irrigation was imbued with the same California imaginary; it focused on the planting of orchards including citrus, apples, plums, apricots and

²⁰ Interview with Omar Bessaoud, eminent researcher in agricultural systems: <https://www.elwatan.com/pages-hebdo/sup-eco/omar-bessaoud-economiste-agricole-rompre-avec-le-modele-agri-business-22-06-2020>; interview with Karim Rahal, president of the Torba association: <https://www.elwatan.com/pages-hebdo/sup-eco/karim-rahah-president-de-lassociation-torba-beaucoup-de-depenses-et-dinvestissements-pour-des-resultats-limites-22-06-2020>; a newspaper article criticising the large-scale option taken by the Saharan Office: <https://www.elwatan.com/pages-hebdo/sup-eco/une-approche-couteuse-dans-un-contexte-de-difficultes-financieres-le-pari-risque-de-lagriculture-saharienne-22-06-2020>.

²¹ In the Tadla irrigation scheme, for instance, collective drip irrigation was planned for 49,000 ha, at an investment cost of US\$436 million; in addition, by 2016 about 25,000 ha were individually equipped with drip irrigation at a total cost of US\$115 million, of which 80-100% was subsidised by the state (Boularbah et al., 2019).

dates, and on the promotion of market vegetables, especially tomatoes for export to the European Union. Today, about half the current surface area of citrus orchards (126,600 ha)²² is located outside large-scale irrigation schemes, mostly in large private landholdings, and more than 80% of the surface area of large-scale irrigation depends at least partially on groundwater. The ambitions of the Green Morocco Plan therefore seem tightly linked to the future of groundwater resources; as in California, however, these are increasingly being overexploited. For specific high value crops, particularly greenhouse tomatoes exported to Europe, projects are underway for the desalination of sea water; these highlight the untiring pursuit of new frontiers in access to alternative water resources and the refusal to admit the inevitability of reductions in water availability for intensive agriculture (Molle and Tanouti, 2017).

In Algeria, an 'emergency imaginary' for times of crisis

The promotion of modern large-scale agriculture in the Algerian Sahara Desert can be described as an 'emergency imaginary'. It has been activated during at least four recent crises: ²³ during the 1986 oil glut, when Algerian revenues linked to oil exports decreased drastically; in 2008 after the international food crisis, when food imports became very expensive and problematic; during the 2014-2016 oil glut; and, most recently, following the international food supply crises in the wake of the COVID-19 pandemic and the Russia-Ukraine war. During these crises, policy actors turned to promoting large-scale desert agriculture; this was seen as a quick fix to financial problems and to potential urban social unrest. This agricultural model combined the perceived efficiency of: (1) requiring only a handful of large-scale 'entrepreneurs' who could be activated at short notice; 2) a 'virgin' space in the desert without the complicated land tenure and water rights of the north; (3) abundant water resources;²⁴ and (4) the promise of not only being able to feed the country, but also of being able to export food. Saudi Arabia was taken as a model for this but so, again, was California. The latter was mentioned by the President of the US-Algerian Business Council in a *Radio Algiers Channel 3* interview in 2017; he projected California as an agricultural powerhouse that was technologically advanced and had expertise in marketing and exports. California could develop a partnership with Algeria, he said, "to achieve its food self-sufficiency and to become an agricultural power capable of exporting to Africa and Europe".²⁵

In line with our general argument of the California imaginary as being a flexible model in terms of its social implications, the promotion of large-scale desert agriculture was accompanied by small-scale projects. This maintained a certain ambiguity that facilitated support from those who favoured more socially sensitive policies. Despite numerous problems in the design and implementation of these projects, they enabled local peasantries to access capital, technology, water and land, in the process providing a powerful impetus to Saharan agriculture (Bendjelid et al., 2004; Daoudi et al., 2017). Côte (2002: 13) underlined the strong potential of a combination of available groundwater resources and the human capacities of secular peasantries, the latter being accustomed to hard work in a hostile

²² The website of the inter-professional citrus association provides updated statistics on the surface areas planted with citrus fruit in different regions: <http://maroc-citrus.com/statistiques-2/>. The planted area in large-scale irrigation schemes and under private irrigation can be estimated by comparing these figures to those provided by regional irrigation authorities; in the Gharb in April 2020, for instance, 10,259 ha were included in large-scale irrigation.

²³ In 2011, in the context of the Arab Spring, there was yet another emergency. This led to the Inter-ministerial Circular 108 of February 23, 2011, which provided for the creation of new farms and livestock farms in the south, for the benefit of both major investors and young people.

²⁴ In an interview on *Al Jazeera* on 29 January 2006, the Minister of Water Resources, A. Sellal, mentioned the existence of a "sea of fresh groundwater" under the Sahara, most of which was located in Algeria. Some scientists made even more whimsical claims, announcing the existence of an aquifer with a capacity of 40,000 billion m³, sufficient "to meet Algeria's needs for 40 centuries" (Interview by the Arabophone newspaper *Echorouk* on 28 February 2017, during the national congress on water and the environment at Béchar University).

²⁵ From *Radio Algiers Channel 3* on 21 March 2017. Mr. Smaïl Chikhoun, president of USABC, was hosted by Ms. El Hachemi during prime time (8h20 - 8h50).

environment. According to Côte (ibid), "for a while destabilized (...), they were able to take advantage of the State's impetus to embark on development projects that combine tradition and innovation, peasant wisdom and openness to modern ideas". Perhaps the most emblematic example is the small-scale artisanal centre pivot system that was developed by local craftspeople and inspired by the failure of large-scale pivots. By 2018, 36,000 pivots had been installed, each one irrigating a hectare of potatoes (Ould Rebaï et al., 2022). The Sahara gradually became Algeria's early season fruit and vegetable garden, as well as the site of its commercial date production. The figures are impressive; together, Biskra and El-Oued accounted for 19% of market garden production in 2017 (compared to 7.9% in 1998). El-Oued has become the leading department of potato production²⁶ (25% of national potato production in 2017, versus 1.2% in 1998). Biskra delivered 49.4% of the country's greenhouse vegetables in 2017, particularly tomatoes and bell peppers.

Figure 2. Artisanal pivot at Oued Souf (Algeria), developed by local artisans.



Source: Photos by Marcel Kuper (2017).

Government officials generally claim credit for the 'success' of Saharan agriculture, which in reality, was mostly developed by peasants on the margins of state projects. The 2015 National Action Plan stated, for instance, that it was the 2009 development programme launched by President Bouteflika that had enabled the agricultural economy to achieve "a qualitative leap forward". Today, the role of Saharan peasantries is still officially unrecognised, while the focus of official discourse has been shifting from large state projects to public-private partnerships.

Countering the California imaginary: Towards an alternative imaginary of Mediterranean and oasis agriculture?

We have shown that imaginaries were a crucial element in the formation of dominant social coalitions. We therefore contend that in order to counter the modern capitalist agricultural imaginary in North Africa, which started off as a California imaginary and was later naturalised and routinised in the different countries, attractive alternative imaginaries are needed. In the present context, at least two imaginaries could qualify. The first is centred on the Mediterranean diet, often seen globally as the template of a healthy diet (Trichopoulou and Vasilopoulou, 2000). Based on olives (and olive oil), vegetables, cereals, legumes and nuts, and associated with relatively small quantities of fish and meat, this diet is under threat in Mediterranean countries, including North Africa, due to "lifestyle changes, food globalization,

²⁶ El-Oued has surpassed Aïn Defla in the north; the latter was formerly the main potato producer and was qualified as being part of Algeria's California during the inauguration of the Oued Fodda Dam in 1925 (Pérennès, 1993).

economic, and socio-cultural factors" (Dernini and Berry, 2015: 1). Currently, however, efforts are being made, including by UN bodies, to promote it as a 'sustainable diet' and thus promote "effective sustainable development in the Mediterranean" (Medina, 2011: 2348). The model has been taken up in recent initiatives related to 'slow food', 'locally produced foods', organic farming, and agroecology, thus adapting the imaginary to a different context. Indeed, recent work on diet in Algeria shows how consumers are developing new food identities that incorporate elements from several repertoires (Chikhi and Padilla, 2014).

The second alternative imaginary, referred to by recent critics of large-scale agricultural development in Algeria's Sahara, is the oasis; it is often presented as "the fundamental model of sustainability" (Fassi, 2017) that visually condensed an ecological balance between people and nature (Battesti, 2005). Described as a heavenly paradise and firmly anchored in religious writings (Nacib, 2017), the oasis imaginary is part of cultural identity and of the profound relationship of communities to their environment (Gast, 1981). This explains the distrust and fierce resistance of these communities, who see large-scale development and the California imaginary that underpins it as a vector of hydro-agricultural neocolonialism that will dispossess local populations of their resources. Saharan peasantries, however, are also well known for their adaptive capacity in the face of global change, within the framework of existing cultural identities (ibid). Due to the extreme climatic conditions, these peasantries progressively incorporated "sustainability allies", that is, technologies, plants and animals that survive and even thrive in these conditions (Fassi, 2017).

Alternative imaginaries – or variations on Jessop's (2010) approach – should thus not be viewed as wholesale opposition to dominant ones; rather, it is likely that the crystallisation of new social imaginaries will make use of, and build on, existing imaginaries but will also rearrange and repurpose them. Just as there is plenty of room for bricolage within existing imaginaries, the formation of new social imaginaries will also likely occur through some kind of ideational bricolage, that is, through "the creative piecing together of different arrangements, styles of thinking and sanctioned social relationships to produce new or adapted institutions" (de Koning and Cleaver, 2012: 278). An alternative imaginary could, for example, make use of some of the new, hybrid forms of Saharan agriculture that we have described. These forms inherited their expertise partly from colonial agriculture and from the deep drilling technology of the oil industry; however, they also borrowed from the secular repertoire of the oasis peasantry, while incorporating the know-how of small-scale market garden producers from the north of the country (Hamamouche et al., 2018). As we have shown, current practices by Saharan peasantries are largely unfolding outside of any social imaginary that could capture the imagination of other groups, and some of these practices may be legitimately criticised by supporters of the oasis model, for example the production of potatoes under artisanal pivots. It can be argued, however, that we may be faced with yet another process of creating sustainability allies in the extreme climate of this desert environment. Such practices are inherently ambiguous, but part of them could be used to foster an alternative imaginary. More fundamentally, the debate on alternative imaginaries must be grounded in the political economy within which selections of dominant imaginaries are made (Sum and Jessop, 2013); that is, under what conditions might other social groups, such as middle-class urban consumers, be attracted by this imaginary and reinterpret their interest accordingly?

CONCLUSION: THE FORCE OF SOCIAL IMAGINARIES

Actors' perceptions of what interests them rarely arise unambiguously; they emerge, rather, from processes of interpretation. Most sustainability scientists, however, have not conducted serious research in this direction; they are focused either on 'best practices' to be consensually adopted, or on the necessary struggle against powerful, entrenched material interests. In this context, imagination has been, at best, merely invoked in the context of visioning and scenario-building processes (see, for example, Wiek and Iwaniec, 2013), without paying due attention to "how such visioning of future-thinking takes

place in larger societal contexts" (Milkoreit, 2017: 6). Yet, as we have shown, social imaginaries are a vital source for how actors interpret their interests, what sort of behaviour they deem to be appropriate, and who they perceive to be their friends and adversaries. Imaginaries are essential for forging social coalitions in support of particular policies and for sustaining them over time in the face of inevitable challenges and criticisms. The California imaginary played an important role in forging new 'modernist' agricultural coalitions in both Morocco and Algeria at very dissimilar junctures, and in sustaining them despite mounting criticism. It did so by powerfully combining science-based understandings of irrigated agriculture and normative evaluations of what modern farming ought to be, with feelings of hope and excitement about the future. It did so, as well, through a subtle combination of forceful clarity and a few key ambiguities that provided both resolve and flexibility to policymakers.

The fact that modernist agricultural policies are underpinned by such a powerful imaginary makes them all the more resistant to criticism and change. Critics generally focus on the way these policies harm a large majority of farmers and consumers, hoping to forge an alternative social coalition by appealing to the majority's enlightened self-interest. A growing number of voices even warn about the impending 'collapse' of societies that are dependent on an eroded resource base such as groundwater, and the preceding of this collapse by a period of general environmental decline (Brown, 2011; Petit et al., 2017). Taking the full measure of the power of social imaginaries points to how these criticisms are both necessary and insufficient to bring about change. A social imaginary does not merely influence how actors define their interests by affecting how they compute different types of costs and benefits; it also provides them with norms, values, aesthetics and desires. The recent literature on the exploitation of desalinated water, for example, provides attractive images of sea water as an "infinite resource" (Sneegas et al., 2022: 1784), including for agriculture; it adds a green gloss (or, in our words, introduces ambiguities) to this polluting and high-energy-requiring activity through the use of renewable energy sources (see, for example, Tomaszewska et al., 2021). The pursuit of the modern capitalist agricultural imaginary may thus be safeguarded without questioning the underlying agricultural imaginary. The modern imaginary cannot be challenged by appealing to instrumental reason only, such as the cost of desalination. It needs, crucially, to be confronted with alternative and more compelling imaginaries.

Today, such imaginaries are at best incipient; they are discernible only in fragmented and disjointed form. Images of industrious smallholder farmers juxtaposed with traditional produce such as argan oil, olive oil and dates, and with visions of ingenious ancient waterworks do not yet add up to an imaginary that is compelling enough to stand up to 'California'. We argue that the construction of a robust counter-imaginary could be explored in at least two directions: the 'Mediterranean diet' imaginary with its rich connotations of health, tradition, gustative variety and pleasant lifestyle; and the 'oasis' imaginary, which is closely associated with images of a delicate adaptive balance between humans and nature, a light environmental footprint, and immemorial cultural identity. We should also explore whether these localised imaginaries could be connected to more encompassing ones. In this vein, Latour (2017) recently suggested imagining our fate as being intricately intertwined with that of the earth through 'Gaia'. To him, Gaia is not a "figure of unification" that should inspire a new type of natural religion; instead, it is a "complex figure" that highlights the diversity and fragility of the myriad reciprocal links that compose life and matter. Rather than viewing the solar system as a single, overpowering complex system, Latour counsels us to see Gaia as "an entity composed of multiple, reciprocally linked but ungoverned self-advancing processes" (ibid: 142). His intention is to use the model of Gaia to bring humanity back down to earth by underlining the complexity and vulnerability of the environmental system.

In our view, these are promising avenues for exploration. Rather than a purely rational-instrumental critique, we need to aim for radical reimagination in tandem with building coalitions to reconsider dominant imaginaries, even if this takes the form of creative bricolage rather than wholesale replacement. As Castoriadis argued, instead of passively absorbing the "laws of culture" to satisfy their needs, human actors are always endowed with a reflective subjectivity that renders them "capable of calling into question the imaginary significations of (...) society" (Castoriadis, 2007: 219). The imaginary

order that underpins modernist agricultural policies in North Africa will thus never totally constrain these societies' capacity for radical reimagination.

REFERENCES

- Ababou, R. 1979. Les inconnues de l'irrigation au 'goutte à goutte'. *Hommes Terre et Eaux* 9: 3-41.
- Adams, S.; Blokker, P.; Doyle, N.J.; Krummel, J.W. and Smith, J.C. 2015. Social imaginaries in debate. *Social Imaginaries* 1(1): 15-52.
- AGR (Administration du Génie Rural, Rural Engineering Administration). 2007. Programme National d'Économie d'Eau en Irrigation (National Irrigation Water Saving Plan). Rabat, Morocco: Ministry of Agriculture, Rural Development and Fisheries.
- Aït Amara, H. 2009. *Quel futur alimentaire pour l'Algérie*. Algiers: Editions Mille Feuilles.
- Akesbi, N. 2014. Le Maghreb face aux nouveaux enjeux mondiaux. Les investissements verts dans l'agriculture au Maroc. IFRI, Paris. http://dev.ocppc.inet.fr/sites/default/files/IFRI_noteifriocpnakesbi.pdf
- Allain, M. and Madariaga, A. 2020. Understanding policy change through bricolage: The case of Chile's renewable energy policy. *Governance* 33(3): 675-692.
- Amzert, M. 1992. De l'eau pour la production à l'eau pour la ville. L'avènement de la vérité des prix de l'hydraulique algérienne. Doctoral dissertation, Grenoble 2, France.
- Arrus, R. 1985. *L'Eau en Algérie: de l'impérialisme au développement, 1830-1962*. Algiers: Office des publications universitaires.
- Atasoy, Y. 2017. *Commodification of global agrifood systems and agro-ecology: Convergence, divergence and beyond in Turkey*. New York. Cambridge University Press.
- Battesti, V. 2005. Jardins au désert : Évolution des pratiques et savoirs oasiens - Jérid tunisien. Paris: IRD, 440 p. (A Travers champs). ISBN 2-7099-1564-2
- Béland, D. and Cox, R.H. 2015. Ideas as coalition magnets: Coalition building, policy entrepreneurs, and power relations. *Journal of European Public Policy* 23(3): 428-445, <https://doi.org/10.1080/13501763.2015.1115533>
- Bendjelid, A.; Brûlé, J.C. and Fontaine, J. 2004. *Aménageurs et aménagés en Algérie: Héritages des années Boumediene et Chadli*. Paris: Editions L'Harmattan.
- Benhadi, A. 1975. La politique marocaine des barrages. *Annuaire de l'Afrique du Nord* 14: 275-294.
- Benmihoub, A. 2016. Formes sociales d'agriculture irriguée en Méditerranée occidentale, expériences des risques et "visions" du monde: étude de cas dans la plaine de la Mitidja en Algérie et comparaison entre plusieurs territoires irrigués du Nord et du Sud de la Méditerranée occidentale. Doctoral dissertation, University of Paris-Nanterre, France.
- Bennoune, M. 1988. *The making of contemporary Algeria*. Cambridge: Cambridge University Press.
- Bensaad, A. 2011. *L'eau et ses enjeux au Sahara*. Edition Iremam-Karthala.
- Berman, S. 2013. Ideational theorizing in the social sciences since "policy paradigms, social learning, and the state". *Governance* 26(2): 217-237.
- Bessaoud, O. 2016. La sécurité alimentaire en Algérie. Étude réalisée pour le compte du Forum des Chefs d'Entreprise (FCE), 19/07/2016, Alger (Algérie).
- Bisson, J. 2003. *Mythes et réalités d'un désert convoité: le Sahara*. Paris: Editions L'Harmattan.
- Blitstein, P. and Lemieux, C. 2018. How to reopen the question of modernity? Some proposals. *Politix* 123(3): 7-33.
- Blyth, M. 2013. *Austerity: The history of a dangerous idea*. Oxford: Oxford University Press.
- Boularbah, S.; Kuper, M.; Hammani, A.; Mailhol, J.C. and Taky, A. 2019. The blind angle: Performance assessment of drip irrigation in use in a large-scale irrigation scheme in Morocco. *Irrigation and Drainage* 68(5): 925-936.
- Brown L.R. 2011. *World on the edge: How to prevent environmental and economic collapse*. New York, London: W.W. Norton & Company.
- Browne, C.B. and Diehl, P. 2019. Conceptualising the political imaginary: An introduction to the Special Issue. *Social Epistemology* 33(5): 1-5.

- Campbell, J.L. 2004. *Institutional change and globalization*. Princeton, NJ: Princeton University Press.
- Castoriadis, C. 1975. *L'Institution imaginaire de la société*. Paris: Seuil.
- Castoriadis, C. 2007. *Figures of the thinkable* (trans. Helen Arnold). Stanford University Press, Stanford, CA.
- Chalet, C. 1987. *La terre, les frères et l'argent*. Office des Publications Universitaires: Algiers, 3 vols, 1197 pp.
- Chikhi, K. and Padilla, M. 2014. L'alimentation en Algérie: Quelles formes de modernité. *New Medit* 13(3): 50-58.
- Cleaver, K.M. 1982. The agricultural development experience of Algeria, Morocco, and Tunisia. A comparison of strategies for growth. World Bank staff working paper No.552. The World Bank: Washington, DC
- Côte, M. 2002. Des oasis aux zones de mise en valeur: L'étonnant renouveau de l'agriculture saharienne. *Méditerranée* 99(3): 5-14.
- Crouch, C. 2011. *The strange non-death of neoliberalism*. Malden, MA: Polity.
- Daoudi, A.; Colin, J.P.; Derderi, A. and Ouendeno, M.L. 2017. Le marché du faire-valoir indirect vecteur de nouvelles formes d'exploitation dans la néo-agriculture saharienne (Algérie). *Géographie, Économie, Société* 19(3): 307-330.
- Daoudi, A. 2018. La néo-agriculture saharienne : Entre mirages et réalités. Collectif Torba. Consulted 20/12/2022.
- Davis, D.K. 2007. *Resurrecting the granary of Rome: Environmental history and French colonial expansion in North Africa* (Vol. 58). Ohio University Press.
- Davis, D. and Burke, E. 2011. *Environmental imaginaries of the Middle East: History, policy, power, and practice*. Athens: Ohio University Press.
- de Koning, J. and Cleaver, F. 2012. Institutional bricolage in community forestry: An agenda for future research. In Arts, B. et al. (Eds), *Forest-people interfaces: Understanding community forestry and biocultural diversity*, pp. 277-290. Wageningen Academic Publishers.
- de Raymond, A.B. 2011. Une 'Algérie californienne'? L'économie politique de la standardisation dans l'agriculture coloniale (1930-1962). *Politix* 3: 23-46.
- Dernini, S. and Berry, E.M. 2015. Mediterranean diet: From a healthy diet to a sustainable dietary pattern. *Frontiers in Nutrition* 2: 15.
- Di John, J. and Putzel J. 2009. *Political settlements: Issues Paper*. International Development Department, University of Birmingham.
- DiMaggio, P.J. and Powell, W.W. 1991. *The new institutionalism in organizational analysis*. Chicago: University of Chicago Press.
- Dubost, D. 1991. Le blé du Sahara peut-il contribuer à l'auto-suffisance de l'Algérie ? (Can the Saharan wheat contribute to Algerian food self-sufficiency?) *Bulletin de l'Association de Géographes Français* 68(4): 311-320. doi: <https://doi.org/10.3406/bagf.1991.1588>
- Eggen, O. 2012. Performing good governance: The aesthetics of bureaucratic practice in Malawi. *Ethnos* 77(1): 1-23.
- El Gueddari, A. 2004. Economie d'eau en irrigation au Maroc: Acquis et perspectives d'avenir. *Hommes, Terre et Eaux* 130: 4-7.
- Elhadj, E. 2004. *Camels don't fly, deserts don't bloom: An assessment of Saudi Arabia's experiment in desert agriculture*. Occasional Paper 48(6). London: SOAS.
- Fassi, D. 2017. Les oasis du Monde, carrefour des civilisations et modèle fondamental de durabilité. *Cahiers Agricultures* 26(4): 46001.
- Fautras, M. 2021. *Paysans dans la révolution: Un défi tunisien*. Paris: Karthala Editions.
- Friedmann, H. 1982. The political economy of food: The rise and fall of the postwar international food order. *American Journal of Sociology* 88: S248-S286.
- Garrido, S. 2014. Water management, Spanish irrigation communities and colonial engineers. *Journal of Agrarian Change* 14(3): 400-418.
- Gast, M. 1981. Le désert saharien comme concept dynamique, cadre culturel et politique. *Revue de l'Occident Musulman et de la Méditerranée* 32: 77-92.

<https://doi.org/10.3406/remmm.1981.1921>https://www.persee.fr/doc/remmm_0035-1474_1981_num_32_1_1921

- Gilleard, C. 2018. From collective representations to social imaginaries: How society represents itself to itself. *European Journal of Cultural and Political Sociology* 5(3): 320-340.
- Girard, G. 1954. *L'équipement hydraulique du Maroc*. Rabat, Morocco: Direction des Travaux Publics.
- Goldstein, J. 1993. *Ideas, interests and American trade policy*. Ithaca: Cornell University Press.
- Hall, P. 1993. Policy paradigms, social learning, and the state: The case of economic policymaking in Britain. *Comparative Politics* 25(2): 275-96
- Hamamouche, M.F.; Kuper, M.; Amichi, H.; Lejars, C. and Ghodbani, T. 2018. New reading of Saharan agricultural transformation: Continuities of ancient oases and their extensions (Algeria). *World Development* 107: 210-223.
- Harris, L. 2014. Imaginative geographies of green: Difference, postcoloniality, and affect in environmental narratives in contemporary Turkey. *Annals of the Association of American Geographers* 104(4): 801-815.
- Hooker, J.D. and Ball, J. 1878. *Journal of a tour in Morocco and the Great Atlas*. London: Macmillan.
- Hornbeck, R. and Keskin, P. 2014. The historically evolving impact of the Ogallala aquifer: Agricultural adaptation to groundwater and drought. *American Economic Journal: Applied Economics* 6(1): 190-219.
- Ingram, S. 2014. *Political settlements: The history of an idea in policy and theory*. SSGM Discussion Paper 2014/5, Australian National University, ips.cap.anu.edu.au/ssgm.
- Ives, R.H. and Bochar, R.M. 2008. From the Colorado River to the Nile and beyond: A century of reclamation's international activities. In USBR (United States Bureau of Reclamation)(Ed), *The Bureau of Reclamation: History Essays from the Centennial Symposium*, Volumes I and II, pp. 663-676. Denver, Colorado.
- Jabko, N. 2006. *Playing the market: A political strategy for uniting Europe, 1985-2005*. Cornell University Press.
- Jenkins-Smith, H. and Sabatier, P. 1999. The advocacy coalition framework: An assessment. In Sabatier, P. (Ed), *Theories of the policy process*, pp. 117-166. Boulder (Colo.): Westview Press.
- Jenkins-Smith, H.; Nohrstedt, D.; Weible, C. and Sabatier, P. 2014. The Advocacy Coalition Framework: Foundations, evolution, and ongoing research. In Sabatier, P. and Weible, C. (Eds), *Theories of the policy process*, pp. 183-224. Boulder, CO: Westview Press.
- Jenson, J. 2010. Diffusing ideas for after neoliberalism: The social investment perspective in Europe and Latin America. *Global Social Policy* 10(1): 59-84.
- Jessop, B. 2010. Cultural political economy and critical policy studies. *Critical Policy Studies* 3(3-4): 336-356.
- Kagan, S. 2019. Proving the world more imaginary? Four approaches to imagining sustainability in sustainability research. *Österreich Z Soziol* 2(44): 157-178.
- Kaika, M. 2006. Dams as symbols of modernization: The urbanization of nature, between geographical imagination and materiality. *Annals of the Association of American Geographers* 96(2): 276-301.
- Kanna, A. 2011. *The superlative city: Dubai and the urban condition in the early twenty-first century*. Cambridge, MA: Harvard University Press.
- Kelsall, T.; Schulz, N.; Ferguson, W.D.; Vom Hau, M.; Hickey, S. and Levy B. 2022. *Political settlements and development: Theory, evidence, implications*. Oxford: Oxford University Press.
- Kuper, M.; Faysse, N.; Hammani, A.; Hartani, T.; Marlet, S.; Hamamouche, M.F. and Ameur, F. 2016. Liberation or anarchy? The Janus nature of groundwater use on North Africa's new irrigation frontiers. In Jakeman, A.J.; Barreteau, O.; Hunt, R.J.; Rinaudo, J.D. and Ross, A. (Eds), *Integrated groundwater management*, pp. 583-615. Springer, Cham.
- Kuper, M.; Amichi, H. and Mayaux, P.L. 2017. Groundwater use in North Africa as a cautionary tale for climate change adaptation. *Water International* 42(6): 725-740.
- Latour, B. 1994. On technical mediation – Philosophy, sociology, genealogy. *Common Knowledge* 3(2): 29-64.
- Latour, B. 2017. *Facing Gaia: Eight lectures on the new climatic regime*. Cambridge, UK; Malden, MA: Polity.
- Lenin, V.I. 1964. *The development of capitalism in Russia*. Progress Pub. [orig. 1899]
- Leveau, R. 1985. *Le fellah marocain: Défenseur du trône* (Vol. 12). Paris: Les Presses de Sciences Po.
- MADRP. 2018. Le foncier agricole par les chiffres: état des lieux. 4 juillet.

- Marié, M. 1984. Pour une anthropologie des grands ouvrages. Le canal de Provence. *Les Annales de la Recherche Urbaine* 21(1): 5-35.
- Marsh D. and Sharman J.C. 2009. Policy diffusion and policy transfer. *Policy Studies* 30(3): 269-288.
- McWilliams, C. 2000. *Factories in the field: The story of migratory farm labor in California*. Univ of California Press. Originally published in 1939 in Boston: Little, Brown and Co.
- Medina, F.X. 2011. Food consumption and civil society: Mediterranean diet as a sustainable resource for the Mediterranean area. *Public Health Nutrition* 14(12A): 2346-2349.
- Mehta, J. 2010. Varied roles of ideas in politics: From "whether" to "how". In Béland, D. and Cox R.H. (Eds), *Ideas and politics in social science research*, pp. 23-46. New York: Oxford University Press.
- Milkoreit, M. 2017. Imaginary politics: Climate change and making the future. *Elementa: Sciences of the Anthropocene* 5: 62. DOI: <https://doi.org/10.1525/elementa.249>.
- Molle, F.; Mollinga, P. and Wester, P. 2009. Hydraulic bureaucracies and the hydraulic mission: Flows of water, flows of power. *Water Alternatives* 2(3): 328-349.
- Molle, F. and Tanouti, O. 2017. Squaring the circle: Agricultural intensification vs. water conservation in Morocco. *Agricultural water management* 192: 170-179.
- Nacib, Y. 2017. Cultures oasiennes, Essai d'histoire sociale de l'oasis de Bou Saâda. Editions Zyriab.
- Otmane, T. and Kouzmine, Y. 2013. Bilan spatialisé de la mise en valeur agricole au Sahara algérien. Mythes, réalisations et impacts dans le Touat-Gourara-Tidikelt. *Cybergeo: European Journal of Geography*.
- Ould Rebaï, A.; Hartani, T. and Kuper M. 2022. The outward journey of a local innovation: Diffusion of an artisanal irrigation pivot from the Algerian Sahara. *New Medit* 5: 71-84. DOI: 10.30682/nm2205e.
- Palier, B. 2005. Ambiguous agreement, cumulative change: French social policy in the 1990s. In Streeck, W. and Thelen, K. (Eds), *Beyond continuity: Institutional change in advanced political economies*, pp. 127-144. Oxford, UK: Oxford University Press.
- Parsons, C. 2016. Ideas and power: Four intersections and how to show them. *Journal of European Public Policy* 23(3): 446-463.
- Pascon, P. 1977. *Le Haouz de Marrakech*. Rabat: Centre Universitaire de la Recherche Scientifique (CURS), Paris: CNRS, and Rabat: Institut Agronomique et Vétérinaire Hassan II.
- Pérennès, J.J. 1993. *L'eau et les hommes au Maghreb: Contribution à une politique de l'eau en Méditerranée*. Paris: Karthala.
- Petit, O.; Kuper, M.; López-Gunn, E.; Rinaudo, J.-D.; Daoudi, A. and Lejars, C. 2017. Can agricultural groundwater economies collapse? An inquiry into the pathways of four groundwater economies under threat. *Hydrogeology Journal* 25(6): 1549-1564.
- Plehwe, D. and Fischer, K. 2019. Continuity and variety of neoliberalism: Reconsidering Latin America's Pink Tide, *Revista de Estudos e Pesquisas sobre as Américas* 13(2): 166-202.
- Popp, H. 1984. *La question hydraulique: Effets socio-géographiques de la politique des barrages au Maroc*. Rabat: IAV Hassan II.
- Préfol, P. 1986. *Prodige de l'irrigation au Maroc: Le développement exemplaire du Tadla, 1936-1985*. Paris: Nouvelles Editions Latines.
- Pritchard, S.B. 2012. From hydroimperialism to hydrocapitalism: 'French' hydraulics in France, North Africa, and beyond. *Social Studies of Science* 42(4): 591-615.
- RADP. 2020. Plan d'action du Gouvernement pour la mise en œuvre du programme du Président de la république (Action Plan of the Government to implement the President's program). www.premier-ministre.gov.dz/ressources/front/files/pdf/communiqués/com-2020/01/com-18-01-2020-fr-2.pdf
- Reisner, M. 1986. *Cadillac desert: The American West and its disappearing water*. Penguin. Revised and updated in 1993, with a new postscript in 2017.
- Schmidt, V.A. and Thatcher, M. 2013. Theorizing ideational continuity: The resilience of neo-liberal ideas in Europe. In Schmidt, V.A. and Thatcher, M. (Eds), *Resilient liberalism in Europe's political economy*, pp. 1-52. Cambridge: Cambridge University Press.

- Scott, J.C. 1998. *Seeing like a state. How certain schemes to improve the human condition have failed*. New Haven et London, Yale University Press.
- Sneddon, C. 2015. *Concrete revolution: Large dams, Cold War geopolitics, and the US Bureau of Reclamation*. Chicago: University of Chicago Press.
- Sneegas, G.; Seghezzi, L.; Brannstrom, C.; Jepson, W. and Eckstein, G. 2022. Do not put all your eggs in one basket: social perspectives on desalination and water recycling in Israel. *Water Policy* 24(11): 1772-1795.
- Stokstad, E. 2020. Deep deficit. *Science* 368(6488): 230-233.
- Stone, D. 1989. Causal stories and the formation of policy agendas. *Political Science Quarterly* 104(2): 281-300.
- Sum N.L. and Jessop B. 2013. *Towards a cultural political economy: Putting culture in its place in political economy*. Cheltenham: Edward Elgar.
- Swearingen, W.D. 1987. *Moroccan mirages: Agrarian dreams and deceptions, 1912-1986* (Vol. 822). Princeton University Press.
- Taylor, C. 2004. *Modern social imaginaries*. Durham: Duke University Press.
- Tomaszewska, B.; Akkurt, G.G.; Kaczmarczyk, M.; Bujakowski, W.; Keles, N.; Jarma, Y. A.;.. and Kabay, N. 2021. Utilization of renewable energy sources in desalination of geothermal water for agriculture. *Desalination* 513: 115151.
- Trichopoulou, A. and Vasilopoulou, E. 2000. Mediterranean diet and longevity. *British Journal of Nutrition* 84(S2): S205-S209.
- Vacher, H. 2019. From mise en valeur to cooperation – Ponts-et-Chaussées engineers overseas and the rise of planning expertise in the twentieth century. *Planning Perspectives* 34(1): 91-113, DOI: 10.1080/02665433.2017.1352476.
- Venot, J.-P.; Kuper, M. and Zwarteveen, M. (Eds). 2017. *Drip irrigation for agriculture: Untold stories of efficiency, innovation and development*. Taylor & Francis.
- Wiek, A. and Iwaniec, D. 2013. Quality criteria for visions and visioning in sustainability science. *Sustainability Science* 9(4): 497-512.
- Wood, M. 2015. Puzzling and powering in policy paradigm shifts: Politicization, depoliticization and social learning. *Critical Policy Studies* 9(1): 2-21, <https://doi.org/10.1080/19460171.2014.926825>
- Worster, D. 1992. *Rivers of empire: Water, aridity, and the growth of the American West*. Oxford University Press, USA.

THIS ARTICLE IS DISTRIBUTED UNDER THE TERMS OF THE CREATIVE COMMONS ATTRIBUTION-NONCOMMERCIAL-SHAREALIKE LICENSE WHICH PERMITS ANY NON COMMERCIAL USE, DISTRIBUTION, AND REPRODUCTION IN ANY MEDIUM, PROVIDED THE ORIGINAL AUTHOR(S) AND SOURCE ARE CREDITED. SEE [HTTPS://CREATIVECOMMONS.ORG/LICENSES/BY-NC-SA/3.0/FR/DEED.EN](https://creativecommons.org/licenses/by-nc-sa/3.0/fr/deed.en)

