

“To Come of Age in a Dry Place”:
Infrastructures of Irrigated Agriculture in the Mexico-U.S. Borderlands

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“Can we resolve the past, lurking jaws, joints of time?
The Base. To come of age in a dry place.”
- Jim Morrison

The Mexico-U.S. border region is defined by aridity. Like the societies that occupied this space before us, our borderlands society is based on the manipulation of water. During the twentieth century the rivers and aquifers of the borderlands were dammed, channeled, straightened, pumped and stored. Monumental works control these hydrological systems to the point where very little of the original riverine dynamics remains. These water sources were put to use irrigating vast extensions of land, and these irrigation systems were home to hundreds of thousands of colonists and immigrants. Hydraulic infrastructure changed the landscape of the borderlands dramatically and irrevocably. While mention of the Mexico-US border usually evokes images of fences, maquiladoras and urban sprawl, the borderlands was built on irrigated agriculture. Today, that history still shapes all aspects of regional life: its built environment, economy, laws, institutions, people, social organization and culture.

This article treats the history and present crisis of irrigated agriculture in the borderlands of northern Mexico. In these pages I show that borderlands society was built in the first part of the twentieth century on the basis of irrigation works and cotton production, and that irrigated agriculture is being displaced by industry, services and other activities as the motor of the region's economy. This is a story of how an agricultural regime of accumulation, and the different physical and social infrastructures that support it, was born, came of age, and grew old. The concept of “infrastructure” holds a central place in my analysis. I argue that although infrastructure has been theorized in a piecemeal fashion from a variety of perspectives, of particular usefulness are the analytical frameworks developed by Marxists who condense within the term both material and ideal elements, and who explain the role played by infrastructure in the historical dynamic of capital accumulation and crisis. Two sources for this theorization stand out: on the one hand Maurice Godelier's anthropological critique of Althusser, and on the other the heterodox economic literature concerning “Social Structures of Accumulation” (SSA) and “Regulation.” While Godelier's views on infrastructure seem to have come and gone without much trace, the SSA and Regulation perspectives have found a new influence in the social sciences because of the role they play in the widely read historical, geographical materialism of David Harvey. While I use Harvey's framework to make sense of the large-scale social and historical phenomenon of irrigated agriculture in the borderlands, I suggest that a political economy that follows Godelier in placing ethnographic attention on local histories of infrastructure can help us understand how this has taken shape on the ground.

So what were the infrastructures of irrigated cotton agriculture in the borderlands? In the first half of the twentieth century an economy and society was built in the borderlands that was based in massive systems of flood control and gravity irrigation, the production of cotton and other staple commodities (as well as fruits and vegetables on the U.S. side), and the provision of labor by land reform and colonization schemes as well as by a vast pool of migrant workers that circulated throughout the region. Dams, canals, headgates, levees and other hydraulic works are clearly “infrastructures” in the most physical sense of the word, but the formal and informal institutions that manage water can be understood as infrastructures of a social kind. The total aggregate of water laws and rights can be included in infrastructure, as well as the technical knowledge for

operating the irrigation systems. Agricultural production is also defined by infrastructures: gins and cottonseed mills; railroads and ports; storage facilities; banks and credit systems; government extension agencies; commodity markets; etc. One commodity that continues to define the borderlands is the labor power of migrants. The physical infrastructures that both enable and restrict the movement of workers also define the cost and value of that labor, as do the border patrol and other police forces. The quotidian experiences of migrants as they negotiate classification systems, bureaucracies and police forces structure their ideas, attitudes, dispositions, and hopes. Land tenure, although varied, was important in organizing the provision of credit and technical assistance to clearly defined groups of agricultural producers. Before we move on to a theoretical discussion of how and why we should consider all these different things as infrastructure, let us first meet some of the people involved in this story, and the environment in which they live and work.

People, Land, Water

Over the last ten years I have listened to farmers speak of their lives cultivating land in one of Northern Mexico's biggest irrigation zones: Matamoros, Tamaulipas, in the delta of the Rio Bravo/Grande. The zone is comprised of more than 500,000 acres of irrigated land watered by two contiguous irrigation systems: Irrigation District 025 and Irrigation District 026. The 025 Irrigation District, also known as the "Valle Bajo Río Bravo" (Lower Rio Bravo Valley), receives its water from the International Falcon Dam, by means of a derivation dam on the Río Bravo and the Anzaldúas Canal. The 026 Irrigation District, also known as the "Valle Bajo Río San Juan" (Lower San Juan River Valley), receives its water from the Marte R. Gómez Dam (previously the "Azucar" Dam) on the San Juan River, by means of the "Rhode" Canal. Through the lives of the farmers we see glimpses of the history of irrigated agriculture in the borderlands – of how the borderlands were built.¹ The oldest of these men and women were born in the first two decades of the twentieth century, children of sharecroppers and migrant workers who fled the violence of the Mexican Revolution to harvest cotton, citrus and vegetables in the irrigation districts of the Southwest United States. Doña Elena, for example, grew up in Pryor, Texas.² Her parents emigrated from San Luis Potosi in 1912, and she was born in 1915. When the irrigation zone around Matamoros was built in the late 1930s the whole family moved back to Mexico to farm 12 and a half hectares (about 30 acres) of irrigated cotton land. The early years were difficult, but by the 1940s her family was settled and prospering. She married Don Felix in 1943. Don Felix came to Matamoros as a teen-ager during the depression, and soon found employment with the Federal engineers building the flood control and irrigation system. When the works were finished, he received a piece of land, where he and Doña Elena raised a family. Three children grew up on the farm, only missing school during the height of the cotton harvest when they were incorporated into the production process weighing cotton, selling food to migrant workers, and doing other odd jobs. Two of their children now live in the city of Matamoros and one son moved to Houston. One of Elena and Felix' grandsons, Rogelio, just returned from Alabama to Matamoros to live with his grandparents. He commutes every day to the Valley of South Texas, where he

¹ For a full treatment of the history of how the borderlands were built, see: Walsh (forthcoming, 2008).

² Interview with autor, Elisa, Valle Hermoso, Tamaulipas, 1997. I follow standard anthropological practice in changing the names of informants to pseudonyms.

builds houses on top of fields where his grandparents and their parents onced labored clearing brush, building irrigation works, planting and picking.

In early 1998 I spoke with Don Felix and two of his lifelong friends about the past and future of irrigated agriculture in Matamoros.³ As we sat on his porch gazing out across the brown fields still not planted with sorghum, the three old men told me of the glory days of cotton in the 1950s when a farmer lived well. “A new truck every year,” they said: “fellows would walk into the dealership in Matamoros with a big sack of money and pay for the truck in cash.” Not like today, they told me, when a person farming the 30 or 50 acre plots created during the 1930s just cannot survive. 500 acres is needed now, just to get by. But by far the most serious problem besetting the farmers was that, for the first time, irrigation deliveries had been completely cancelled due to lack of water. No one was planting anything in 1998, because there was no water in the big international dams on the Lower Rio Bravo (or Rio Grande, when seen from the US) and the government wouldn’t promise to move any down from the Upper Rio Bravo in Chihuahua. Since 1992 there had been steady reductions in the amount of water given to the delta region for irrigation. Water shortages throughout the river basin caused serious conflicts between regions, states and even national governments in the late 1990s and early 2000s.⁴ Analysts spoke of a water crisis in the borderlands, and hyped the conflict as a water war (Walsh 2004). Currently, another major conflict is unfolding in the delta of the Colorado River over a works project in the U.S. that will effectively transfer water from the irrigation zone in Mexicali, to the urban users of Los Angeles and San Diego (Sánchez Munguía, ed., 2004).

The fact is, the hydrological systems of the borderlands are in deficit (Carabias and Landa 2005; Moreno 2006). Since 1940, a tenfold, mostly urban increase in population in the border states has put pressure on uses and rights established earlier, when population was thin and mining and agriculture dominated (Peach and Williams 2000). In addition to this increase in urban uses, agriculture has actually increased during this same period. Put simply, in many hydrological systems in the border region we take more water out than goes in, and something has to give. The first to be affected are the ecologies that depend on that water. Obviously, removing water from rivercourses threatens the plants and animals that live in them. What is not so obvious is that the use of aquifer water can have the same effect. Water flows down, pulled by gravity, and recognizes few absolute barriers.⁵ So when the subsoil water within a river drainage is pumped to below the level of the river, the water flows down and away from the river (Glennon 2002). Worse yet, aquifers in arid and semiarid places often have very low recharge rates, and even if subsoil extraction were to be stopped entirely, it could take decades for them to recover.

The drying of a riverbasin is a relatively long process, and the plants and animals that suffer its effects cannot make their complaints heard. As a result we are much more aware of the effects of water scarcity on humans: lower reservoir levels; ever-deeper and more costly wells; water rationing in cities and farms; legal struggles. Domestic and urban uses of water take precedence over agriculture in Mexico and the United States, and so the effects of water scarcity fall mostly on the farms. Among the human

³ Interview with author, Fausto, Marcelo and Roberto, Poblado Anáhuac, Tamaulipas, 1997.

⁴ Two issues of the Natural Resources Journal cover the problem of water scarcity in the Río Bravo/Grande drainage during that period: Volume 39, Number 1 (1999); Volume 40, Number 2 (2000).

⁵ See Pielou (1998) for a thorough discussion of hydrology in laymen’s terms.

uses of water in the borderlands we are witnessing a crisis in the physical and social infrastructures of irrigated agriculture that were erected at the beginning of last century, and enabled more than 50 years of steady economic and demographic growth in the region. In the borderlands, the dams, canals, laws, government institutions and policies, domestic economies, consumer habits and even expectations and aspirations are under enormous strain. When seen from this perspective, the “water crisis” so often mentioned in Mexico is more accurately described as the crisis of irrigated agriculture: that is, a crisis of the infrastructures upon which the borderlands were built.

Infrastructures

“Delving into someone else’s infrastructure has about the same entertainment value of reading the yellow pages of the phone book.”⁶

Infrastructure is invisible in that it is taken for granted, and all but those involved in its construction and upkeep are usually ignorant of its workings until it stops working, such as happened to the levees in New Orleans when Hurricane Katrina roared through. Perhaps because of this invisibility the concept of infrastructure remains pretty much on the level of common sense. Most people would mention highways, bridges, levees, electrical grids as examples of infrastructure, and would probably use some sort of metaphor of levels to describe it: that upon which our society and economy is built.

When thinking about water use and irrigated agriculture the concept of “infrastructure” is especially appealing. Images of dams, canals, levees, and other elements of the built environment come to mind immediately, and “infrastructure” seems the obvious word to capture the physicality, scale, connectedness, and social nature of these objects. As we have seen however, there are social and cultural phenomena that can easily be thought of as infrastructure. How are we to understand the relations between dams, canals, credit markets, land tenure, cotton markets, aspirations of migrant workers, and the many other elements that comprise irrigated cotton agriculture in the borderlands? How are we to define “infrastructure”?

Theoretical discussions of infrastructure are disperse, incomplete, and not always terribly specific. An important original influence is Karl Marx, who throughout his work sustained a materialism that placed emphasis on the physical dimensions of human reproduction, and the intimate relationship between humans and their environment. This was a view that insisted that “nature” was always wrapped up with human activity, and that to strengthen the materialist critique it was better to speak of “second nature” or “social nature” inseparable from human activity. Particular societies develop particular forces of production that distinguish them from others in time and space. The overly succinct preface to A Contribution to the Critique of Political Economy both captures his materialist understanding of society and history and enables distorted understandings of it:

In the social production of their life, men enter into definite relations that are indispensable and independent of their will, relations of production which correspond to a definite stage of development of their material productive forces. The sum total of these relations of production constitutes the economic structure of society, the real foundation, on which rises a legal

⁶ Bowker and Star 1999: 321-322.

and political superstructure and to which correspond definite forms of social consciousness (Tucker 1978: 4).

One reading led to a formalistic, structural model of society in which the “base” or “infrastructure” determined the “superstructure” which in turn determined “ideology.”

Raymond Williams and E.P. Thompson led a critique of the mechanical Marxism represented by Althusser and associates, and their insights informed a series of important discussions within anthropology. William Roseberry, for example, explored the implications of the material/ideal split that characterized the work of Marvin Harris and Clifford Geertz, and, recovering the voice of Marx in the German Ideology, questioned an anthropology that focused on structures rather than “real people, doing real things” (Roseberry 1989). This Northamerican and British variant of Marxist anthropology largely abandoned the language of structures in favor of process and relations, and a discussion of “infrastructure” did not unfold within this community.

Maurice Godelier, on the other hand, articulated a similar critique through a direct engagement with the structuralism and terminology of Althusser, Balibar and others. His 1978 article “Infrastructures, Societies and History” presents a definition of infrastructure that includes: 1) “specific ecological and geographical conditions”; 2) “productive forces, i.e., the material and *intellectual* means” by which humans interact with a “socialized” nature; 3) “social relations of production” (763). Godelier reminds the reader that Marx defined “economic structure” as the “sum total of these social relations of production,” and that relations of production are always inseparable from forces of production. Forces of production, for their part, include representations, ideas, rules, taxonomies, patterns and other means by which humans interact with their environment. Thus “infrastructure” is not at all restricted to fixed capital or the built environment, but includes a whole series of “*idéel* realities” – “facts that are indissociable from language and thought” (Godelier 1978: 764). Having established these definitions, Godelier is in position to make his principal argument: that “the distinction between infrastructure and superstructure is not a distinction between institutions, but a *distinction between different functions within a single institution*” (764, italics original). For example, kinship, often thought of as superstructural, constitutes in its function in some situations the relations of production, that is, part of the infrastructure. Kinship as infrastructure, in turn, contains an *idéel* element which is “not a passive, a posteriori, representation of this productive force in the mind, but, from the very beginning, an active ingredient, an internal condition of its very emergence”(766). By this line of argument Godelier, much like Williams and Roseberry, emphasizes process (function), bridges the material/ideal divide, collapses to some degree the structuralist marxist architecture of infrastructure(base) /superstructure/ideology, and complicates simplistic ideas of determination. Perhaps most important for our purposes, Godelier offers an understanding of “infrastructure” that encompasses cultural, social and physical elements, and presents a series of ethnographic examples that portray infrastructure as the substance of local, everyday life.

To the best of my knowledge, Godelier’s reflections in this 1978 article have not been put to use by other scholars studying irrigation infrastructures, or infrastructures of any kind for that matter. In anthropology, material and cultural studies of irrigation derived, on the one hand, from the cultural ecology of Julian Steward, and on the other from Karl Wittfogel’s thesis on hydraulic societies and oriental despotism (Steward, et.al. 1941; Jacinta Palerm 1985). The central concerns for much of the archaeology and anthropology of irrigation was therefore to, first, understand the evolutionary

relation between humans, technologies and environment, and second, to determine the extent to which the technical demands and social organization of irrigated agriculture shaped politics on local and supra-local levels, as well as whether irrigation was the cause or the effect of the formation of states and complex societies (Ángel Palerm 1973; Doolittle 1991; Geertz 1953; Hauser-Schaublin 2005??; Lansing 1991). Recently anthropologists have contributed to a general critique of large-scale, state-built and -operated irrigation systems by providing discussions of small-scale, sometimes autonomous irrigation systems and communities (Burgete 1995; Martínez and Palerm 1999; Rodríguez 2005; Trawick 2003; Zimmere 2000). But while these authors discuss in great detail the physics and operation of the irrigation infrastructures of the communities where they work, the central theoretical issues are couched in terms of power, politics and governance.

Scholars working in the field of science and technology studies (STS) have carried on a discussion of infrastructure that, while it doesn't make reference to Godelier, covers some of the same ground and is germane to the social use and management of water. They part from the idea, already well-established, that it is not useful to maintain a series of distinctions that isolate the technology being studied (foreground/background; organism/environment; object/context; science/politics) and establish it as determinate of social relations or culture. Rather, the focus of research should be on systems or networks that constitute a "seamless web" (Hughes 1986) of elements, as well as the multiple determinations that exist between nodes. Power and politics are therefore considered to be constitutive of the infrastructures under consideration, and infrastructures can only be understood as they are used, in relation to the practices that constitute or make use of them. The focus here is on how people "live" the ever-changing infrastructures that surround them: infrastructures are both process and product (Star and Ruhleder 1996: 111).

Star and Ruhleder (1999: 113) venture a descriptive definition of infrastructure that includes the following points: 1) it is "embedded" in social relations; 2) it is invisible in its support of work; 3) it has an inclusive reach or scope, tying events and practices together; 4) it is learned as part of membership in a community of practice; 5) it shapes and is shaped by that community of practice; 6) it embodies standards, connecting with practices and other infrastructures in standardized ways; 7) it is built on an already existing infrastructural base, and is cumulative in that sense; 8) it becomes visible when it stops working. This definition of infrastructure has been picked up and used by a number of authors working in STS (Bowker 1996; Bowker and Star 1999; Van Fenema and Raisanen 2005). Perhaps because of the success of the Star and Ruhleder definition, or perhaps because of the common-sensical nature of the term, the term "infrastructure" has also been deployed in other places in the STS literature, often without the precision of the Star and Ruhleder definition. We read about "infrastructures of piracy" (Larkin 2004), "soft infrastructures," "cultural infrastructures," "material infrastructures," and so on (Fisher 2007).

Those who focus on practice and the social nature of infrastructures logically insist on a definition of infrastructure that includes symbolic, meaningful aspects, also not a new intervention, but one which reflects the huge importance of a specific, relatively new, and dominant research topic: computation; the information age; information infrastructures. Computer systems and infrastructures don't move things like water, cars, or electricity: they move information. And, as Bowker and Star (1999) argue, this information needs to be classified even before, and while, it enters into the computer. To grapple with the enormous importance of information, these authors extend the notion of infrastructure established by Star and Ruhleder (1996) to include

systems of classification and standards themselves, which, of course, can never be isolated from their materialization in work activity, hardware, bodily dispositions, etc. These classification and standards systems are, I think, perfect examples of Godelier's "*idéal* realities," but Bowker and Star point to Durkheim and Foucault instead as the foundational inspiration for their analysis (1999: 5). This genealogy is coherent with the body of feminist and poststructural theory Bowker and Star engage with as they ponder the possibilities of building "boundary infrastructures" that articulate the subject positions of those marginalized by the systems of classification that are practiced in today's world.

As Bowker and Star so clearly argue, any decision about standards or categories is simultaneously an act of inclusion and exclusion. So it is with intellectual traditions: they are invariably selective. While I find the definition and descriptions offered by Bowker, Star and Ruhleder useful, especially for understanding what they refer to as the "biographical" dimensions of infrastructure, I suggest that work on the topic would benefit greatly by recovering the point of departure figured by Godelier, and engaging anew with the wider Marxist tradition that supported his intervention. Put simply, STS scholars such as Bowker, Star and Ruhleder do not contemplate the political economy of infrastructures. They focus more on the effects of power of classification and information infrastructures, than on providing a systematic analysis of how, why, when and where infrastructures are built and undone.

To approach an understanding of the historical dynamics of hydraulic infrastructure in the borderlands, I turn to a discussion among economists concerning the cyclical nature of capitalism, and the periodic expansions and contractions that mark economic history since the 19th century. During the great depression of the 1930s Nikolai Kondratiev published his theory of "long-waves" and Joseph Schumpeter his analysis of the "business cycle," each describing in his own way how the periodic expansion and contraction of capitalism was due to mechanisms internal to the economy. In the postwar period Ernest Mandel and Paul Sweezy continued this line of investigation from a more clearly marxist position, arguing that the natural tendency of capitalism to enter in crisis is a result of the inevitable fall in the rate of profits, but that this "law of motion" of capitalism can be contraverted by external, "noneconomic" factors such as technological innovation, wars, natural disasters, and the like. What is important about this line of theorizing is, first, the assumption that various aspects of capitalist society form unified wholes during definite periods, second, that these wholes operate to enable accumulation, and third, that these unified wholes include a wide array of social and cultural ("non-economic") elements.

In the 1980s research emerged that sought to explain the world economic crisis and restructuring that began to gain importance in the 1970s. Often referred to in a general way as "globalization", this fundamental reorganization of the global political economy was seen as a move from one kind of capitalism to another: as a move from "organized" to "disorganized" capitalism in one formulation (Lash and Urry 1987), or from "fordism" to "flexible accumulation" in another (Harvey 1989). Two very similar schools of thought addressed this issue. On the one hand a group of French thinkers, known as the "regulation" school, studied the formation of "regimes of accumulation" during specific historical periods (Aglietta 1979; Boyer and Saillard, eds., 2002). The unity and historical movement of these "regimes" was achieved through "modes of regulation" that operated in many dimensions: from the legal and political all the way to the emotional. On the other hand, a group of economists in the United States produced histories of the "social structures of accumulation" that formed around accumulation processes during defined periods of expansion and contraction (Gordon 1978; Gordon

1980; Kotz, McDonough and Reich, eds., 1994). Both approaches built upon the strengths of previous work by investigating the economic, social and cultural dimensions of capitalist society as a unified whole. Furthermore, these formulations downplayed economic determinism and hyperstructural models in favor of culture and process.

The regulation and social structures of accumulation approaches have found a measure of new fame through the work of geographer-turned-anthropologist David Harvey. Unlike marxism in general during the last twenty years, Harvey's influential 1989 book, The Condition of Postmodernity, enjoyed a great deal of popularity. Part of the success of the book is precisely its ability to connect postmodern architecture, art and other cultural forms to fundamental tendencies in capitalism that have emerged over the last few decades. To achieve this Harvey resorts explicitly to the language of the regulation school theorists. Citing Alan Lipietz he states that "there must exist, therefore, 'a materialization of the regime of accumulation taking the form of norms, habits, laws, regulating networks and so on that ensure the unity of the process, i.e. the appropriate consistency of individual behaviours with the schema of reproduction. This body of interiorized rules and social processes is called *the mode of regulation*'" (Harvey 1989, 122. Italics original).

The centrality of "norms, habits, laws, regulating networks, and so on" to the concepts of "regime of accumulation" and "mode of regulation" clearly makes the regulation literature attractive to the cultural theorist. At the same time, however, Harvey undergirds this discussion of postmodern culture and the geography of flexibility with a thorough and painstaking analysis of the workings of capitalism, and it is here that the idea of "infrastructure" plays a crucial role (Harvey 1982: 398-405). In Harvey's argument, the central problem of capitalism is overaccumulation, which must be addressed through the destruction of capital or investment in enterprises that displace the realization of profit far into the future. Infrastructures soak up stagnant capital, alleviating crisis tendencies. Physical infrastructures are easily conceptualized. These are the dams, canals, roads, power lines, and other elements of the built environment that require immense outlays of capital, often provided by the state. Social infrastructures are more difficult to grasp, as is their relation to the productive activities at the heart of capital. Education, health care, labor law, family structures, community social organization, and all the other elements of a vast "human resource complex" (Harvey 1982, 399) form the substance of social infrastructure, a much more encompassing, and social rather than cultural concept than that of "mode of regulation," and one that includes more of the intimate fabric of daily life. The surplus value created in the "economic" nucleus of the workplace is exported to all the social activities here described as infrastructure. Eventually this investment returns value to the production process, whether, for example, by making the transport of commodities faster and cheaper, or by reducing health-related improductivity of workers through better health care, or even by stimulating productivity among workers by instilling a corporate ethic. Obviously this process is infinitely more complex than the descriptions provided here or in Harvey's writings, and can only be understood as it unfolds in relation to the effervescence of class conflict, but the basic historical relationship between accumulation and the creation of infrastructures – including "norms, habits, laws" and all the less tangible elements of social infrastructures – is established through this analysis of the crisis tendencies of capitalism.

Infrastructures of Irrigated Agriculture in the Borderlands

At this point it should be clear that the Marxist approach reviewed here offers the possibility of contemplating the unity of economic, social and cultural elements that coincide in a specific time and place, and provides a way of answering the questions of how, why, when and where infrastructures are built. It should also be clear that, for their own good, concepts as vast and encompassing as the one provided by Harvey of “infrastructure” (especially “social infrastructure”) must be brought to bear on empirically substantial histories and ethnographies. Irrigation works are clearly infrastructures in the most physical sense of the term. From the pre-conquest period until around 1880, small scale ditch irrigation systems were built and colonized by communities along rivers and streams throughout the borderlands, usually in cooler, wetter, mountain regions such as New Mexico and Chihuahua (Martínez Saldaña 2005; Meyer 1996). In the late nineteenth century, land and development companies in both countries built larger canal systems using concrete, steel and motorized pumps. But efforts to colonize these zones with small farmers were not very successful, and the large dams required to ensure water for these systems proved to be too much for the private companies. The federal governments took over irrigation in the beginning of the twentieth century. The U.S. Bureau of Land Reclamation was created by the Reclamation Act in 1902, and that agency began to build dams such as the Elephant Butte dam on the Rio Grande near El Paso and Ciudad Juarez. By the 1920s and 1930s the Bureau of Reclamation commanded a huge budget and was building such massive dams as the Hoover (Pisani 2002). These dams stored water for new irrigation districts and provided electricity for the industries and cities of the Pacific Slope, which mushroomed in size after the Second World War (Fiege 1999; Nash 1984).

Mexico didn't begin a concerted program of dam-building until the late 1920s. Between 1910 and 1920 the Mexican revolution disrupted irrigation and colonization plans, and bankrupted the agency that financed infrastructure, the Caja de Prestamos. In 1926 a pair of laws passed by President Calles created the National Irrigation Commission (Comision Nacional de Irrigacion, or CNI) to build irrigation districts, and created a framework for establishing colonists on newly irrigated lands (Aboites 1988; Aboites 1998). The irrigation systems built throughout the borderlands were, for the most part, big dam and canal systems that delivered water by gravity through unlined canals, periodically inundating the fields. These were monumental works of infrastructure: clear examples of what James Scott (1998) would describe as the aesthetic and planning style of “high modernism.” Mimicking the flood patterns of the borderlands' river basins, these dams controlled and administered those floods.

The construction of irrigation infrastructure in the borderlands amounted to something of a race between the two countries to control and develop the water resources of the international rivers. As the dams were built and the uses of water increased, both countries recognized the need for a more comprehensive treaty governing the distribution of water in the Bravo/Grande and Colorado basins. But the governments were engaged in a standoff. On the one hand, the Mexican irrigation district of Mexicali covered the very last few miles of the Colorado River, and depended on the US for its water. On the other hand, the most productive irrigation district along the US side of the Rio Grande was the Valley of South Texas, which depended on the water that flowed from the Mexican tributaries of the Rio Conchos, Rio Salado, and Rio San Juan. Both countries recognized that the most effective pressure for establishing their rights to water was to put that water to productive use before it left national territory. But they also realized they could not establish uses for water that was not

guaranteed legally to be available in the future (Hundley 1966; Samaniego 2006; Tamayo 1945).

Legislation, then, was a key social infrastructure supporting irrigated agriculture in the borderlands. After almost two decades of dam building and political maneuvering, in 1944 Mexico and the U.S. signed an international water treaty that governs the use and distribution of the water of the Colorado, Tijuana and Bravo/Grande rivers. The 1944 Treaty ratified the division of water among the many users on both sides of the border, and provided a framework for the resolution of water conflicts so that they would not interfere with investment and production. The International Boundary and Water Commission, a binational institution, was created to oversee the application of the Treaty and the management of the shared water. The Treaty permitted the construction of dams in the course of the Rio Bravo/Grande, and in 1953 the enormous Presa Falcon began to deliver irrigation water to the Lower Rio Bravo/Grande of Texas and Tamaulipas. With the signing of the 1944 Treaty, and the completion of the Presa Falcón and the expansion of the Valle Bajo Río Bravo irrigation district around Matamoros, agriculture on the Mexican side of the Rio Bravo/Grande was deemed to have reached the maximum limit possible given the water resources available (Orive Alba 1945).

Flood irrigation, provided by the physical and legal infrastructures discussed above, was especially suited to a plant that was native to the arid and semi-arid borderlands: cotton. Cotton was the crop of choice in the borderlands for a number of reasons. First, domestic cotton production in the United States determined the price and markets for the fiber around the world. Throughout the second half of the nineteenth century and the first half of the twentieth, the U.S. produced 80 or 90% of the world's cotton, and shipped most of that cotton to the industrial centers in Europe. The foreign currency earned by cotton paid for the importation of machinery and the creation of textile industries in places like Lowell, Massachusetts. As the U.S. industrialized, and the dollar got stronger in relation to other currencies, U.S. cotton became increasingly expensive. And because the U.S. produced most of the world's cotton, the price of cotton in the U.S. determined the price of cotton everywhere else (Clayton 1930; Clayton 1931; Clayton 1934; Wallace 1935).

Around 1900 high prices stimulated cotton production outside the old cotton belt in the southeastern U.S. Cotton migrated west to Texas and the newly opened irrigation districts of the southwest U.S., where mechanization and economies of scale lowered production costs (Foley 1997; Menefee 1941). Cotton also migrated south, to imperial locations such as Egypt, India, the Sudan and West Africa (Bernal 1997; Isaacman 1996; Isaacman and Roberts 1995; Roberts 1996). National governments in Latin America – especially Argentina, Peru, Brazil and Mexico – stimulated production as well (Guy 2000; Peloso 1999). Cotton was also seen as an important input for the creation of national textile industries in these developing countries. By the 1920s the Mexican government looked at cotton as the way to finance its ambitious new irrigation program in the borderlands, to create a new agrarian north, and to spur national development.

The great depression in the 1930s accentuated all these tendencies. Faced with a desperate situation among its farmers in the south, the U.S. government created a set of institutions and policies to support cotton prices by purchasing surplus stocks of the fiber (Richards 1936). These institutions, as well as rapidly growing demand, kept cotton prices high from 1933 to 1958. Once again, because the U.S. still dominated the production of the fiber, world prices were those set in the big cotton markets in New Orleans and New York. Farmers around the world earned about the same for their cotton as farmers did in the U.S. Cotton production for export boomed in northern

Mexico during this time, and the newly opened irrigation district of Matamoros, Tamaulipas was the epicenter of this boom.

There were also strong ecological and biological reasons why cotton thrived in the borderlands. Cotton was exceptionally well suited to the borderlands irrigation systems, which were designed to deliver periodic floods of water to the cultivated fields, essentially reproducing the behavior of the borderlands rivers, which also followed a pattern of flood and recession. The cotton plant has a very deep tap root, which allows it access to subsoil humidity long after the floodwaters recede. Cotton also benefits from the extreme climatic conditions of the borderlands, thriving in hot sunny weather. Winter frosts help to reduce pest problems. And because the plant needs long nights for its biological process, cotton at the latitude of the borderlands is much more productive than cotton grown in the tropics. The borderlands irrigation zones had higher yields and better quality cotton than most places in the world (Porter 1995).

The third area in which important physical and social infrastructures of irrigated cotton agriculture were established was land and labor. The crisis of the 1930s opened the way for far-reaching agrarian reform in Mexico. With agriculture floundering and landless peasants and agricultural workers literally up in arms, the government of Lázaro Cárdenas orchestrated the nationalization of private lands and the creation of *ejidos*, or state owned farms, and agricultural colonies (Eckstein 1966; Warman 2001). In the Mexican borderlands these measures created a sizeable class of farmers with access to anywhere between 10 and 50 acres of public land. With cotton prices as they were, this amount of land was considered sufficient to support a family. Some farmers were organized into collective farms. Others farming state land were given, or simple asserted, more individual control. Production was managed by the federal government through a vast apparatus of agrarian political institutions, banks, agronomists, railroads, irrigation engineers, and the like. Through these infrastructures, the government practically forced these farmers to grow cotton.⁷

Land reform only solidified the strong position held by the Anderson Clayton Company, the world's largest cotton company, in Mexico's cotton economy. Anderson Clayton was already active in Latin America in the 1920s, but in the mid-1930s increased its presence remarkably, nowhere more than in Mexico. The crisis of the early 1930s bankrupted many of the local cotton companies, and the Anderson Clayton bought them out. In 1937 "the Clayton," as people in northern Mexico call it, struck deals with the Mexican federal government to finance and market all the cotton produced by the state-owned agricultural sector. The government agrarian bank functioned as the intermediary.⁸ While land reform settled many migrant agricultural workers as small farmers, increased cotton production generated even more migrant labor, and a huge army of cotton pickers circulated throughout the borderlands during

⁷ "Acuerdo" (1939). Archivo General de la Nación, México; Ramo Presidentes; Fondo Lázaro Cárdenas; Expediente 508.1/490.

⁸ "Cárdenas to Clayton," Archivo Histórico de CONDUMEX; Fondo Montes de Oca (hereafter CONDUMEX), 326/493, #30332; "Clayton to Montes de Oca," CONDUMEX; document # 28195; "J.W. Stone to Gabino Vázquez," CONDUMEX, document #28141; "Anderson Clayton to Cárdenas," CONDUMEX, 306/493, document #28213; "Montes de Oca to Cannafax," CONDUMEX, 306/493, document #28246; "Anderson Clayton to Montes de Oca," CONDUMEX, 321/493; "Montes de Oca to Anderson Clayton," CONDUMEX, 322/493, document #29867; "Sharp to Montes de Oca," CONDUMEX, 323/493, document #29938; "Montes de Oca to Cárdenas," AGN, Cárdenas, 705.2/26.

the summer harvest, what Carey McWilliams once described as the “big swing” (McWilliams 1968[1942]). Borderlands cotton agriculture, then, was based in a quite specific transnational structure of social classes. This class structure was, in turn, rooted in a built environment shaped by categories of land tenure.

A final area in which we can discern infrastructures supporting irrigated agriculture is in the realm of aspirations, desires, ideas, feelings and the subjective dimensions of culture. Following Godelier, we can expect to find that even the most personal, private and individual experiences are integral to physical and social infrastructures. Throughout Mexico’s northern borderlands in the late nineteenth and twentieth centuries there was a developmentalist structure of feeling that supported projects ranging from the construction of the Don Martin Irrigation System on the Río Salado, to the nationalist agrarian reform, to the constitution of regional associations of cotton industrialists, to the efforts of Don Felix and Donha Elena to clear and farm their land in Matamoros. The slogan of the National Irrigation Commission was “por la grandeza de Mexico” – “for the greatness of Mexico.” Don Benito, another farmer from Matamoros, reflected the optimism of the generation of farmers that came of age with irrigated cotton when he told me: “I was 16 when I arrived to Matamoros. There was nothing here, and all I had was a screwdriver and pliers in my pocket. Today I am a wealthy man.” This developmentalism involves an idea of historical progress, of economic growth, of fulfillment, and it is usually couched in regional and national terms. This discourse of development came to dominate precisely because it was inseparable from the material process of development that the region’s inhabitants experienced. Doña Elena and Don Felix, for example, could believe in and talk about progress because they went from being migrant workers to prosperous farmers. Developmentalism was part of a regime of accumulation based in irrigated cotton agriculture. And Doña Elena and Don Felix came of age together with this regime.

Developmentalism had a strong racial component. The north of Mexico was seen as different from the central and southern parts of the country: more advanced; harder working; more European; more white. We know that the nomadic indigenous groups that lived in the area were largely eradicated during the colonial period, but we also know that indigenous people from Tlaxcala, in central Mexico, were settled in their place (Martínez Saldaña 2005). In some of these settlements Nahuatl was still spoken at the end of the nineteenth century. Large numbers of slaves and workers of African descent were also sent to the north to work in the mines. But what is important here is that despite this diversity the north was considered whiter; more apt for development by the government planners and engineers that built the irrigation districts of the borderlands. For example, in the preliminary study for an irrigation project in the Lower Valley of the Rio Bravo/Grande, an engineer wrote:

The region’s dwellers are similar in every way to those of the rest of the borderlands... of Nuevo Leon and Tamaulipas; they are of Spanish ancestry, white, bearded, with caucasian features, tall and robust.

Their customs are simple, their habits moderated, hard workers, frank and very honorable in their dealings. They are not taken to vice, and it is rare to see drunkards in the streets...

In review . . . it is undoubtable that irrigation will bring them uncountable benefits that they will know how to take advantage of (Brambila 1930: 22-23).⁹

This engineer was not alone. Other engineers and even the anthropologist Manuel Gamio, who participated in the project to develop irrigated cotton agriculture in the borderlands, continued this line of analysis. It was, and still is, quite common for people to discuss development in northern Mexico in racial terms. This structure of feeling contributed to the decision of the engineers and government planners to erect physical and social infrastructures of irrigated cotton agriculture in the borderlands, and was in turn bolstered by the enormous success of cotton agriculture. Even today, despite the fact that borderlands society is made up almost entirely of people who have migrated from central and southern Mexico, people in the region continue to consider their region more developed, harder working, whiter. The developmentalist structure of feeling both derived from and contributed to the regime of accumulation based in irrigated agriculture.

Reflections

I began this article by stating that the infrastructures of irrigated agriculture in the borderlands have, together with the people that built the borderlands, come of age and grown old. I then described some of those infrastructures in the areas of irrigation, cotton, and land and labor. I would like to suggest that using the idea of infrastructures to describe such different things as hydraulic works and feelings about progress and race can help us to fruitfully confront some of central problems of political economy: that of connecting the material and the ideal; the global and the local; the internal and the external. Those of us who do histories and ethnographies of the borderlands should not see the hopes, projects, works and experiences of Doña Elena, Don Felix, Don Benito and their *compañeros* as lived in the context of irrigation systems and cotton production. Rather, we should try to see them as the substance of this regime of accumulation. Infrastructure, as a concept, helps us do this.

But what does it mean say that these various infrastructures have come of age and grown old? The phrase “coming of age” is made more analytically powerful by connecting it to a processual, historical concept of cycles or waves; of “regimes of accumulation” to use the language of the regulation school. The physical and social infrastructures that ensure a smooth process of accumulation only work for a certain time before the same forces of production they help stimulate grow beyond the ability of those structures to resolve the crisis of overaccumulation. Attempts to scientifically measure these “long waves” or “long swings” have been made, and these concepts have been used to great effect to understand restructuring and the shift to “flexible”

⁹ “Los moradores de la región se asemejan en todo a los del resto de la frontera de los Estados de Nuevo Leon y Tamaulipas; son de ascendencia Hispánica, blancos, barbados, de facciones caucásicas, altos y robustos. Sus costumbres son sencillas, sus hábitos moderados, muy trabajadores, hospitalarios, francos y muy honrados en sus tratos o negocios. Son poco viciosos siendo raro ver ebrios en las calles.... Su comida consiste en tortillas de maíz o mezcla de maíz y harina de trigo; el nixtamal lo muelen los varones en molino de metal y a mano. Usan diariamente la carne los huevos y algunos acostumbran las legumbres que ellos mismos cultivan. Todos calzan zapato, pantalón y chaqueta y se cubren con sombreros de palma o fieltro. En resumen los moradores han crecido en un ambiente sano, espiritual y materialmente y es indudable que la irrigación les traerá incontables beneficios que sabrán aprovechar.”

accumulation over the last 30 years. But the ethnographic potential of the idea of structures of accumulation does not lie so much in establishing a universal periodization that describes an evolutionary series of different kinds of capitalism, or even in the detailed description of macrosocial and historical processes. The duration of these periods, and the configuration of society and economy that distinguishes each one, depend on many factors that are quite local in scope, and are best appreciated by giving attention to the complexity of local history. The idea that structures of accumulation are born, come of age, grow old and are replaced by others in a cyclical or wavelike fashion can shed light on long-term transitions in regimes of accumulation such as those analyzed by the regulation and social structures of accumulation schools, and by Harvey. But this idea can also be used to study social change on another scale more accessible to ethnographic inquiry: how, for example, the infrastructures supporting the production of one staple agricultural commodity in a certain region are replaced by or transformed into an other set of infrastructures linked to another agricultural commodity. The transition in 1960 from cotton to basic grains in Matamoros implied a wholesale reorganization of the social fabric of that region – new kinds of work, new classes of workers, new businesses, new concentrations of capital, etc. But this shift in crops did not coincide perfectly with the long-term historical movement from fordist to flexible capitalism that occurred in the US and Europe. Cotton did not disappear everywhere when “fordism” fell apart; it just moved even farther south, to Michoacan, Chiapas, Guatemala and El Salvador. At the very least, a regional or local perspective shows that such transitions in regimes of accumulation are not clean breaks, they are not unified or complete.

A political economy concerned with cycles and infrastructures should begin by identifying what infrastructural elements are changing. Or rather, how they change at different rates, and in different ways. Take again the example of the shift from cotton to basic grains in Matamoros. The cotton companies packed up and moved their gins and oilseed presses to Sonora and Michoacan where cotton was still grown profitably. New companies moved into Matamoros, bringing new industrial infrastructure to process the grains. Corn and sorghum production was much more mechanized than that of cotton, so the mass of migrant workers that picked the crop in Matamoros no longer arrived every summer. The labor of the farming families settled during the cotton period was not needed for corn and sorghum, and these grains brought in less money than cotton. So the young people moved to cities in Mexico and the United States to work in industry, services, and illegal commerce. These were major changes in the social structures of accumulation related to particular commodities.

But some things did not change with the demise of cotton agriculture. The irrigation infrastructure built in the period of cotton production remains for the most part unchanged and unimproved in northern Mexico. It works well enough for irrigating basic grains, but cannot deliver water with enough precision or efficiency to support vegetables. After the Second World War in the Southwest United States irrigation infrastructure incorporated advances such as lined canals, tubes, spray and drip systems, which in turn increased the precision with which water could be applied and thus permitted the production of fruits and vegetables. In Northern Mexico subsoil water has been exploited intensively since the 1940s, but the same basic flood irrigation systems built for cotton in the 1920s and 1930s remain in place today.

The system of land tenure created in the 1930s also remains largely intact. Constitutional reform in 1992 allowed ejidatarios farming state-owned lands to acquire property titles, effectively dismantling the enormous state agrarian apparatus. It was hoped this reform would create a market in land, but in the irrigation districts of

northern Mexico land is not bought and sold to a large degree. Because these small parcels, and the irrigation infrastructure that services them, can no longer support a family, a vast and complicated set of rental arrangements have been created to allow a few farmers to achieve economies of scale by renting everyone else's plots, and, even more important, their rights to irrigation water (Wilder 2007). Those who rent their lands to others have integrated non-agricultural sources of income into their domestic economies, marking something of a return from the family farm to the highly diversified peasant economy that characterized rural northern Mexico before the postrevolutionary era of irrigated agriculture (Miguel Juárez 2005; Robles Linares 2005).

Many cultural elements generated during the period of cotton agriculture persist as well. The developmentalist structure of feeling has not disappeared, as much as it has changed. At the turn of the millenium there were few left of the generation of farmers that colonized the cotton zones in the 1920s and 1930s. Those I interviewed spoke of the cotton era as a time of national progress under the guidance of an enlightened and benevolent federal government. Their children and grandchildren, who have come of age in a neoliberal period, have much less faith in national progress, and much less trust in the federal government. The high modernist spirit with which the massive public irrigation works were built seems to them both a bit pretentious and a bit naïve. They criticize earlier generations for having received everything from the state. As one farmer told me, "the government made people lazy: they gave them the land, the seeds, the tractors, and the extension workers to drive the tractors. All that was left for them to do was to lie down in the fields and listen to the cottton grow."¹⁰ In return for its largesse, the commen-sense analysis continues, the one-party state secured political support. True development, many said, requires individualism and entrepreneurial skill, the willingness to take risks, and an international perspective. In the new developmentalism, visions of social progress are not as important as visions of individual progress.

Infrastructures are long-term investments that commit sizeable amounts of capital to the support of certain productive schemes, and in so doing they provide a temporary escape to the problem of overaccumulation generated within the production process. By their very nature they are inflexible and establish path dependency. Physical infrastructures are massive works built into the environment that cannot be destroyed, changed or abandoned from one day to the next. Social infrastructures also have an enormous amount of inertia and are resistant to change, as many studies of modernization and development projects have pointed out (Scott 1998). Both kinds of infrastructure return value over a very long time frame, and cannot be abandoned before then without writing off the investments made in them. For these reasons the history of infrastructures is somewhat out of step with the cycles of accumulation and crisis, and the transitions between regimes of accumulation. As we can see in the case of the borderlands crisis of irrigated agriculture, infrastructures often overstay their welcome.

The history of the borderlands during the twentieth century shows the consolidation of an irrigated agricultural development model based in relatively stable physical and social infrastructures having to do with land, water, labor and commodities. Some of the structures have been transformed over time, but others, especially the hydraulic infrastructure, endure. This however, is beginning to change, and the change is caused by the conflicts engendered by water scarcity. The shift of the

¹⁰ Guadalupe González, Interview with Author, Matamoros, Tamaulipas, 2006.

region's economy over the last forty years to an industrial and urban focus, together with enormous population growth, has placed a great deal of stress on the structures established during the first part of the twentieth century to capture, administer, deliver and use water. Legally, in both countries urban users have priority over agricultural users, and so agriculture is getting less water. The water conflicts currently raging throughout the borderlands are evidence of this crisis of irrigated agriculture. These conflicts are currently being addressed by projects to adapt and improve existing infrastructure so as to use agricultural water more intensively and efficiently. These efficiency schemes promise to reduce filtration of irrigation water into the soil, principally by lining earthen canals with concrete and applying the water by drip or spray directly to roots of the plants. The water that is saved will then be available to urban users.

In the infrastructural efficiency schemes that I have studied – in the Rio Bravo/Grande in Chihuahua, and in the Rio Colorado in Mexicali and the Imperial Valley – there is no absolute reduction of water use. Neither has there been any attempt to lower the amount of water guaranteed to each country by the 1944 water treaty. These infrastructures remain in place. Our rivers and aquifers are already overexploited, and population is expected to double again in the next 25 years. Worse still, it appears that current levels of water use were established in the wettest century the region has seen for 2000 years, and it is expected that things will get dryer in the future. Established water uses will have to change. How this process unfolds can only be understood by considering the physical and social infrastructures that were built to support irrigated agriculture, and how these are changing to accommodate a new regime of accumulation.

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