

Sons of the Sāqiya: Grassroots Water Politics in Southeastern Morocco

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I. Abstract

This study examines the informal institutions that govern the *sāqiya* and *khettāra* irrigation system in southeastern Morocco. I frame those institutions using literature concerning politics of irrigation, governing the commons, and North African political culture. While interviewing farmers in agricultural communities near the Morocco-Algeria border, five themes emerged as key aspects of *sāqiya* and *khettāra* governance: the definitions of irrigation communities, the methods of water distribution, the institutions for selecting leaders, and those leaders' authorities and responsibilities. Institutional arrangements and management practices associated with those themes show that *sāqiya* and *khettāra* governance is rooted in the democratic values of consensus and consultation. The presence of indigenous democratic institutions in southeastern Moroccan farming communities contradicts scholars who claim an inherent incompatibility between North African culture and democratic institutions. The study also examines how grassroots irrigation institutions respond to social, economic and environmental challenges.

II. Introduction

Although my research focuses on farmers in the Moroccan desert, my path began in New Mexico. In my home state of New Mexico, people understand the importance of water. A centuries-old irrigation system made up of communally managed canals called *acequias* crisscrosses New Mexico's arid landscape, providing water to farming communities around the state. I grew up hearing stories from my mother and grandparents about playing along the acequia, riding horses beside it, and disputing the right to use its waters. As a teenager, I once worked on an alfalfa farm that irrigates with the acequia. When my brother purchased his first

house in Socorro, he bought a property abutting an acequia. The acequia frequently appears in folklore and history, flowing through the stories New Mexicans tell about ourselves.

I first visited Morocco in 2016 and felt at home in the country's southern desert, which sits at the northern edge of the Sahara. Buildings constructed from mud-brick and straw reminded me of New Mexican adobe, a word that comes from the Arabic *al-tūb*. Moroccan jewelry resembles that of the Diné and Hopi people of the American Southwest, who learned to work silver from Spaniards who in turn learned from Arab and Amazigh people from Morocco.

In Morocco, I remembered the histories, traditions, and legends that linked New Mexico to North Africa. Seven centuries of Islamic civilization in Spain have left their mark on former Spanish colonies like New Mexico. In 711, Tariq ibn Ziyad led an army of Arab and Amazigh soldiers across the strait of Gibraltar, which comes from the Arabic words meaning "Tariq's mountain," marking the beginning Muslim presence in the Iberian Peninsula. North African culture entered the Iberian mainstream, famously influencing language, architecture, and cuisine. Only in 1491 did Spanish armies topple the last Muslim emirate in Granada, completing the Reconquista. Even so, Muslims remained in Spain for over a century. Despite the Catholic monarchy's efforts to stamp out heresy in a series of inquisitions, Muslims secretly expressed their culture and practiced their religion. Muslims faced the choice to either publicly convert to Christianity or seek refuge far from the reaches of Spanish authority; some fled to Islamic states in the Middle East and North Africa while others settled in Spain's American colonies.¹

In the wake of the Reconquista and the Inquisition, the first Spanish expedition entered New Mexico in the 1530s. Among them was Estebanico the Moor, a slave from the Moroccan

¹ Karoline Cook, *Forbidden Passages* (Philadelphia: University of Pennsylvania, 2016).

port of Azemmour. In 1598, the conquistador Juan de Oñate led a company of colonists, missionaries, and soldiers to return to New Mexico, occupying the Tewa village of Ohkay Owingeh and initiating what would be two centuries of Spanish colonization. Oñate's party and their successors carried with them a culture significantly impacted by North Africa. That culture remains prominent in New Mexico today.

I had read that the acequia came to New Mexico from Spain but originated with “the Moors,” the name that Spaniards called Arab and Amazigh people from North Africa.² Visiting the town of Merzouga, a popular tourist destination near the Algerian border, I first learned that people in Morocco still irrigate using the sāqiya, which gave the acequia its name.³ I knew that a system of “water democracy” and communal ownership governs the New Mexican acequia.⁴ I wanted to find out whether Moroccan sāqiya users govern their system with similar institutions. Upon returning to the United States, I applied for a grant to compare traditional water politics in New Mexico and Morocco.

Using a grant from the Sally McDonnell Barksdale Honors College, I set out to compare the institutions that govern the sāqiya and the acequia. I was particularly interested in whether I would encounter democratic institutions in Morocco similar to the ones I knew in New Mexico. Skeptics about democracy and democratization in the Middle East and North Africa often argue that the region is not ready for democratic institutions. I wanted to determine whether indigenous democratic institutions exist on the local level to contribute to a better understanding of grassroots political culture in the region. Thanks to the support of the Honors College, my

² Gustavo Arellano, *Enduring Acequias* (Albuquerque: University of New Mexico, 2014), 27-31.

³ Thomas Glick, *Irrigation and Society in Medieval Valencia* (Cambridge: Harvard University Press, 1970), 221.

⁴ Jose Rivera, *Acequia Culture* (Albuquerque: University of New Mexico, 1998), 77-145.

curiosity has evolved into this thesis, which examines the institutions that govern the sāqiya and khettāra system of southeastern Morocco.

Research Question

I formulated a question to guide my research: How do local stakeholders manage the khettāra and sāqiya irrigation system in Drâa-Tafilalet Province of Morocco? Based on institutions for acequia governance in New Mexico, I hypothesized that local stakeholders manage the khettāra and sāqiya irrigation system in southeastern Morocco using informal democratic political institutions.

Importance

This study is significant because it contributes to understanding rural North African political culture and the social impact of water scarcity. Even after the Arab Revolts of 2011, authoritarian, undemocratic governments continue to dominate Middle Eastern and North African states. However, claims that the region's culture is inherently unfit for democratic governance overlook the small-scale, indigenous political structures that form the basis of a society's political culture. Assumptions about democratic political culture have tangible impacts on policy decisions towards the region. Recognizing the presence of indigenous, grassroots democratic institutions could affect the ways that policymakers view democratization. This study demonstrates that local water politics in southeastern Morocco exhibit a democratic political culture at the informal, local level. The research focuses specifically on grassroots institutions in which legitimacy derives from the members of a community and authority emanates from the bottom-up.

As the effects of global warming intensify, understanding the underlying grassroots structures that govern water resources may help communities respond to water scarcity. Morocco experiences severe water scarcity that is especially acute in the country's deserts.⁵ The kingdom also suffers from intense periods of drought that sometimes leave regions of the country without rain for months at a time.⁶ The consequences of such droughts can be catastrophic, resulting in loss of crops, food shortages, and rural-to-urban migration.⁷ A 2015 drought depressed economic growth to just 1.5 percent due to crop failures.⁸ Climatological studies agree that, while global warming will not dramatically increase the frequency of droughts, it will quicken their onset and exacerbate their intensity.⁹ In the 20th century, the Moroccan government responded to droughts by investing in large-scale, centralized irrigation projects, largely overlooking community-based irrigation.¹⁰ However, centralized irrigation projects rarely succeed in the long term, calling for a closer examination of small, more sustainable irrigation communities like the ones I researched.¹¹

Global warming will impact Morocco's arid irrigation communities in various ways. Irrigation using systems such as the *sāqiya* and *khattāra* can help mitigate the effects of decreasing rainfall to an extent, but water scarcity places pressures on the social and political institutions that govern and sustain irrigation systems. Studying how communities govern irrigation systems could help determine the capacity of irrigation to absorb environmental shocks and sustain farmers' livelihoods. Because forty percent of the Moroccan population works in the

⁵ Hamza Guessous, "Morocco Among Countries Facing Water Scarcity," Morocco World News, February 15, 2018, <https://www.moroccoworldnews.com/2018/02/240719/morocco-countries-facing-water-scarcity/>.

⁶ Richards et al, *A Political Economy of the Middle East* (New York: Westview Press, 2013), 172.

⁷ Richards et al, *A Political Economy of the Middle East*, 172.

⁸ World Bank, "5 things Morocco is doing about Climate Change," accessed April 19, 2019, <http://www.worldbank.org/en/news/feature/2016/11/17/5-things-morocco-is-doing-about-climate-change>.

⁹ Kevin Trenberth et al, "Global Warming and Changes in Drought," *Nature Climate Change* 4, no. 1 (2014): 17.

¹⁰ Alan Richards et al, *A Political Economy of the Middle East*, 172.

¹¹ Jonathan Mabry, *Canals and Communities* (Tucson: University of Arizona Press, 2001), 21.

agricultural sector, examining local political institutions for irrigation is especially important.¹² Institutional collapse due to environmental change could also spur internal migration, increase dependence on outside food sources, and contribute to conflict.

Geography of Southeastern Morocco

Morocco is situated at a crossroads between Europe, sub-Saharan Africa, and the Arab world. Morocco's contemporary culture results from an indigenous Amazigh foundation overlaid with Arab conquest followed by a slow process of Arabization and then French and Spanish imperialism. My research focuses on oasis villages in the southeastern Moroccan desert, which have distinct cultural, political, and environmental characteristics. I focus on communities in the Drâa-Tafilalet region of Morocco and especially villages near the Ziz Oasis in the Tafilalet area. Figure 2.1 shows the locations of my interview sites within Morocco while Figure 2.2 shows them relative to the Morocco-Algeria border. Some important geographical characteristics of southeastern Morocco are its high concentration of Amazigh people, its location at the edge of the Sahara desert, and its cultural and political marginality within Morocco and the broader Arab world.

¹² Hafez Ghanem, "Agriculture and Rural Development for Inclusive Growth and Food Security in Morocco," 1, Brookings Institution, published February 2015, https://www.brookings.edu/wp-content/uploads/2016/07/Agriculture_WEB_Revised.pdf.

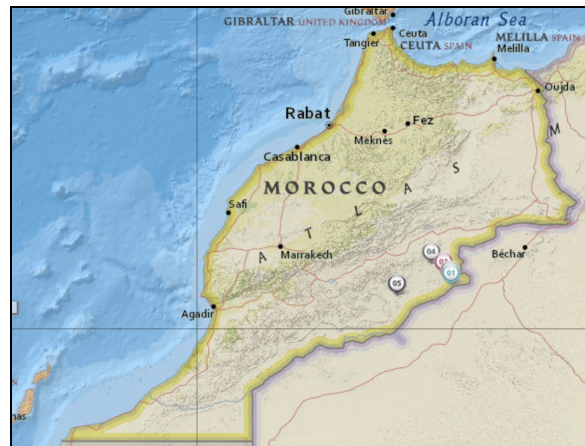


Figure 2.1: Map of interview sites within Morocco.

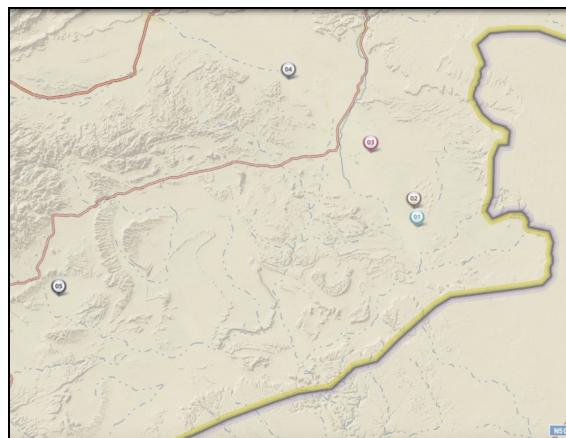


Figure 2.2: Map of interview sites relative to the Moroccan-Algerian border.

Key: 1: Merzouga, 2: Hassi Labied, 3: Haroun, 4: Fezna and Walad Jalal, 5: Khettāret A'ashīsh

Before Arabs arrived in North Africa in the eighth century, Amazigh people, often known

in the English-language discourse as Berbers, lived in the region for millennia.¹³ Gradually, Amazigh and Arab people intermarried and the indigenous Amazigh culture mixed with the exogenous Arab one. Today, most Moroccans have Amazigh ancestry but fewer of them speak Amazigh languages, which are distantly related to Arabic but not mutually intelligible. Morocco ranks first among North African countries in terms of speakers of Amazigh languages, with

¹³ Bruce Maddy-Weitzmann, *The Berber Identity Movement and the Challenge to North African States* (Austin: University of Texas Press, 2012.), 13-33.

approximately 40 to 45 percent of Moroccans speaking Tamazight, Tashelhit, and Tarifit.¹⁴ Both Amazigh and Arab tribes reside in southeastern Morocco.



Figure 2.3: Map of Tamazgha.

The traditional Amazigh homeland is Tamazgha, which stretches from Egypt's Siwa oasis in the east to the Canary Islands in the west and from the Mediterranean in the north to just beyond cities like Gao, Mali and Agades, Niger in the south.¹⁵ In much of Tamazgha, an Amazigh substratum influences contemporary culture. Although Morocco has an especially high proportion of Tamazight speakers today, Amazigh culture extends across North Africa; Morocco's evident Amazigh influence alongside Arab culture does not divide it from North Africa but rather connects it to populations across the region. Figure 2.3 shows the historical extent of Tamazgha according to Amazigh nationalist narratives.

Southeastern Morocco is located at the northern edge of the Sahara Desert. Deserts constitute ninety percent of Algeria, two-thirds of Tunisia, and half of Morocco.¹⁶ Arid regions face environmental challenges unlike those in temperate areas, meaning that desert societies develop solutions suiting their ecologies. Rissani, a town where I conducted research, receives an

¹⁴ Maddy-Weitzmann, *The Berber Identity Movement and the Challenge to North African States*, 1.

¹⁵ Maddy-Weitzmann, *The Berber Identity Movement and the Challenge to North African States*, 4.

¹⁶ Will Swearingen and Abdellatif Bencherifa, *The North African Environment at Risk* (Oxford: Westview Press, 1997), 4.

average of two inches of rainfall annually, necessitating irrigation to grow crops.¹⁷ Due to dwindling water supplies and a growing population, Morocco has declined from 2500 cubic meters of water per person per year in 1960 to just 500 cubic meters in 2018, putting it well below the water scarcity threshold of 1000 cubic meters.¹⁸ Southeastern Morocco's desert geography also renders it more vulnerable to the impact of climate change than other parts of the country. In particular, arid areas of Morocco experience vegetation loss that contributes to desertification.¹⁹ Vegetation loss especially impacts people living in oases as the desert encroaches on their communities. Climate change caused the Sahara Desert to expand about 10 percent from 1920 to 2013, including northward expansion into areas of North Africa.²⁰ Desertification will likely continue.

Although oases in North African deserts once enjoyed extensive political power and cultural influence, arid regions have generally experienced underdevelopment and neglect since the colonial period.²¹ Ralph Austen's book, *Trans-Saharan Africa in World History*, and Eamon Gearon's *The Sahara: A Cultural History* both present histories centered on the Sahara. Austen and Gearon show that the world's largest warm weather desert contained a vital commercial network connecting sub-Saharan Africa to the Mediterranean coast to transport salt, gold, and slaves.²² Many people in southeastern Morocco descend from nomads who participated in the

¹⁷ Ronald Messier and James Miller, *The Last Civilized Place* (Austin: University of Texas Press, 2016.), 39.

¹⁸ Hamza Guessous, "Morocco Among Countries Facing Water Scarcity," Morocco World News, February 15, 2018, <https://www.moroccoworldnews.com/2018/02/240719/morocco-countries-facing-water-scarcity/>.

¹⁹ Hespress, "Fez: jamā'a qarawiyya bi-iqlīm Errachidia tetekayyef ma' taghayur al-munākh", May 1, 2016, <https://www.hespress.com/regions/304153.html>.

²⁰ Natalie Thomas and Sumant Nigam, "Twentieth-Century Climate Change over Africa," *Journal of Climate* 31, no. 9 (March 28, 2018): 3349.

²¹ Swearingen and Bencherifa, *The North African Environment at Risk*, 5.

²² Eamonn Gearon, *The Sahara: A Cultural History* (Oxford: Oxford University Press, 2011); Austen, Ralph A. *Trans-Saharan Africa in World History*, (New York: Oxford University Press, 2010).

trans-Saharan trade before transitioning to agricultural production and more recently the tourism industry. The introduction of hard borders after independence, as well as a decades-long border war with Algeria, all but ended the nomadic lifestyle. After World War II, formerly nomadic populations settled into villages, which added a new layer to a landscape previously dominated by mud-brick castles called *qsūr* (s. *qsar*).²³

The southeastern Moroccan oasis city of Sijilmassa, located near Rissani, prospered as a center of commerce, political power, and scholarship for centuries.²⁴ As the last major trading post before the Sahara, Sijilmassa maintained a lively trade with cities like Aoudaghost in present-day Mauritania.²⁵ Controlling Sijilmassa became a stepping stone for aspiring rulers such as the Almoravids, who launched their 13th-century conquest of Morocco from the port at the edge of the desert. Ever since the Bani Midrar dynasty founded Sijilmassa in the eighth century, irrigation sustained the town and its inhabitants. Sijilmassa's first known irrigation canal, the *sāqiya midrariyya*, dates back to the Bani Midrar, who ruled the city until the late tenth century.²⁶ Canal irrigation in medieval Sijilmassa expanded as the city integrated into the Almohad and Almoravid empires. Oral tradition and archaeological evidence agree that a network of sawāqi (s. *sāqiya*) linked the Ziz and Gheris Rivers to farmland that nourished a major urban center.²⁷ However, Sijilmassa's importance declined as new trade centers rose to prominence in southern Algeria and elsewhere. Locally, fortified villages in the Tafilalet Oasis, which surrounds the Ziz River, dominated the area while Sijilmassa fell into disrepair.²⁸

²³ Susanne Steinmann, "Gender, Pastoralism, and Intensification: Changing Environmental Resource Use in Morocco," *Yale Forestry & Environmental Studies Bulletin* 103: 81.

²⁴ Messier and Miller, *The Last Civilized Place*, 26.

²⁵ François-Xavier Fauvelle, *The Golden Rhinoceros* (Princeton: Princeton University Press, 2018.), 53.

²⁶ Messier and Miller, *The Last Civilized Place*, 8.

²⁷ Messier and Miller, *The Last Civilized Place*, 51.

²⁸ Fauvelle, *The Golden Rhinoceros*, 116.

Morocco's royal family, the Alawites, emerged as princes of Tafilalet before conquering the country in the 17th century. Just as the Almoravids did centuries before them, the Alawites consolidated power in Tafilalet and used it to launch a national conquest. Under the Alawites, Tafilalet fell to the margins of a kingdom centered in Fes. Tafilalet remains marginal; the vestiges of the royal family's Tafilalet roots are limited to an Alawite research center and the mausoleum of a prominent Alawite prince. Passing the ruins of Sijilmassa, few visitors to the area realize that they look upon one of medieval North Africa's greatest cities.



Figure 2.4: Map showing the countries of the Maghreb.

Located at the edge of Morocco, which is itself at the periphery of the Arab world, southeastern Morocco is doubly marginalized. Arabic speakers call Morocco “al-Maghreb,” a word that can also refer to the countries of North Africa shown in Figure 1.4. The word Maghreb means “western place” because it lies far to the west of traditional Arab power centers like Baghdad, Damascus, and Cairo. The division between the Maghreb in the west of the Arab world and the Mashreq in the east carries a political dimension as well. Long distances from centers of Arab power in Damascus and Baghdad have historically afforded the Maghreb with a large degree of autonomy under various Islamic empires. That autonomy has manifested itself in regional kingdoms such as the Almoravids, Almohads, Marinids, Hafsids and Barbary states. It

would be a mistake to confuse autonomy for isolation, however. On the contrary, Morocco has been an important participant in both Saharan and Mediterranean political, commercial, and social systems despite its distance from their centers.

In the contemporary Maghreb, economic activity and political authority center on urban areas in the Mediterranean climes of the northern coast. Therefore, southeastern Morocco lies on the margin of the country. Within Morocco, a traditional internal distinction divides *bilād al-makhzan*, the land of the royal court, from *bilād al-sība*, the land of anarchy.²⁹

In recent history, southeastern Morocco has belonged to *bilād al-sība* and therefore did not see extensive investment in large-scale, centrally planned irrigation projects.³⁰ Bureaucracies managed those large-scale irrigation projects with limited involvement from farmers.³¹ While large-scale irrigation predominates in coastal lowlands of the makhzan, traditional, communally managed irrigation systems such as the *sāqiya* and *khattāra* prevail in the desert.³² Villages built in the 20th century adopted those centuries-old systems even as the Moroccan government invested in large water projects elsewhere. Tribes in southeastern Morocco, especially the Ait Khabbash, earned a reputation for rebelling against French colonial rule and have at times enjoyed de facto independence from the Moroccan state. The context of quasi-independence facilitated the development of grassroots political institutions, often related to the tribe rather than the state, throughout *bilād al-sība*.³³

²⁹ Joffé, “Traditions of Governance in North Africa,” 726.

³⁰ Swearingen, *Moroccan Mirages*, 11.

³¹ Marcel Kuper et al, “Supporting the Shift from State Water to Community Water,” *Ecology and Society* 14, no. 1 (2009): 132-148.

³² Swearingen, *Moroccan Mirages*, 11.

³³ Joffé, “Traditions of Governance in North Africa,” 727.

Describing the Saqiya and Khettara

The sāqiya and khettāra are physical structures, the former a canal and the latter a tunnel, that carry water from a source to a population center for irrigation. In addition to the tangible elements of the sāqiya and khettāra, a set of norms and practices govern the sāqiya, the khettāra, and their waters within a small community of farmers. Although the sāqiya and khettāra can exist independently, my research occurred in communities that use a connected sāqiya and khettāra system.

The khettāra is a tunnel dug at a slight decline to allow water to flow from one location to another using gravity.³⁴ A khettāra relies on a water table at one point that is higher than the ground level at another point. For example, a khettāra may carry mountain spring water underground because the khettāra's tunnel slants downwards, but the surface slants to a lesser degree.³⁵ Thus, the khettāra eventually surfaces even as gravity continues to pull the water that flows through it.



Figure 2.5 (Courtesy of Google Earth): A khettara from above. al-Fallah)



Figure 2.6 (Courtesy of Said

³⁴ Interview with Muhammad Aoujil, November 6, 2017.

³⁵ Interview with Muhammad Lquz, December 20, 2017



Figure 2.7 (Courtesy of Said al-Fallah): An empty khattāra.

People construct khattārat by digging wells and then connecting them laterally with a tunnel.³⁶ Figure 2.7 shows the inside of an empty khattāra tunnel. A functioning khattāra would be full of water. Those wells also serve as access shafts for maintenance and are surrounded by a mound on the surface that allows the shaft openings to remain visible after a sandstorm.³⁷ From a bird's eye view, a khattāra appears to be a line of wells leading towards a population center, as Figure 2.5 shows.

Once a khattāra reaches a population center, it surfaces to become a sāqiya. The sāqiya continues at a slight decline and runs perpendicular to a row of fields, which are themselves arranged at an incline so that they descend away from the sāqiya. Those fields are typically located at the edge of a *wād*, an ephemeral riverbed that accumulates water after major rainfall.³⁸ The arrangement of the sāqiya and adjacent fields facilitate the controlled flooding of agricultural plots. Figure 2.8 shows a sāqiya running alongside crops in Merzouga.

³⁶ Interview with Said al-Fallah, December 18, 2017.

³⁷ Interview with Said al-Fallah, December 18, 2017.

³⁸ Interview with Muhammad Aoujil, November 6, 2017.



Figure 2.8: The sâqiya of Tamazant in Merzouga.

Institutional and technological relatives of both the sâqiya and khettâra, which overlap in southeastern Morocco, have spread across the world in parallel with imperial expansion, religious proselytism, and settler colonialism. The Arab world in general and the Maghreb in particular contain large numbers of khettâra-related systems. However, other patterns of proliferation go far beyond the Arab world. Systems related to the khettâra are used in places as disparate as Mexico, Oman, and China.³⁹ After the sâqiya reached al-Andalus, as Muslims called the Iberian Peninsula, it remained a part of southern Spanish agricultural life long after the Reconquista and eventually arrived in Spain's colonies.

Definitions

This study will use the terms “stakeholders” and “irrigation community,” in reference to the group of people who use, govern, and manage the sâqiya and khettâra. The *shaykh as-sâqiya* (p. *shyūkh as-sâqiya*) is the person an irrigation community elects to oversee the sâqiya and khettâra. “Water chief” or “irrigation chief” are approximate English translations for shaykh as-sâqiya.

³⁹ Dale Lightfoot, “Moroccan Khettara: Traditional Irrigation and Progressive Desiccation,” *Geoforum* 27, no. 2 (1996): 262; Scarborough, *The Flow of Power*, 45

This research adopts Elinor Ostrom's definition of institutions. Ostrom defines institutions as "the prescriptions that humans use to organize all forms of repetitive and structures, including those with/in families, neighborhoods, markets, firms, sports leagues, churches, private associations, and governments at all scales."⁴⁰ Therefore, I refer to the practices and norms that govern the *sāqiya* and *khettāra* as institutions because irrigation is a repetitive act within a community.

III. Literature Review

In examining the governance of southeastern Moroccan irrigation systems, this research contributes to studies on irrigation and governance in North Africa by utilizing a theoretical framework that combines governing the commons and democratic political culture. In particular, the research shows that informal democratic institutions govern the *sāqiya* and *khettāra* irrigation system. Therefore, a variety of historical, ethnographical, and political works concerning political institutions, water, and environment inform my research, complement my primary sources, and reinforce my conclusions. The literature on the politics of irrigation provides a comparative functional lens for understanding the *sāqiya* and *khettāra* in relation to similar systems around the world. My theoretical framework combines two conceptual lenses: institutions for governing the commons and traditions of North African political culture. Together, those lenses form the conceptual scaffolding for this research to complement the functional aspect.

⁴⁰ Elinor Ostrom, *Understanding Institutional Diversity* (Princeton: Princeton University Press, 2009), 3.

Politics of Irrigation

Many scholars have written on the role of irrigation in forming political structures and vice versa. Early literature on water politics focused on large-scale, centralized irrigation projects. Karl Wittfogel's 1957 book *Oriental Despotism: A Comparative Study of Total Power* argued that entrenched, centralized political power grew out of despotic states' control of large water projects. Wittfogel's theory of hydraulic despotism stimulated academic discussion about the relationship between water and political institutions. However, Wittfogel primarily discusses models of large-scale state coercion rather than small-scale community cooperation. Even in his discussion of relatively decentralized systems of political control in feudal Europe, rigid social and political hierarchies mark institutions of resource management. Wittfogel's model does not apply to the sāqiya and khettāra system, where authority rises from the bottom up instead of descending from the top down.

The sixty years since Wittfogel's writing have seen rising interest in small-scale irrigation and grassroots political institutions. My research shows an example of an arid irrigation system with governing institutions based on consensus and representation, thereby also challenging the conclusions of Clifford Geertz. Geertz's "The Wet and the Dry" compares the environmental politics of two small-scale irrigation systems, one in Bali and the other in Morocco. Geertz argues that arid regions are characterized by less democratic forms of water governance than water-rich regions. According to Geertz, "it is in part that [arid] climate which projects the aura of irregularity and tension," thereby incentivizing competition for water resources instead of cooperation.⁴¹ In her article on the Seguia Khrichfra irrigation system in northern Morocco,

⁴¹ Clifford Geertz, "The Wet and the Dry," *Human Ecology* 1, no. 1 (1972):38.

Saskia van der Kooij reinforces Geertz's assertion that "what institutions are and what they do is intimately linked to the types of distributional dilemmas they have to deal with."⁴² Whereas van der Kooij does not challenge Geertz's correlation between aridity and social tension, John Welch's chapter in *Canals and Communities* does just that. Welch demonstrates that there is not a significant correlation between the availability of water and the extent of democratic governance institutions for that water.⁴³ Geertz's article and Welch's response presents an argument within the field of political ecology about how arid climates impact political institutions. My research builds on Welch's argument by showing well-functioning arid irrigation systems based on communal cooperation.

The khettāra belongs to a global family of *qanāt* systems, which are underground tunnels for transporting groundwater. Originating in ancient Persia, qanāt systems spread throughout the Persian Empire before Arabs adopted the technology and brought it with them across North Africa. Also called foggāra, khettāra, falaj, and karez, qanāt systems exist in various parts of the world and are especially prevalent in the Middle East and North Africa. Analyses of qanāt systems originate in a wide range of disciplines and provide methodological guidance as well as points of comparison for my thesis. Remini Boualem's article on the foggara in southern Algeria proves that the pairing of qanāt and sāqiya systems is not limited to Morocco, but rather extends to other parts of Saharan North Africa.⁴⁴ The geographer Dale Lightfoot has written extensively on qanāt systems, including the khettāra of Morocco. His work clarifies the technical

⁴² Saskia Van der Kooij, Margreet Zwarteveen, and Marcel Kuper "The Material of the Social: The Mutual Shaping of Institutions by Irrigation Technology and Society in Seguia Khrichfa, Morocco," *International Journal of the Commons* 9, no. 1 (March 16, 2015): 131.

⁴³ John Welch, "The Dry and the Drier" in *Canals and Communities*, ed. Jonathan Mabry (Tucson: University of Arizona Press, 1996), 69-87.

⁴⁴ Remini Boualem, Achour Bachir, and Kechad Rabah, "The Foggara: A Traditional System Of Irrigation In Arid Regions," *GeoScience Engineering* 60, no. 2 (2014): 31.

functionality of the khettāra and inspired me to use satellite imagery to show the physical structures of the sāqiya and khettāra. Most research on qanat systems primarily addresses their history, construction, and function. My research fills a gap in the literature by analyzing the social and political institutions associated with the khettāra.

On a larger scale, some scholars have drawn from a broad range of case studies to come to general conclusions about the politics of irrigation. Jonathan Mabry's *Canals and Communities* and Vernon Scarborough's *The Flow of Power* help contextualize the khettāra and sāqiya governance system among other methods of governing small-scale and traditional irrigation systems. Mabry's book features two chapters explicitly dedicated to irrigation in Morocco.⁴⁵ Scarborough and Mabry provide this research with functional frameworks applicable to water politics and show the importance of governing institutions around irrigation.

A wealth of academic literature focuses on the New Mexican acequia system, an extant system of small-scale irrigation related to the sāqiya. The acequia evolved from Morocco's sāqiya by way of Spain, exists in a similar environmental context, and uses similar governance structures, therefore warranting a brief discussion of acequia institutions to inform this research. Juan Arellano, a New Mexican poet and writer, describes the cultural origins and role of the acequia in New Mexican society, including mention of the acequia's ties to Morocco.⁴⁶ Jose Rivera provides a more academic analysis of the history and political culture of acequia communities as well as their contemporary role in rural New Mexico. Arellano's and Rivera's books on the acequia helped me understand the informal political institutions that surround small-scale irrigation in arid regions. Rivera describes acequia governance as "a system of direct

⁴⁵ Mabry, *Canals and Communities*, chapters 4 and 6.

⁴⁶ Arellano, *Enduring Acequias*, 27.

democracy where all irrigators participate in the functioning and operations of their institution.”⁴⁷

In an article co-written with Thomas Glick, a historian of medieval Spain, Rivera remarks that “irrigators own the acequia watercourses, regulate them, police them, and maintain them from generation to generation, all the while perpetuating a sense of place and a system of direct, participatory democracy.”⁴⁸ Glick and Rivera’s description of the New Mexican acequia could just as well apply to the Moroccan sāqiya. They also write that water democracy is not limited to New Mexico; they say “the acequia persists as a transplanted Iberian civil and social institution” and that the Iberian institution has Islamic origins.⁴⁹ This research takes Rivera’s work a step further by directly examining the institutions of Morocco’s sāqiya communities, partially through the lens of the acequia.

Theoretical Framework

Approaching the sāqiya and khettāra from the perspectives of neo-institutionalism and regional political culture, I selected two discrete bodies of relevant academic literature: theory on governing the commons and theory on democratic institutions in North Africa.

Because the sāqiya and khettāra irrigation system is communally owned, used, and governed, political theory concerning governing the commons frames my research. In particular, Elinor Ostrom’s books on institutions and common-pool resources analyze how societies govern the commons. Ostrom identifies a tension between scholars who propose that the state can best govern common resources and those who believe that the free market ought to regulate those resources.⁵⁰ In response, Ostrom observes that “communities of individuals have relied on

⁴⁷ Rivera, *Acequia Culture*, xxi.

⁴⁸ Jose Rivera and Thomas Glick, “Iberian Origins of New Mexico’s Community Acequias,” accessed March 18, 2019, <http://www.newmexicohistory.org/people/iberian-origins-of-new-mexicos-community-acequias>.

⁴⁹ Rivera and Glick, “Iberian Origins of New Mexico’s Community Acequias.”

⁵⁰ Elinor Ostrom, *Governing the Commons* (Cambridge: Cambridge Univ Press, 1990.), 1.

institutions resembling neither the state nor the market to govern some resource systems with reasonable degrees of success over long periods of time.”⁵¹ She also critiques previous models used to understand the commons, particularly the tragedy of the commons,⁵² the prisoner’s dilemma,⁵³ and the logic of collective action. Each of those models indicates that people prioritize their individual welfare over collective welfare, leading to the degradation of shared resources. Ostrom asserts that no single solution can apply to every case of communal resource management. She also writes that in the tragedy of the commons, prisoner’s dilemma, and logic of collective action models “individuals are perceived as being trapped in a static situation, unable to change the rules affecting their incentives.”⁵⁴ Instead of relying on models and metaphors, Ostrom turns to empirical evidence -- real-world communities of individuals who have constructed cooperative institutions to successfully and sustainably govern common-pool resources. In Ostrom’s assessment, institutions that govern the commons often transcend the neat public-private dichotomy that has informed policymakers. Ostrom does not explicitly employ the language of democracy. However, her descriptions of self-governing communities that practice collective decision-making, build accountability structures, and establish and enforce norms can serve as a bridge connecting common-pool resource governance to democratic political culture.

Ostrom uses case studies that, like the sāqiya and khettāra irrigation system, are self-organized and self-governed. The institutions in her case studies involve relatively small communities and govern scarce renewable resources that are vital to economic productivity.⁵⁵

⁵¹ Ostrom, *Governing the Commons*, 1.

⁵² Ostrom’s work challenges James Hardin’s influential 1968 article “The Tragedy of the Commons,” which asserts that individual incentives to overuse communal resources lead to their depletion.

⁵³ The prisoners’ dilemma is a game that shows why rational actors may choose not to cooperate, even though it may be in their best interest to do so. The game is often used to explain cooperative situations.

⁵⁴ Ostrom, *Governing the Commons*, 182.

⁵⁵ Elinor Ostrom, *Governing the Commons*, 26, 182.

The small irrigation communities that govern water in southeastern Morocco fit in well with Ostrom's analysis, although she does not specifically discuss them. However, many of Ostrom's case studies come from other irrigation systems, including the *huerta* system of Valencia⁵⁶ and the *zanjera* system of the Philippines.⁵⁷ Both of those systems bear close institutional resemblance to the *sāqiya* and *khettāra* system in terms of water allocation methods, governance structure, and the rights and responsibilities of elected leaders. The historical connections between Morocco and Spain during the Andalusian period and between Spain and the Philippines from the 16th to 19th centuries indicate that the *huerta*, *zanjera*, and *sāqiya* may derive from common roots in medieval Morocco.

This research shows that grassroots water politics in rural southeastern Morocco are part of a democratic political culture. Using case studies from rural irrigation communities in southeastern Morocco, I apply Ostrom's work on managing of common-pool resources to counter claims that regional culture makes the Middle East and North Africa unsuitable for democratic governance. Amartya Sen proposed the universality of democratic values, but George Joffé specifically highlighted institutions based on consensus and consultation in the North African context. My research shows those values of consensus and consultation extend to governing the *sāqiya* and *khettāra* system.

Amartya Sen's 1999 article "Democracy as a Universal Value" refutes claims of inherent cultural incompatibility with democratic governance.⁵⁸ Sen makes the case that societies around the world value the underlying principles of liberal democracy, including allegedly illiberal societies in the Muslim world. He acknowledges that opposition to democratic practices can be

⁵⁶ Elinor Ostrom, *Governing the Commons*, 26.

⁵⁷ Elinor Ostrom, *Governing the Commons*, 82.

⁵⁸ Amartya Sen, "Democracy as a Universal Value," *Journal of Democracy* 10 (3): 3-17.

found in intellectual traditions around the world, including those from western Europe. On the other hand, he also points to the diversity of Islamic, Chinese and Indian intellectual traditions, all of which contain schools of thought that recognize the value of democracy. However, Sen's argument primarily addresses the realm of high politics and philosophy, dealing with democracy as a system for governing an entire state.

Other scholars addressing the suitability of democracy in the Islamic world have also focused largely on state-level governance. Shadi Hamid, for instance, argues that Western liberal democracy is incompatible with Islamic models of governance.⁵⁹ Although Hamid arrives at a different conclusion from Sen, he also only analyzes governance at the highest levels of the state. Implicit in these arguments is the assumption that democratic institutions disperse from the top of a society downward rather than rising from the grassroots upward. Fewer studies have focused on the local political institutions with which people in the Middle East and North Africa interact on a daily basis. Those institutions at the local level may contain guidance for forming national institutions that are more compatible with an existing political culture. Thus, this research contributes to the current discourse by showing that Sen's core argument applies to grassroots institutions, using Elinor Ostrom's framework as a lens.

George Joffé's 2015 article "Traditions of governance in North Africa" bridges between Sen's article and the political culture of North Africa. Arguing that popular protest movements in North Africa have drawn from indigenous political culture in addition to Western democratic prescriptions, Joffé highlights a history of consultative and consensual political culture in North Africa. Joffé's examples counter claims of Arab exceptionalism, which is the idea that "Arab and

⁵⁹ Shadi Hamid, *Islamic Exceptionalism* (New York: Saint Martins Griffin, 2017).

Muslim societies are temperamentally unsuited to the complexities of democratic politics.”⁶⁰

Joffé builds on the work of anthropologists Ernest Gellner and David Hart, both of whom studied informal, indigenous political institutions that developed independent of the government within Moroccan tribal structures. According to Joffé, Gellner and Hart argued that “the concepts behind [indigenous political practices] did constitute a traditional political culture which should, as a result, still find an echo today in the much more recent political experiences of the contemporary countries of the Maghrib.”⁶¹ Joffé goes on to analyze four cases that he claims contribute to “a consensual and consultative political culture which provides a rich parallel tradition to the prescriptive narrative of democracy that has been articulated by the Western world.”⁶² One of those cases focuses on rural political institutions in the Maghreb, while the other three address Islamic ideals of governance (which are similar to those Sen describes), political dynamics of the Moroccan sultanate, and contemporary Maghrebi politics.⁶³

My research shows that the governing institutions of the *sāqiya* and *khattāra* demonstrate the existence of a democratic political culture in southeastern Morocco. Ostrom’s analysis helps my work by showing that small-scale institutions for governing common-pool resources, such as irrigation systems, provide fertile ground for political institutions based on consultation and consensus. Joffé, on the other hand, bears relevance to my research because he makes the case that the political culture of North Africa does not only derive from high politics. Joffé argues that local, indigenous institutions such as “village-based democracies” in the Algerian region of Kabylie and the election of Ait ‘Atta confederacy chiefs in southern Morocco call attention to a

⁶⁰ George Joffé, “Traditions of governance in North Africa,” *Journal Of North African Studies* 20, no. 5 (December 2015): 723.

⁶¹ Joffé, “Traditions of governance in North Africa,” 723.

⁶² Joffé, “Traditions of governance in North Africa,” 723.

⁶³ Joffé, “Traditions of governance in North Africa,” 723-724.

democratic dimension of North Africa's political culture.⁶⁴ My research uses Ostrom and Joffé to expand on Sen's argument, showing there is institutional diversity in the Islamic world that includes democratic values at the local level.

IV. Methodology

In December 2017, I bought a bus ticket from Meknes, where I lived at the time, to Merzouga. I had spent several weeks planning the trip with Youssef Aoujil, a student at Meknes' Moulay Ismail University with roots in the southeast. In November, I interviewed Youssef's father, Muhammad, who had farmed using the *sāqiya* and *khettāra* before joining the military and moving away from home. Muhammad's interview helped orient me and informed the planning process. Setting out with Youssef on my third of four trips to Merzouga, I planned to speak with subsistence farmers about irrigation in their communities. Once we arrived, I met Youssef's uncle Said, a farmer himself, who connected me with many of the participants in this study. I used a mix of semi-structured interviews and observations for my research. In all, I completed seventeen interviews with from November 6 to December 21, 2017.

Interviews

I chose a semi-structured format for my interviews and prepared a list of questions for my research. Interviewees answered questions concerning political structures and customs associated with the *sāqiya* and *khettāra*. Keeping democratic institutions in mind, I was particularly interested in hearing about the social contract between water users and water authorities. I also tried to understand the relationships between members of an irrigation community to clarify how power and authority are distributed within institutions. In writing my preliminary questions and

⁶⁴ Joffé, "Traditions of governance in North Africa," 728.

asking clarifying questions, I remembered George Joffé's concepts of consultation and consensus, using those as a basis for understanding how informal democratic institutions act on a small scale. The Stanford Encyclopedia of Philosophy defines democracy as a "method of group decision making characterized by a kind of equality among the participants at an essential stage of the collective decision making."⁶⁵ The concept of "group decision making" overlaps with Joffé's principles of consultation and consensus. Drawing from the Stanford Encyclopedia of Philosophy, I also paid attention to the levels of equality in participation between members of the irrigation community. Outside of the scope of my questions, interviewees also described agricultural practices, oral histories, conflict resolution mechanisms and maintenance requirements surrounding khettāra and sāqiya irrigation. The semi-structured format allowed me to ask follow-up questions, clarify ambiguities, and request examples. I sometimes skipped questions if interviewees answered them during a previous response.

I recruited interviewees with the help of my friend Youssef Aoujil and his uncle Said al-Fallah, who is a farmer in the Tamazant irrigation community of Merzouga. Many of my interviewees were friends, neighbors, and relatives of Youssef and Said. Youssef and Said helped me gain trust among interviewees due to their social and cultural position in the area. I observed that interviewees who did not know Youssef and Said asked more questions about my research and motivations than those who knew them. This hesitance became more pronounced in areas outside of their tribe, the Ait Khabbash. In some cases, interviewees directed me to other people, especially shyūkh as-sāqiya, who they believed would be interested in my research. In a few cases, I recruited candidates by approaching farmers in their fields and introducing myself

⁶⁵ Tom Christiano, "Democracy," *The Stanford Encyclopedia of Philosophy* (Fall 2018 Edition), Edward N. Zalta (ed.), <https://plato.stanford.edu/archives/fall2018/entries/democracy/>.

and my research before asking if they wished to participate in an interview. At the beginning of each interview, I received oral informed consent from each interviewee.

My recruitment methods meant that my research results are based on a convenience sample. The people participated in this study were male subsistence farmers engaged in small-scale canal irrigation in southeastern Morocco. Their ages ranged from 37 to 75. I did not actively seek out female interviewees because approaching a woman to ask about farming and irrigation would violate social norms that frown upon substantive interactions between men and women who are not related by blood or marriage.

I conducted sixteen interviews in Merzouga, Rissani, Hassi Labied, Fezna, Walad Jalal and Khettāret A'ashīsh, which appear in Figure 4.1. I conducted interviews in people's homes, workplaces, and fields. I completed my interview with Muhammad Aoujil outside of Drâa-Tafilalet, although he grew up in Merzouga and his father served as shaykh of Tamazant

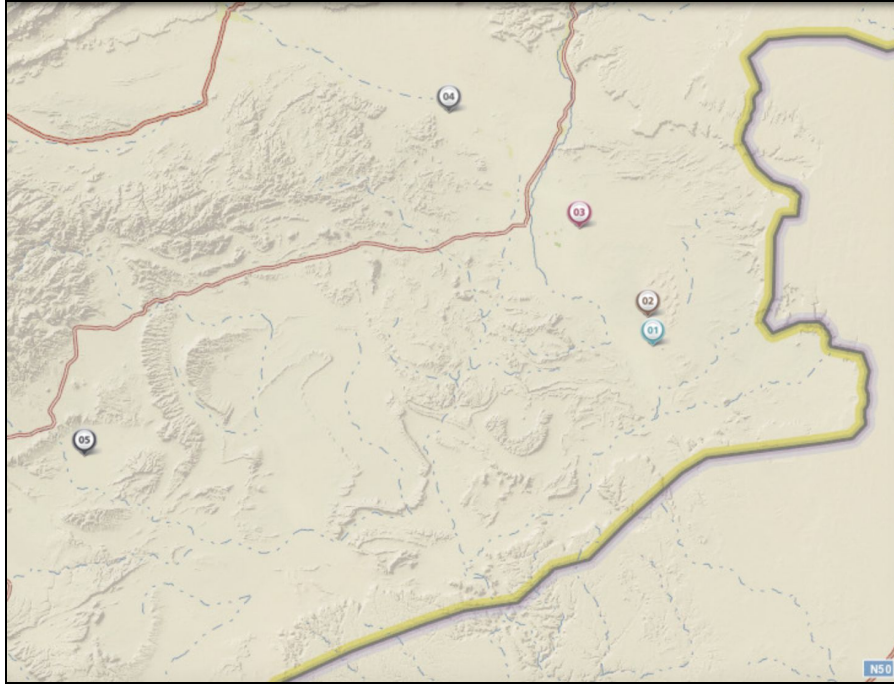


Figure 4.1: Map of interview sites relative to the Moroccan-Algerian border.

Key: 1: Merzouga, 2: Hassi Labied, 3: Haroun, 4: Fezna and Walad Jalal, 5: Khettāret A'ashīsh

Observations

In most cases, I interviewed research participants in or adjacent to their fields, allowing me to record field notes about my surroundings. In Khettaret A'ashish and Merzouga, interviewees gave me extended tours of their irrigation communities. We walked through fields, beside the sāqiya, and along the khettārat while interviewees answered questions and commented on our surroundings. In Fezna, Bashir Jakani allowed me to descend into a large, empty khettāra that he told me dates to the 11th century. I also photographed interview sites during and after each experience. While interviewing the shaykh of Tamazant, a farmer from the Tahafit sāqiya community approached the shaykh with a dispute. I observed and took notes during the exchange, which formed the beginning of a conflict resolution process.

Limitations

Language sometimes posed a barrier during the interview process. Although I speak Modern Standard Arabic and a northern dialect of Moroccan Darija, many people in southeastern Morocco speak Tamazight as a first language, which is mutually unintelligible with Arabic. The southeastern dialect of Moroccan Darija often incorporates vocabulary from Tamazight. Some of that vocabulary is key to discussions about the *sāqiya* and *khettāra*. I encountered interviewees who used the Tamazight words *inghorān* and *hāssi* instead of the Arabic *khettāra* and *bīr* (well). To overcome linguistic barriers, I sometimes used Youssef and Said as intermediaries between Modern Standard Arabic, local dialects, and Tamazight. Ideally, I would have liked to conduct each interview in the dialect or dialects of an interviewee's choice, which may have included French, Tamazight and various dialects of Moroccan Darija.

My dependence on Youssef and Said limited my results in that I relied on their personal connections for the majority of my interviews, which were concentrated mainly in and around the town of Merzouga. Their connections outside of the area were more sparse. I did not spend enough time in Merzouga to cultivate relationships beyond those of the Aoujil family. If I had lived in Merzouga full-time and had fewer time constraints, I would have recruited participants more systematically.

V. Results and Analysis

Five major themes emerged during my field research: the ways of defining the irrigation community, the methods of water distribution, the process of choosing the leader of an irrigation community, the responsibilities and authorities of those leaders, and the ways in which irrigation communities respond to change. Each of the following subsections addresses one of those

themes. Throughout this section, institutional arrangements and management practices reveal the underlying democratic values and principles that govern the *sāqiya* and *khettāra*.

Defining the Sāqiya Community

Defining an irrigation community is crucial to analyzing its political institutions because such an analysis requires identifying who creates and participates in those institutions. To determine the level of democratic political culture in southeastern Moroccan irrigation governance, I must first identify who and what is governed. The flow of the *sāqiya* clearly defines each irrigation community, meaning that people who do not own land adjacent to the *sāqiya* cannot participate in *sāqiya* institutions or use the *sāqiya*'s waters. Ostrom confirms the importance of such a physical definition, noting that successful irrigation communities need to clearly define the area that they serve and the individuals who can use water resources.⁶⁶

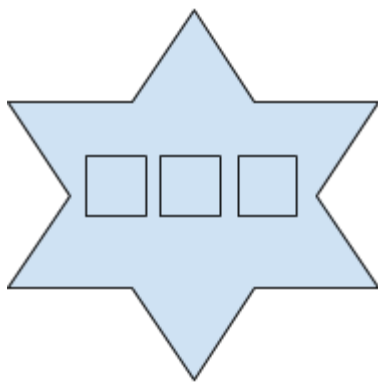


Figure 5.1

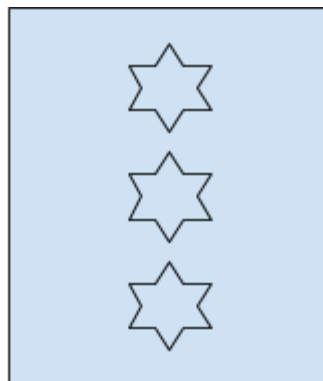


Figure 5.2

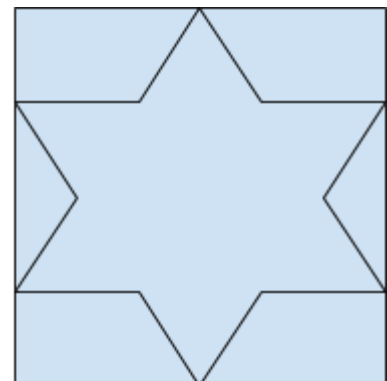


Figure 5.3

Key: Stars represent the governing institutions of towns and squares represent the governing institutions of *sāqiya* communities.

A *sāqiya* community may or may not completely overlap with a town or village. In Merzouga, the three *sāqiya* communities of Tamazant, Tahafit, and Tamarikht neighbor one another but operate independently. Figure 5.1 represents this configuration, in which the community of the town, represented in the figure by a star, contains three irrigation communities,

⁶⁶ Mabry, *Canals and Communities*, 12.

which are represented by squares. On the other hand, one khettāra community can comprise of individuals from multiple towns. Figure 5.2 shows a multi-town, single-irrigation community configuration, with the stars representing towns and the square representing a broader irrigation community that uses a common water source. In qsar communities like Haroun, the sāqiya community not only overlaps entirely with the qsar community, but the governance structures of the sāqiya and the qsar coexist in a common institutional framework. A majles ash-shyūkh governs each qsar and elects from among their ranks a shaykh al-ghāba and a shaykh al-qsar. The shaykh al-ghāba is responsible for governance of the sāqiya, khettāra and the farmland that they irrigate while the shaykh al-qsar is responsible for governance of the fortified town.⁶⁷ Town government and sāqiya institutions may coincide in qsūr due to the longstanding tradition of governance by council in those communities, providing a convenient structure which has developed in tandem with sāqiya governance. Figure 5.3 shows the qsar configuration, where governance of a water community and town overlap in a single institution.

An irrigation community's name can indicate who that community includes and excludes. Naming conventions of irrigation communities vary, with some names describing geographic locations while others derive from kinship groups or descriptors of the irrigation community itself. The towns of Khettaret A'ashish and Hassi Labied take their names from water infrastructure: the former means the khettāra of A'ashish, which is a larger, nearby village, and the latter means "white well." The fact that towns take their names from wells or khettārāt shows the significance of water in southeastern Morocco. In other cases, an irrigation community borrows its name from the town. This naming practice appears to be especially common when a

⁶⁷ Interview with Ali Ou Aabi, December 21, 2017.

town only has one irrigation community, as was the case in Walad Jalal. Those names indicate that the community can include all landowners in the village. The Tahafit irrigation community takes its name from the kinship group that uses it, which is called the Ait Hafit. Naming an irrigation community after a kinship group implies that, to some extent, that kinship group has a special connection to the community either as founders or exclusive users. Finally, some irrigation communities carry names based in their attributes; Tamazant, for example, connotes that the community is small while Tamarikht means “salty water.”⁶⁸ Both of those communities include members of various kinship groups within the Ait Khabbash tribe. The variation in naming customs for irrigation communities shows that communities define themselves in different ways, with some presenting their geographic or kinship affiliations while others describe their water.

Exclusive membership characterizes the sāqiya irrigation communities where I conducted interviews. Therefore, only people who pay dues and hold land can use the waters of the sāqiya. However, the concept of property ownership in sāqiya communities is blended between communal and private. In Merzouga, one individual holds the deed to all of the plots in the Tamazant community.⁶⁹ Despite exclusive legal ownership, different families farm their own plots and Moroccan law dictates that they own that land on a de facto basis.⁷⁰ The hybrid land ownership arrangement indicates a high degree of trust among the members of a community and a willingness to operate without formalizing land ownership. The physical structures of the sāqiya and khattāra are considered communal property, as are their waters. The underlying reasons for a hybrid model of land and water ownership remain unclear. However, keeping the

⁶⁸ Interview with Muhammad Aoujil, November 6, 2017.

⁶⁹ Interview with Ahmed Aoujil, December 18, 2017.

⁷⁰ Interview with Ahmed Aoujil, December 18, 2017.

sāqiya and khattāra out of private hands ensures that each member of an irrigation community holds a stake in maintaining their physical structures, thereby incentivizing collective, democratic decision-making. Formalizing land ownership allows members of a sāqiya community to more easily define the extent of their communal land without complicating the relationships between landowners or needing to secure new deeds to divide up land after inheritance.

Methods of Water Distribution

Across southeastern Morocco, communities rely on sāqiya irrigation channels for small-scale, subsistence agriculture. Those communities grow a variety of crops including date palm, carrot, garlic, onion, eggplant, parsnip, beans, tomatoes, okra, barley, cumin, parsley, henna, and fodder. For farmers living on the edge of the Sahara, the sāqiya provides a regular source of water to irrigate their families' plots. The satellite images below show the towns of Hassi Labied (5.4), Merzouga (5.5), and Khettāret A'ashīsh (5.6), three of the communities in which I interviewed farmers about irrigation and the grassroots political institutions that govern it.

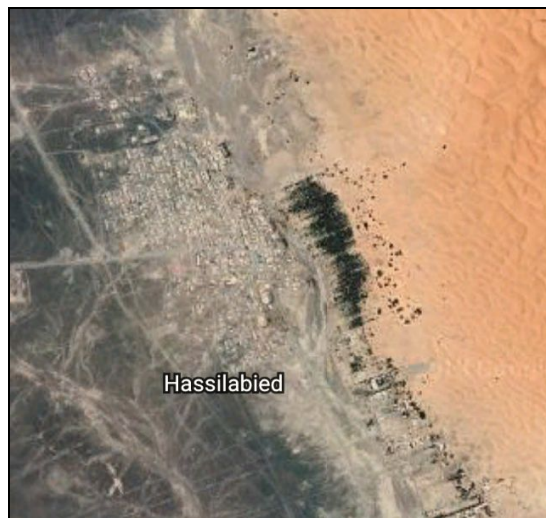


Figure 5.4 (Courtesy of Google Earth): Satellite image of Hassi Labied.



Figure 5.5 (Courtesy of Google Earth): Satellite image of Merzouga.



Figure 5.6 (Courtesy of Google Earth): Satellite image of Khettaret A'ashish

Each sāqiya community I visited distributes water to stakeholders on a rotation in which each water holder is allocated a certain amount of time to irrigate their fields in proportion to the size of their plot. Figure 5.7 shows a sāqiya channel flowing in Merzouga. In the lower left corner of the photo, an earthen barrier blocks the water from flooding a plot. To inundate their plots, a farmer removes the barrier with a shovel during their allotted time and then replaces the barrier when their time slot ends. Figure 5.8 shows water flowing out of the sāqiya, streaming down the slight incline of a farmer's land to flood one plot and then continue into the next.



Figure 5.7: The sāqiya in Merzouga.



Figure 5.8: Inundating a plot.

The number of days in a rotation is typically based on the original number of families who established a sāqiya community. Table 5.1 shows a 4-day cycle with eight plots. As I found in most communities, each plot shown in the table switches between time slots during the day and during the night to balance against the effects of evaporation.

Table 5.1: Sample irrigation cycle.

	Day 1	Night 1	Day 2	Night 2	Day 3	Night 3	Day 4	Night 4
Even Week	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7	Plot 8
Odd Week	Plot 2	Plot 1	Plot 4	Plot 3	Plot 6	Plot 5	Plot 8	Plot 7

In practice, most communities use rotations more complex than the one outlined in Table 5.1. Four families established the Tamazant community in Merzouga in the 1950s. Because four families started Tamazant, the rotation consists of a number of days divisible by four. Today, Tamazant's sixteen plots, which are themselves divided into sub-plots, associate with time slots on an eight-day cycle and switch off between a daytime and nighttime slot.⁷¹ Since Tamazant is a relatively small *sāqiya* community, its rotation is relatively simple.

By contrast, seven families established Khettaret A'ashish, which operates on a seven-day cycle in the summer and a fourteen-day cycle in the winter. Each family originally held water rights for a full day of the summer cycle and divided that day among their members.⁷² Today, the descendants of the original families each hold rights to a time slot proportional to the size of their plot. If one landholder owned a quarter of one family's original plot, they would receive six hours of water in the summer, switching off each cycle between nighttime and daytime slots. In practice, those slots are often divided into half-hour increments.

⁷¹Interview with Muhammad Ait Khuya, December 19, 2017.

⁷²Interview with Muhammad Lquz, December 20, 2017.



Figure 5.9: The sâqiya of Khettaret A'ashish

Scholars have developed two broad categories for understanding the link between land ownership and water rights in irrigation communities: the Yemenite and Syrian models. In the Syrian model, water rights are inseparable from land ownership and are distributed in proportion to the extent of land. In the Yemenite model, land ownership and water rights function independently from one another. Both models exist in Morocco. In a sâqiya irrigation system in the Saiss region, “one can inherit, buy, hire, exchange or borrow water from an owner, independent of land ownership.”⁷³ In the sâqiya communities where I conducted research, land and water rights are not usually separable on a permanent basis, and therefore a plot is tied to a given time slot. However, landowners may choose to sell or trade their time slot when their fields lie fallow or to trade a portion of their time slot in order to consistently irrigate their crops during summer months, especially in the case of long cycles that could leave fields without water for

⁷³ Van der Kooij, Zwarteveen, and Kuper, “The material of the social,” 136.

more than ten days at a time.⁷⁴ Therefore, understandings of water rights in my interviews generally appear consistent with the Syrian model, in which water rights are tied to land and fluctuations in water output from the sāqiya and khettāra are evenly distributed among stakeholders.⁷⁵ However, the potential for a transition to the Yemenite model of water rights, in which individual farmers hold water rights separate from their land rights, is also apparent in that time slots can be traded and sold, albeit temporarily.⁷⁶ Under that model, individual farmers can buy others' time slots to compensate for periods of low water in the sāqiya.

When an heir inherits land belonging to an irrigation community, they also inherit an associated time slot for irrigation. Landholders often subdivide their plot among their sons, who receive time slots proportional to the size of their plot. In large sāqiya communities, this practice results in some farmers having crops that receive as little as half an hour of water each cycle.

Choosing Leaders

The communities in which I conducted interviews use consensus-based, representative institutions to select shyūkh as-sāqiya, who are water chiefs responsible for overseeing an irrigation community's technical and institutional components. The reliance on consensus and representation in the irrigation communities I researched demonstrates part of a democratic political culture. Those types of institutional values are not universal across small irrigation communities. For instance, an alternate model of choosing an irrigation community leader appears in the Faiyum depression of Egypt, where "the largest landholder usually administers the operation and maintenance... and also arbitrates conflicts."⁷⁷

⁷⁴ Interview with Muhammad An'aam, December 19, 2017.

⁷⁵ Mabry, *Canals and Communities*, 17.

⁷⁶ Mabry, *Canals and Communities*, 17.

⁷⁷ Mabry, *Canals and Communities*, 8.

In the communities that I studied, farmers elect shyūkh as-sāqiya from the members of an irrigation community. Smaller communities tend to have less rigid institutions governing the election process and the length of a shaykh's term. For example, the shaykh of Tamazant has served in his position for about 20 years and is the fourth person to occupy the position since the community's establishment in the late 1950s.⁷⁸ However, even in the case of institutions without rigid term lengths, a political culture based on a shaykh's accountability to his community was evident. The irrigation communities that I researched operate on consensual authority, which Scarborough defines as "organization and control of a water management system develop from a diffuse, collective societal consciousness or understanding."⁷⁹ Scarborough's definition of consensual authority connects both to Joffé's concept of consensus as a part of democratic political culture and to broader themes of collective decision-making in democratic institutions.⁸⁰ Members of irrigation communities expressed high trust in governing institutions and indicated that their shyūkh served at the will of their communities. Tamazant stakeholders reported that they could call for a meeting to choose a new shaykh based on consensus of landholders if the current shaykh failed to perform his duties effectively. For instance, the shaykh as-sāqiya in Hassi Labied said that he began serving when the former shaykh could no longer serve due to failing eyesight.⁸¹ In contrast to the flexible term lengths of the small Tamazant community, the sāqiya community in Khetaret A'ashish provides water to about 500 people and the shaykh

⁷⁸ Interview with Muhammad Ait Khuya, December 19, 2017; Interview with Ali Ait Hassan, December 19, 2017.

⁷⁹ Scarborough, *The Flow of Power*, 21, quoting Geertz; Glick, *Irrigation and Society in Medieval Valencia*.

⁸⁰ Joffé, "Traditions of governance in North Africa," 722; Christiano, "Democracy."

⁸¹ Interview with Mbarek Ou 'Abu, December 19, 2017.

consistently serves a term of one to three years. Then, men in the community nominate potential leaders and come together to choose a new shaykh as-sāqiya from among the nominees.⁸²

In each sāqiya community, the shaykh as-sāqiya directly interacts with representatives elected to serve a portion of stakeholders. Representation is usually based on the physical division of the sāqiya community into strips that run parallel to the sāqiya. In Tamazant, sixteen water holders divide into four groups, each of which appoints a representative to serve on a council that interacts directly with the shaykh. Of those four, one person serves as the shaykh's deputy while another serves as treasurer. Larger irrigation communities have more complex representation arrangements.

Qsar communities are fortified villages that predate most other towns in Drâa-Tafilalet and use a model of irrigation community governance integrated with broader community governance. In qsūr around Rissani, *majāles ash-shyūkh* (s. *majles ash-shyūkh*), or councils of chiefs, govern communities and choose among themselves a shaykh specifically responsible for the sāqiya.⁸³ That shaykh serves for a year before the majles selects a new shaykh as-sāqiya. The major kinship groups that constitute a qsar elect a representative to serve on the majles. The Rissani qsūr are distinct from other examples because the governance of the sāqiya community is embedded within a broader structure for governing the qsar, whereas other towns had irrigation governance structures disassociated from other governance structures. The majāles also show that representative democratic institutions function in southeast Morocco's informal qsar governments, extending beyond structures dedicated exclusively to irrigation.

⁸² Interview with Muhammad Lquz, December 20, 2017.

⁸³ Interview with Ali Ou Aabi, December 21, 2017.

In terms of the election process, the most significant outlier in my research came in Fezna, where three interviewees reported that the shaykh as-sāqiya inherited his position from his father without an election.⁸⁴ However, the two older interviewees reported that the shift to a hereditary system of succession occurred within their lifetime and that the sāqiya community selected previous shyūkh through elections. The example of Fezna supports the scholarly consensus that posits larger irrigation communities correlate with more centralized institutions.⁸⁵

Regardless of the institutional framework used to choose a shaykh, interviewees reported that they voted based on a candidate's knowledge of sāqiya customs and experience mediating conflict. A new shaykh typically does not have any specialized training in these topics but rather has engaged with their community as a stakeholder and worked alongside former shyūkh in planning renovation projects or mediating conflicts. They may have previously served as a deputy or treasurer for their sāqiya community and proved their competence in that manner.

Although women do help farm their family plots, I never encountered a female shaykh or heard of one during my research.⁸⁶ The image of a shaykh in southeastern Morocco remains that of an old man. Furthermore, only heads of families attend the meetings in which a community chooses a shaykh, and those heads of families are men. Gender limitations are an undemocratic element of sāqiya governance. However, a consensus-based political culture surrounds the institution of shaykh as-sāqiya, meaning that shyūkh serve at the pleasure of their (male) constituents and can be removed by them in the case of underperformance.

Limiting voting rights to heads of families is another undemocratic aspect of sāqiya governance. Regardless of how many people belong to a family or how much land a family

⁸⁴ Interview with Bashir Jakani, December 20, 2017.

⁸⁵ Mabry, *Canals and Communities*, 9

⁸⁶ Interview with Muhammad Lquz, December 20, 2017.

owns, one water holder represents each family in the decision-making process. However, an irrigation community in the Saiss region shows how decision making can expand beyond heads of families to include both male and female community members.⁸⁷

Responsibilities and Authorities of the Shaykh as-Sāqiya

The responsibilities and authorities of shyūkh as-sāqiya were consistent across the communities where I completed interviews. Interviewees listed the main areas of responsibility for shyūkh as overseeing maintenance, collecting resources, calling meetings of the sāqiya community, resolving conflicts, and enforcing norms. The balance of responsibilities and authorities for shyūkh as-sāqiya shows that irrigation communities confer authority upon leaders and expect those leaders to fulfill certain duties. Such an arrangement demonstrates the presence of a revocable social contract in irrigation communities. The balance of responsibilities and authorities also indicates that final authority lies with the irrigation community, which can collectively retract their consent to be governed and then elect a new shaykh.

Shyūkh oversee routine maintenance of the physical structures of the sāqiya and khettāra. To determine whether maintenance is necessary, the shyūkh regularly ride along the khettāra to check for collapses in the tunnel or interruptions in the flow of water.⁸⁸ The underground tunnels of a khettāra are prone to collapse when subjected to large shifts of mass above them. In Merzouga, rally cars repeatedly drive over the tunnels during the annual Merzouga Rally and their weight sometimes collapses the tunnels.⁸⁹ In Khettāret A'ashīsh, one farmer reported that abundant rainfall and tree roots growing into the khettāra also cause collapse.⁹⁰ Monitoring,

⁸⁷ Van der Kooij, Zwarteveen, and Kuper, "The material of the social," 136.

⁸⁸ Interview with Bashir Jakani, December 20, 2017.

⁸⁹ Interview with Said al-Fellah, December 18, 2017.

⁹⁰ Interview with Muhammad Lquz, December 20, 2017.

maintaining, and repairing the khettāra require significant financial and human resources that the shaykh must mobilize, primarily from the irrigation community but sometimes with support from the regional government or NGO partners. Additionally, the sāqiya often fills with sand during the windy season, requiring periodic cleaning to ensure that water flows. Contributing and mobilizing resources is an accepted and understood element of the sāqiya community, a core element of community membership and a prerequisite to use of its resources. The expectation of individual participation in the irrigation community strengthens the legitimacy of communal governance, the community's democratic ethos, and the informal social contract established among stakeholders.

To oversee the sāqiya community, a shaykh may collect money and labor from farmers in proportion to the extent of their lands and consequently the length of their time slots. A treasurer manages each sāqiya community's finances. Each member of a water community is expected to contribute either labor or money to maintain the sāqiya. Interviewees indicated that they pay regular dues in proportionate to the amount of land owned.⁹¹ When physical structures of the khettāra collapse, a shaykh collects additional funds to fund large scale repair structures, which can require renting equipment, buying construction materials, and mobilizing labor.

The shaykh has the authority to call meetings of the sāqiya community or their representatives. However, a shaykh's authority is not exclusive. Using the representative institutions in place, sāqiya stakeholders can call a meeting of the community to replace a shaykh who is not effectively performing his duties.⁹²

⁹¹ Interview with Muhammad Lquz, December 20, 2017; Interview with Sayyid 'Abd al-Rahman, December 20, 2017.

⁹² Interview with Lhassan Ou L'arbi, December 18, 2017.

As I interviewed Muhammad Ait Khuya, the shaykh of the Tamazant irrigation community, a farmer from the neighboring Tahafit irrigation community approached on his bike. A small earthen dam separates the Tamazant and Tahafit communities to prevent Tahafit rainwater from flowing out of their plots downhill to Tamazant and to clearly delineate the two communities. The Tahafit farmer owned a plot of land bordering the Tahafit side of the dam. Because earth from the dam had started collapsing onto his palm trees and invading his plot, the farmer wanted to clear the earth out of his plot. However, the shaykh claimed that the farmer should not have planted palm trees so close to the dam in the first place. In order to resolve the conflict and determine who ought to be liable if the dam collapsed further, the farmer and the shaykh agreed to meet at the dam itself along with the Tahafit shaykh and witnesses to reach an agreement. This case shows another of the shaykh's responsibilities: mediating intra- and inter-community conflict. For intra-community conflict, the mediation process begins with meetings with parties to a conflict to hear each side.⁹³ Then, a shaykh convenes a meeting between the parties and mediates a conversation between them to work towards a resolution.

Ali Ou al-Aabi, a farmer in Haroun, told me that people stakeholders generally prefer locally-based conflict resolution to arbitration in the courts, which only occurs rarely.⁹⁴ As Mabry notes, "decisions may be appealed," but "each step upward in the hierarchy of [conflict resolution] options represents a decrease in local autonomy and an increase in social cost."⁹⁵ In the case of conflicts between sâqiya communities, the shaykh represents his constituency in talks with the other shaykh. Ahmed Aoujil recounted a story about a dispute that reached the formal court system. When a Tamazant farmer's bulldozer felled a tree in the Tahafit irrigation

⁹³ Interview with Bashir Jakani, December 20, 2017.

⁹⁴ Interview with Ali Ou al-Aabi, December 21, 2017.

⁹⁵ Mabry, *Canals and Communities*, 19.

community, shaykh-to-shaykh mediation failed and instead each shaykh represented their respective community in the judicial system. Members of the Tamazant sāqiya community contributed to a legal defense fund that the shaykh used during the arbitration process.⁹⁶

Shyūkh enforce norms surrounding irrigation communities by levying fines and ensuring that violators of norms cannot use the sāqiya's waters without paying a fine in either money or extra labor for a maintenance project.⁹⁷ When a farmer does not pay their dues, the shaykh ensures that they cannot use the sāqiya until they do so, exemplifying the contractual, albeit informal, nature of community membership.⁹⁸

Facing State Intervention, Social Transformation, and Environmental Change

Although the sāqiya and khettāra are traditional systems, they are not frozen in time. The institutions governing the sāqiya and khettāra are fluid; they have evolved and will continue to do so. In order to demonstrate the dynamic nature of the sāqiya and khettāra institutions and to extrapolate how current trends will affect them, this section discusses external factors that test the flexibility and sustainability of southeastern Morocco's grassroots irrigation. State intervention through centralized irrigation, social transformation resulting from economic pressures, and environmental change all pose challenges for sāqiya and khettāra irrigation.

For centuries, the Ziz Valley of southeastern Morocco has attracted outsiders. The renowned travelers Ibn Battuta and Leo Africanus, visiting the Ziz Valley centuries apart from one another, would have seen the lush farmlands of the oasis and its mud-brick villages. Today, the dune sea of Erg Chebbi attracts an altogether different sort of visitor: tourists. Drawn to the relative political stability of Morocco and enchanted by the golden sands of Merzouga, tourists

⁹⁶ Interview with Ahmed Aoujil, December 18, 2017.

⁹⁷ Interview with Bashir Jakani, December 20, 2017.

⁹⁸ Interview with Muhammad Yussuf, December 19, 2017.

from across Morocco and around the world pour by the busload into the 1500-person village. For most, Merzouga is little more than a stop on the way to a camel trek into Erg Chebbi. Often, visitors wander the town while waiting for their camels, perhaps buying a headwrap or a local fossil before riding a well-trod path to a camp in the dunes. Local guides show off their skills in English, Spanish, French, and Korean, but they speak to one another in Tamazight. A chain of tourists rides in a caravan, with each camel tied to the one before it, eventually ending with a guide who wears a sky-blue djellaba embroidered with gold thread and a blue turban, often concealing a pair of jeans and a t-shirt. In Merzouga, authenticity sells. Each year that more tourists come to Merzouga, the families running camel trek businesses hire more guides to walk tourist-laden camels into the desert and drop them off at a camp, many of them fully equipped with small generators, a toilet, and drinking water. When given the chance to seek out gratuities from tourists enchanted by a sunset over the dunes and a hearty Moroccan meal, many people, especially young people, eagerly enter the tourism sector.

My interviews indicated that social change destabilizes *sāqiya* irrigation communities and can potentially result in their collapse. Many interviewees reported a shift away from subsistence agriculture and towards tourism. Merzouga has become one of the most popular tourist sites in Morocco, attracting domestic visitors who come for therapeutic sand baths and international visitors who take camel treks, ride ATVs, and camp in the Erg Chebbi dunes. Merzouga's international tourism sector began to develop in the late 1980s and has continued to grow as the number of foreign tourists to Morocco increases.⁹⁹ Morocco suffers from a youth unemployment rate of 26.5 percent as of late 2018, meaning that young people in places like Merzouga leap at

⁹⁹ Laurent Gagnol and Pierre-Antoine Landel, "Psammotourism: Desert Sand as a Specific Resource and Touristic Experience," *Tourism Review*, no. 10 (2016).

the opportunity to find a job.¹⁰⁰ As young people work in the tourism sector, their commitment to subsistence agriculture decreases and irrigation community institutions weaken. Shyūkh need their irrigation community to provide the financial support and labor that maintain the physical structures of the sāqiya and khettāra. However, as younger generations increasingly gain employment in the tourism sector, their incentive to farm and contribute to their irrigation community decreases. In towns such as Hassi Labied and Merzouga, which are major centers of tourism due to their proximity to the Erg Chebbi dunes, socio-economic factors threaten irrigation community stability more than they do in other areas.

Salem Bokbot previously served as the shaykh of Tamarikht, one of Merzouga's three sāqiya irrigation communities until it dissolved in 2017 after 59 years. When I spoke with Salem, he told me that ten families originally farmed plots in the Tamarikht land, but as water holders sought work in other regions or sectors, they left their fields barren and did not contribute to the upkeep of the sāqiya and khettāra.¹⁰¹ A major sandstorm shifted large amounts of sand and resulted in the physical collapse of a portion of the khettāra, cutting off the flow of water to the sāqiya. That collapse precipitated the eventual dissolution of the Tamarikht irrigation community. Facing high costs to repair the khettāra and lacking funds or labor, Salem called a meeting of the families who owned the farmland and they agreed to dissolve the irrigation community. Lhassan Ou L'arbi, shaykh of the neighboring Tahafit irrigation community in Merzouga, expressed his concern that the sāqiya would die with the current generation of farmers.¹⁰² Brahim, a farmer in Tamazant, lamented that the system functioned more

¹⁰⁰France 24, "al-maghreb: al-batāla fī sufūf ash-shabāb 'qanbala mawqūta' wa sabab ra'īsī lil-qalaq al-ijtimā'i," November 2, 2018, <https://www.france24.com/ar/20180211-المغرب-بطالة-شباب-قنبلة-موقوتة-احتجاجات>.

¹⁰¹ Interview with Salem Bokbot, December 19, 2017.

¹⁰² Interview with Lhassan Ou L'arbi, December 18, 2017.

democratically when everyone worked and contributed and complained that young people do not recognize the value of natural farming.¹⁰³ Without a sustained commitment to agricultural production, irrigation communities cannot maintain the physical structures of the *sāqiya* and *khettāra*. When maintenance demands exceed the capacity of an irrigation community, that irrigation community risks extinction. However, interviewees in towns such as Khettaret A'ashish, which is located far from tourist areas, were far more optimistic about institutional longevity. The difference in outlook between Khettaret A'ashish and Merzouga reinforces the idea that socio-economic change can undermine an irrigation community's sustainability.

Tourism also places stress on local infrastructure, requiring people to turn to the *sāqiya* for household use and drinking water. The shaykh of Tamazant in Merzouga reported that pressures on water supplies in the town reach their peak during the summer, when tourists at local hotels consume the largest amounts of water.¹⁰⁴ Using the *sāqiya* for domestic purposes increases stress on the *sāqiya* and *khettāra* system as a whole. Additionally, drinking from the Tamazant *sāqiya* can result in sickness and turn people's teeth brown.

Environmental change in pre-Saharan communities will likely result in more intra-community conflicts over water usage. Lhassan Ou L'arbi, shaykh of the Tahafit *sāqiya* in Merzouga, said that his job as a shaykh becomes more difficult when water is scarce.¹⁰⁵ According to Lhassan, disagreements over water arise more often in times of drought, when the stakes of misallocation of water run higher. Droughts are common in southeastern Morocco due to its proximity to the Sahara. Since 1912, Morocco has experienced about 27 years of drought.

¹⁰³ Interview with Brahim Zawiya, December 19, 2017.

¹⁰⁴ Interview with Muhammad Ait Khuya, December 19, 2017.

¹⁰⁵ Interview with Lhassan Ou L'arbi, December 18, 2017.

¹⁰⁶ However, the khattāra and sāqiya irrigation system mitigates the impact of droughts by drawing from relatively consistent water sources like aquifers and mountain springs to compensate for low rainfall. According to Will Swearingen, droughts have increased in frequency in North Africa since 1980 and will gradually increase due to climate change.¹⁰⁷ Climate change will also intensify the effects of droughts.¹⁰⁸ Drought can force waves of rural-to-urban migration, which weakens the social and political structure of irrigation communities. That was the fate of many kuhl irrigation systems in India's Kangra Valley, where "out-migration has created acute labor shortages that has challenged farmers' capacities for mobilizing collective labor for annual kuhl repair and maintenance."¹⁰⁹ In addition to damaging institutions in rural communities, rural-to-urban migration destabilizes urban areas when rural migrants "join the large number of urban poor living in overcrowded slum areas with little access to basic physical and social infrastructure."¹¹⁰ As demonstrated in Tamarikht, a decrease in the population of a sāqiya community can also result in collapse when large maintenance projects require more labor or money than a community can provide.

The building of Hassan ad-Dākhil dam demonstrates how sāqiya community institutions can adjust to centrally-planned, large-scale irrigation projects. In my interviews, stakeholders described their irrigation communities as mostly self-sufficient, only rarely taking funds from the regional government and aid organizations. Interviewees never mentioned sub-regional governments. With that said, the national government does interact with the sāqiya and khattāra

¹⁰⁶ Swearingen, *The North African Environment at Risk*, 20.

¹⁰⁷ Swearingen, *The North African Environment at Risk*, 17.

¹⁰⁸ Kevin Trenberth et al, "Global Warming and Changes in Drought," 17.

¹⁰⁹ Mark Baker, *The Kuhl of Kangra: Community-managed Irrigation in the Western Himalaya* (Seattle: University of Washington Press, 2007), 4.

¹¹⁰ Ghanem, "Agriculture and Rural Development for Inclusive Growth and Food Security in Morocco," 1.

in less direct ways. State intervention in the Ziz River, which provides intermittent water to some of the communities that I visited and forms the core of the Tafilalet oasis, initially destabilized small-scale, indigenous irrigation using the *sāqiya* and *khattāra*. In January 1968, King Hassan II broke ground on the Hassan ad-Dākhil Dam, which stemmed the flow of the Ziz River and formed a reservoir near Errachidia, one of the largest cities in southeastern Morocco. Instead of flowing freely, the waters of the Ziz could be controlled through a concrete canal running over sixty miles south from Errachidia to Merzouga.¹¹¹ The dam project sought to irrigate one million hectares of land by transporting rainwater southwards from Errachidia while preventing catastrophic flooding of the sort that occurred in 1965.¹¹² In *The Last Civilized Place*, Ronald Messier and James Miller note that, although farmers initially demonstrated suspicion towards “government water” in the first decades of the dam’s operation, they have since acclimated to centralized water flowing from Errachidia.¹¹³ Said al-Fellah, a farmer in the Tamazant *sāqiya* community, confirmed that *shyūkh as-sāqiya* now regularly communicate with irrigation administrators in Errachidia to prepare for and adjust to supplementary water from the reservoir.

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The case of the Hassan ad-Dākhil Dam complicates the archaeologist Jonathan Mabry’s claim that irrigation systems imposed from above fail to achieve the same sustainability and stability as small-scale, grassroots irrigation systems.¹¹⁵ In Merzouga, a combination of local and

¹¹¹ State intervention in the Ziz River is not new; some experts believe that the entirety of the southern Ziz River took its current form after a major diversion in the medieval period, (Messier and Miller, *The Last Civilized Place*, 51).

¹¹² Messier and Miller, *The Last Civilized Place*, 39; Akhbar Errachidia, “Quset Binaa Sed Al-hassan Al-dakhil,” accessed December 04, 2018, <http://akhbarerrachidia.over-blog.com/article-114206511.html>.

¹¹³ Messier and Miller, *The Last Civilized Place*, 188.

¹¹⁴ Interview with Said al-Fellah, December 18, 2017.

¹¹⁵ Mabry, *Canals and Communities*, 20.

national irrigation system reached an institutional equilibrium in which shyūkh interact with central irrigation authorities without relying on a consistent supply of water from the dam. Despite institutional functionality, water from the concrete canals running from the Hassan ad-Dākhil reservoir evaporates at a faster rate than water that runs through the khettāra's underground tunnels.

VI. Conclusions

King Muhammad VI rules Morocco because his father, King Hassan II, ruled Morocco. Royal palaces stand in cities across the country. Royal advisors, allies, and appointees control the distribution of key resources. Royal portraits appear in shops and private homes. Royal-owned businesses dominate many sectors of the Moroccan economy. However, the institutions that govern southeastern Morocco's sāqiya and khettāra are based in democratic values. When farmers choose the people who manage and oversee the sāqiya and khettāra irrigation systems, they do so based on a communal consensus. Authority in an irrigation community originates from the will of those farmers. Shyūkh govern by consulting with representatives of groups of farmers. In southeastern Morocco, I found a grassroots water democracy much like the one I knew from New Mexico's acequia communities.

The existence of grassroots water democracies in southeastern Morocco contradicts claims of a primordial Middle Eastern and North African incompatibility with democracy. My research draws from a few communities at the edge of the Sahara, but the implications for regional political culture are far broader. The institutions that govern the sāqiya and khettāra in southeastern Morocco underscore the diversity of configurations for local governance in the region. Just as Amartya Sen emphasized the variety of philosophical traditions of governance,

this research shows the variety of informal traditions of governance; even in the Kingdom of Morocco, informal democratic institutions thrive at the community level. That conclusion contributes to George Joffé's work describing North African political institutions built on consensus and consultation. Building on Elinor Ostrom's findings about governing the commons, institutions similar to those of the *sāqiya* and *khettāra* may govern water or other common-pool resources across the Middle East and North Africa.

Although Morocco does lie at the edge of the Arab world, many of its circumstances, whether they be environmental, cultural, political, or economic, are not dissimilar to those found in other parts of the region. Therefore, Moroccan marginality within the Arab world and its Amazigh substratum does not limit the implications of this research. Rather, this research shows the potential for finding similar governing structures in other Middle Eastern and North African societies and shows that grassroots water governance may hold the seeds of democratic political culture, even in countries perceived to be undemocratic.

Sāqiya and *khettāra* governance does not bear the egalitarian ethos of liberal democracies in the United States or Europe. When it comes to the participation, no semblance of gender parity exists in the irrigation community. Only men who hold water rights participate in electoral processes, which violates the democratic principle of equality between community members.

It would be unreasonable to expect informal institutions that have evolved organically to perfectly resemble the outcome of centuries of deliberate constitutional reform. As Joffé writes, "grassroots examples of participatory governance, despite their defects arising from the roles of patronage-clientage and gender bias, also demonstrate mechanisms for the dispersal of predatory

power and popular engagement.”¹¹⁶ Mature liberal democracy does not come ready-made. However, democratic institutions need not be formalized to make up the base of a democratic society. In southeastern Morocco, an indigenous water democracy lies at the foundation of society. Recognizing that fact can broaden the ways that academics and policymakers see traditional politics in North Africa and the region’s political culture as a whole.

My research indicates that the most severe threat facing the sustainability of the *khettāra* and *sāqiya* is social and economic change that could trigger the collapse of irrigation communities. As the Moroccan tourism sector grows, the younger generation of would-be farmers will be incentivized to seek employment as guides, drivers, and other service workers. As older generations stop farming, more irrigation communities will face collapse. The collapse of *khettāra* and *sāqiya* systems will mean not only a decline in agricultural production and food security, but also the disappearance of a vital social and political institution. A second threat to institutional longevity lies in increasing water scarcity, which could manifest itself in multiple ways harmful to an irrigation community. However, it appears that the institutions governing small-scale irrigation in southeastern Morocco have adjusted well to the introduction of centralized, large-scale irrigation. Especially since the national policy is shifting to local control of irrigation, conflicts between local and national systems of irrigations are unlikely to threaten the institutions I studied.

My core conclusion -- that institutions governing irrigation in southeastern Morocco are rooted in democratic values -- raises an important question: what is the connection between grassroots political culture and the political culture of governing a country? Although Morocco

¹¹⁶ Joffé, “Traditions of governance in North Africa,” 732.

has progressed towards a parliamentary democracy in recent decades, it remains a largely authoritarian monarchy. Why have local, informal democratic norms not risen to the national level? Significant institutional distance separates the *sāqiya* and *khettāra* from the Kingdom of Morocco; where is the disconnect between local institutions and national ones? Future projects could build on my research and that of Joffé, Gellner, and Hart by clarifying the relationship between grassroots and national political cultures.

Further studies should examine why some *sāqiya* and *khettāra* institutions grow more authoritarian. I hypothesize that larger irrigation communities may correlate with the breakdown of democratic institutions due to increased incentives for individuals to seek power. The case of Fezna deserves more attention and could serve as a case study that illuminates how consensus-based institutions for choosing *shyūkh as-sāqiya* can decay. In an era marked by a global democratic backsliding, examining grassroots institutional decay could explain why institutions turn towards autocracy.

On the other hand, further studies could also explore the potential for democratization of *khettāra* and *sāqiya*. By examining how *sāqiya* and *khettāra* communities expand the franchise to amplify more voices, scholars could gain insight into the conditions that encourage grassroots democratic expansion. One example in Saiss shows that formalization could result in more equitable participation for all members of an irrigation community.¹¹⁷ By examining other irrigation communities in other parts of Morocco, scholars could determine the correlation between environmental, institutional, or cultural factors and the level of democracy in an irrigation community.

¹¹⁷ Van der Kooij, Zwarteveen, and Kuper, “The material of the social,” 136.

Sitting in plastic chairs outside of a garage overlooking the rocky plateau that precedes Merzouga's dunes, Muhammad Yusuf described his relationship with the *sāqiya*. "I am a son of the *sāqiya*," he told me, "it is like my mother; it raised me; it taught me."¹¹⁸ I remembered the acequia stories that my own mother told me. Running alongside the ditches in Albuquerque's North Valley. Plucking frogs from the water. Chasing her dog as the waters carried it downstream. Before the Tamazant *sāqiya* emerges from underground, it flows through a concrete tunnel, painted in blue and white, that reads "water is life" in Arabic, Tamazight, French, English, and Spanish. In Morocco, people understand the importance of water. Farmers like the ones I spoke with understand the importance of water so much that, instead of fighting over scarce resources, they have built physical structures and cooperative institutions to distribute water among members of their community based on democratic values.

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IX. Appendix

Interview Questions (Translated from Arabic)

Demographic Questions

- 1- How old are you?
- 2- What is your name?
- 3- What is your relationship with the sāqiya irrigation system?

General Sāqiya Questions

- 4- Could you please describe the sāqiya irrigation system to me?
- 5- Who is allowed to use water from the sāqiya?
- 6- Who oversees the sāqiya irrigation system and what are their responsibilities?
- 7- What are the sources of funding for the sāqiya irrigation system?
- 8- What are some of the problems connected with the sāqiya irrigation system?
- 9- What are the rules of the sāqiya and where do they come from?
- 10- What are the main priorities in water distribution using the sāqiya irrigation system?
- 11- Is there any relationship between the government and the sāqiya irrigation system?
- 12- How is the sāqiya irrigation system repaired and maintained?
- 13- Who owns the sāqiya irrigation system?
- 14- Have there been any major changes in the sāqiya irrigation system that you can remember?
- 15- As far as you know, what is the history of the sāqiya irrigation system?

Specific Sāqiya Community Questions

- 15- What is the name of this sāqiya and what is the meaning of the name?
- 16- How many people farm using this sāqiya?
- 17- How long is the sāqiya?
- 18- As far as you know, what is the history of this specific sāqiya?