

Cambridge University Press

978-1-107-00876-2 - Nature and Empire in Ottoman Egypt: An Environmental History

Alan Mikhail

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## INTRODUCTION

## EMPIRE BY NATURE

Water lends itself to cliché – its beauty, its power, its abundance or absence, its transformative capabilities. Long before and after Herodotus observed Egypt to be “the gift of the Nile,” others have offered clichés about the role of the Nile’s waters in Egypt’s history.<sup>1</sup> This book avoids those and other clichés altogether in favor of a social and environmental history of water usage and irrigation in the Egyptian countryside in the long eighteenth century (1675 to 1820).<sup>2</sup> Water, however, is only one part of this environmental story of Egypt. Timber, plague, animals, wind, grain, and microbes all have their roles to play as well in this account of struggle and community, of want and excess, of import and export, and ultimately of literal life and death.<sup>3</sup>

<sup>1</sup> For Herodotus’s comments on Egypt and the Nile, see: Herodotus, *The History*, trans. David Grene (Chicago: University of Chicago Press, 1987), 2.5.

<sup>2</sup> Social and environmental histories of water that have informed this study include the following: André E. Guilleme, *The Age of Water: The Urban Environment in the North of France, A.D. 300–1800* (College Station: Texas A&M University Press, 1988); Norris Hundley Jr., *The Great Thirst: Californians and Water, A History* (Berkeley: University of California Press, 2001); Jean-Pierre Goubert, *The Conquest of Water: The Advent of Health in the Industrial Age*, trans. Andrew Wilson (Princeton, NJ: Princeton University Press, 1989); Paolo Squatriti, *Water and Society in Early Medieval Italy, AD 400–1000* (Cambridge: Cambridge University Press, 1998); Roberta J. Magnusson, *Water Technology in the Middle Ages: Cities, Monasteries, and Waterworks after the Roman Empire* (Baltimore: Johns Hopkins University Press, 2001); Thomas F. Glick, *Irrigation and Hydraulic Technology: Medieval Spain and Its Legacy* (Brookfield, VT: Variorum, 1996); Glick, *Irrigation and Society in Medieval Valencia* (Cambridge, MA: Harvard University Press, 1970); David Blackbourn, *The Conquest of Nature: Water, Landscape, and the Making of Modern Germany* (New York: W. W. Norton, 2006). See also the following ambitious volumes on the history of water: Terje Tvedt and Eva Jakobsson, eds., *Water Control and River Biographies*, vol. 1 of *A History of Water* (London: I. B. Tauris, 2006); Terje Tvedt and Richard Coopey, eds., *The Political Economy of Water*, vol. 2 of *A History of Water* (London: I. B. Tauris, 2006); Terje Tvedt and Terje Oestigaard, eds., *The World of Water*, vol. 3 of *A History of Water* (London: I. B. Tauris, 2006).

<sup>3</sup> Notions of life and death abound in descriptions of land and water in the archival and literary record of Ottoman Egypt. Unirrigated – and hence barren – land was often

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In the chapters that follow, I first detail an Ottoman imperial system of natural resource allocation and balance that served to move grains – the products of irrigation – out of Egypt and wood supplies – vital material needed for Egypt’s rural irrigation infrastructure – into this most lucrative of the Empire’s provinces.<sup>4</sup> Water bound Egyptian peasants in even the

referred to with the adjective *dead* or *lifeless* (*mawāt* in Arabic, *mevat* in Turkish). See, e.g.: DWQ, al-Jusūr al-Sulṭāniyya 786, pp. 113v–114r, no case no. (18 Z 1117/2 Apr. 1706). Moreover, the word often used to describe the irrigation of land was *ihyāʿ*, meaning “enlivening,” “revitalization,” “revival,” and the like. For examples of the use of this word in this context, see: DWQ, Maḥkamat al-Manṣūra 19, p. 374, no case no. (9 M 1124/16 Feb. 1712); BOA, MM, 6:238 (Evasit Ca 1158/12–21 Jun. 1745). Thus, images of life and death were intimately connected to the ability of water to make possible or to preclude the productivity of land. Consider the following Quranic verse in this regard: “We send down pure water from the sky, so that We may give life to a dead land and quench the thirst of countless beasts and men We have created” (Quran, 25:48–49). We are also reminded of the Quranic verse very often found on communal fountains and other water structures throughout the Muslim world: “We made every living thing from water” (*wa jaʿalnā min al-māʾi kullā shayʾin ḥayyin*) (Quran, 21:30). Generally on water in the Muslim world, see: *EI*, s.v. “Mā” (T. Fahd et al.); *Encyclopaedia Iranica*, s.v. “Āb ii. Water in Muslim Iranian Culture” (I. K. Poonawala).

<sup>4</sup> The political, economic, and administrative histories of Ottoman Egypt that have proved most useful for my analysis are the following: Stanford J. Shaw, *The Financial and Administrative Organization and Development of Ottoman Egypt, 1517–1798* (Princeton, NJ: Princeton University Press, 1962); Laylā ʿAbd al-Laṭif Aḥmad, *al-Idāra fī Miṣr fī al-ʿAṣr al-ʿUthmānī* (Cairo: Maṭbaʿat Jāmiʿat ʿAyn Shams, 1978); Aḥmad, *al-Mujtamaʿ al-Miṣrī fī al-ʿAṣr al-ʿUthmānī* (Cairo: Dār al-Kitāb al-Jāmiʿī, 1987); Aḥmad, *Tārīkh wa Muʿarrikhī Miṣr wa al-Shām ibbāna al-ʿAṣr al-ʿUthmānī* (Cairo: Maktabat al-Khānǧi, 1980); Michael Winter, *Egyptian Society under Ottoman Rule, 1517–1798* (London: Routledge, 1992); Peter Gran, *Islamic Roots of Capitalism: Egypt, 1760–1840* (Austin: University of Texas Press, 1979); the relevant sections of P. M. Holt, *Egypt and the Fertile Crescent, 1516–1922: A Political History* (London: Longmans Green, 1966); the relevant contributions to P. M. Holt, ed., *Political and Social Change in Modern Egypt: Historical Studies from the Ottoman Conquest to the United Arab Republic* (London: Oxford University Press, 1968); the relevant contributions to M. W. Daly, ed., *Modern Egypt, from 1517 to the End of the Twentieth Century*, vol. 2 of *The Cambridge History of Egypt* (Cambridge: Cambridge University Press, 1998); Ibrahim el-Mouelhy, *Organisation et fonctionnement des institutions ottomanes en Egypte (1517–1917): étude documentaire, d’après les sources archivistiques égyptiennes* (Ankara [?]: Imprimerie de la Société turque d’histoire, 1989); Daniel Crecelius, *The Roots of Modern Egypt: A Study of the Regimes of ʿAlī Bey al-Kabir and Muhammad Bey Abu al-Dhahab, 1760–1775* (Minneapolis: Bibliotheca Islamica, 1981); Jane Hathaway, *A Tale of Two Factions: Myth, Memory, and Identity in Ottoman Egypt and Yemen* (Albany: State University of New York Press, 2003); ʿAbd al-Raḥīm ʿAbd al-Raḥman ʿAbd al-Raḥīm, *al-Rif al-Miṣrī fī al-Qarn al-Thāmin ʿAshar* (Cairo: Maktabat Madbūli, 1986); Stanford J. Shaw, ed. and trans., *Ottoman Egypt in the Eighteenth Century: The Nizāmnāme-i Miṣr of Cezzār Aḥmed Pasha* (Cambridge, MA: Center for Middle Eastern Studies of Harvard University, 1964); Galal H. El-Nahal, *The Judicial Administration of Ottoman Egypt in the Seventeenth Century* (Minneapolis: Bibliotheca Islamica, 1979); Kammāl Ḥāmid Muḥayth, *Miṣr fī al-ʿAṣr al-ʿUthmānī 1517–1798: al-Mujtamaʿ . . . wa al-Taʿlīm* (Cairo: Markaz al-Dirāsāt wa al-Maʿlūmāt al-Qānūniyya li-Ḥuqūq al-Insān, 1997); ʿIrāqī Yūsuf Muḥammad, *al-Wujūd*

most rural locations to the center of the Empire in Istanbul because the status of a dam or canal in Egypt held wide imperial consequences.<sup>5</sup> The disrepair of irrigation works and the destruction of agricultural land that would surely ensue meant less food and less money for this early modern land-based, agrarian polity.<sup>6</sup> This arrangement ensured that Egyptian peasants held near-absolute authority over the function and repair of irrigation works because they were the ones with the most specialized and longest experience of those irrigation features and of the environments they served.

At the end of the eighteenth century and the beginning of the nineteenth, however, this system of balance, transport, and extreme localism with respect to the elements of Egypt's irrigation infrastructure was replaced by a much more centralized and authoritarian regime of environmental resource management in Egypt. To show this change, I follow the stories of labor and plague over the course of the long eighteenth century to document how governance in Egypt by the beginning of the nineteenth century resulted in the forced labor of more than three hundred thousand peasants – more than the population of Cairo at that time – and the death of a third of those workers in the reconstruction of the Maḥmūdiyya Canal between the Nile and Alexandria.

The driving force behind this change in the nature of political rule over peoples and environments in Egypt over the course of the long eighteenth century (again, 1675 to 1820) was the province's move away from its position as the most important territory in the Ottoman Empire toward a form of independent Cairo-based sovereignty in the early nineteenth century. Beginning a few decades earlier at the end of the eighteenth century, various Ottoman governors of Egypt attempted to break away from the Empire to seize autonomous control of the province's revenues for themselves. As part of this process of challenging the central administration of the Empire, Egypt developed strong institutions of its own

*al-'Uthmānī fī Miṣr fī al-Qarnayn al-Sādis 'Ashar wa al-Sābi' 'Ashar (Dirāsa Wathā'iqiyya)*, vol. 1 (Cairo: Markaz Kliyūbātrā lil-Kumbiyūtar, 1996); Muḥammad, *al-Wujūd al-'Uthmānī al-Mamlūki fī Miṣr fī al-Qarn al-Thāmin 'Ashar wa Awā'il al-Qarn al-Tāsi' 'Ashar* (Cairo: Dār al-Ma'ārif, 1985).

<sup>5</sup> For two of the few studies of irrigation in the early modern Ottoman Empire, see: Rhoads Murphey, "The Ottoman Centuries in Iraq: Legacy or Aftermath? A Survey Study of Mesopotamian Hydrology and Ottoman Irrigation Projects," *JTS* 11 (1987): 17–29; *EI*, s.v. "Mā". 8. Irrigation in the Ottoman Empire" (Halil İnalcık).

<sup>6</sup> Indeed, on this point, Rhoads Murphey writes of Ottoman Iraq that "water, more than land itself, was the basis of agriculture in the Middle East." Murphey, "Mesopotamian Hydrology and Ottoman Irrigation Projects," 21.

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(schools, military forces, and eventually ministries) and independent sources of capital accumulation (new forms of taxation, peasant laboring classes, and a mint). All of this required an extremely strong and vast centralized bureaucracy.

Egyptian peasants' experience of this transition from an Ottoman imperial system of natural resource management to a centralized Egyptian bureaucracy was a difficult one. Because this change in political rule meant that Egypt could no longer benefit from its historical links to other areas of the Empire – links that provided it with wood and the means to fix irrigation works – the province had to seek out its own lumber supplies, grain markets, sources of cash, laboring power, and other necessities. The demands for those and other items and the pressures they caused drove the Egyptian bureaucracy of the early nineteenth century to ask much more of the Egyptian peasantry and of the land they tilled – to produce more, to work more, and to give up more. Egyptian peasants were thus robbed of autonomy over their fields and labor, of their generations of rootedness in local environments, and eventually of many of their lives as well. Over the course of the long eighteenth century, they went from having quite a bit of room to maneuver in an Ottoman imperial system to essentially having none in an Egyptian one. As they came to suffer more and more under this new political system, so, too, did the Egyptian rural environment.

My ultimate claim is, thus, that the very moment Egypt purposefully bypassed the Ottoman system of natural resource balance documented in the first three chapters of this book – a moment of supposed modernity and independence – was one in which water, labor, environmental resources, local control over rural irrigation, and ultimately Egyptian peasants' biological lives were taken over as never before by a despotic form of bureaucratic government.

*A Very Short Introduction to the Ottoman Empire*

Before examining transformations in the long eighteenth century in detail, I offer a very quick (and largely political) overview of the arc of the history of the Ottoman Empire as a whole to orientate those readers unfamiliar with the Empire and Egypt's place in it.<sup>7</sup> The Ottoman Empire

<sup>7</sup> For a very useful and accessible synthetic treatment of the entirety of Ottoman history, see: Caroline Finkel, *Osman's Dream: The History of the Ottoman Empire, 1300–1923* (New York: Basic Books, 2006).

was the longest-lasting and geographically largest empire to rule in the Mediterranean basin since antiquity. Its rule for more than six hundred years across the Middle East, North Africa, and southeastern Europe both continued and created precedents for nearly all modern states in these regions. The Empire first emerged around the turn of the fourteenth century in the context of centuries of steady migrations by nomadic Turkic peoples through Central Asia, the Mongol invasions of Anatolia, and internal crises in the Byzantine Empire. Through a series of military victories, Osman, the leader of one of the many Turkish tribal groups that came to settle in what was then still Byzantine northwestern Anatolia, was able to carve out for himself an area of autonomy from which to extend his power. Osman's son Orhan captured the city of Bursa from the Byzantines in 1326, making it the first capital of the rising polity that would come to be known as the Ottoman Empire.

Ottoman military conquests in western Anatolia and around the Sea of Marmara continued throughout the rest of the fourteenth century and the beginning of the fifteenth. The final blow to waning Byzantine power in Anatolia and southeastern Europe and the greatest conquest of the early Ottoman state was the capture of Constantinople in 1453. With this new strategic and symbolic capital – Istanbul – the Empire was fully in place to strengthen and extend its rule throughout the second half of the fifteenth century in the Morea, the southern Black Sea coast, the Crimea, and areas further south and west. Süleyman “the Magnificent” was the first major sultan of the Empire in the sixteenth century. His reign, traditionally referred to as the Ottoman “Golden Age,” saw the Empire gain Egypt and most of the Arab world from the Mamlûks, including the religious centers of Mecca and Medina. In what one scholar has called “a sixteenth-century world war,” Süleyman's military forces fought not only the Mamlûks in the Arab world and the Safavids in Iran on their eastern frontiers but also the Spanish and the Habsburgs in the western Mediterranean; the Portuguese in the Indian Ocean; the Hungarians, Serbs, and Bulgarians in the Balkans; and the Venetians and Genoese in the central Mediterranean and the Aegean.<sup>8</sup>

These sixteenth-century military successes came in addition to and themselves necessitated new modes of imperial rule (some of which I discuss shortly) in these vast, newly acquired territories. Numerous law codes were promulgated during the period; the functions of various kinds of

<sup>8</sup> Donald Quataert, *The Ottoman Empire, 1700–1922* (Cambridge: Cambridge University Press, 2000), 21.

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legal courts and other venues were adapted to changing circumstances throughout the Empire; new forms of administrative practices, taxation regimes, and means of revenue collection were instituted and refined; commercial relations were further strengthened and extended. As the central imperial bureaucracy expanded in the sixteenth century, the day-to-day administration of the Empire slowly moved away from the person of the sultan to his surrounding retinue in the palace – to the mothers and wives of sultans, to the Empire’s grand viziers (chief administrators), and to others in the dynasty’s ruling elite. Political power thus became decentralized and more diffuse from the end of the sixteenth century through the seventeenth as new power brokers emerged. Chief among these were the large households of viziers and other elites throughout the Empire that, even as they challenged central imperial authority, came to mirror the internal workings of the royal family in their hierarchies, their abilities to accumulate wealth and followers, and eventually also in their power in various urban and rural locales.

The Ottoman eighteenth century has usually been noted for the Empire’s military defeats, territorial losses, internal urban and rural rebellions, and increasing inability to compete economically with Europe on both global and local scales. Because most of this book is about the eighteenth-century Empire, I leave it to the reader to decide whether the eighteenth century should be deemed a period of “decline,” as has traditionally been the case in Ottoman historiography. I have more to say on the specific issue of decline later in this introduction.

The Empire’s territorial losses continued into the nineteenth century, now under the guise of what was referred to in European capitals as the Eastern question – namely, how were European powers to deal geopolitically and strategically with the Empire’s continual losses of territory? For the Russians, the British, and the French (and eventually the Germans as well), the answer was to keep a weakened Empire limping along so as to check the encroachment of any one power over Ottoman lands. This was, however, mostly only a European conversation.

For their part, the Ottomans responded to nineteenth-century ideas and political reforms like most other states in the period. Their governmental bureaucracy greatly expanded with the establishment of new ministries, schools, and legislative bodies. New industries, military units, medical institutions, and social clubs were either founded or greatly expanded during the period. As with most other polities in the world, the Ottomans also had to deal with the specter of various rising nationalisms during the nineteenth century. Given the multiethnic, multiconfessional,

and multilinguistic makeup of the Empire's populations, there were all sorts of competing and overlapping nationalisms, interests, and desires at work as the century wore on. Sometimes encouraged by outside forces interested in weakening or ending the Ottoman Empire altogether, Arab, Turkish, Balkan, and other nationalists pushed their claims against the Ottoman state. The crucible of World War I brought these conflicting passions and political agendas to a violent climax that saw the eventual dismemberment of the Ottoman Empire after more than six centuries of rule and its replacement by various states. As with the establishment of all borders, some won in this affair and many more lost.

### *Land and Water in Ottoman Egypt*

After its conquest by Ottoman armies in 1517, Egypt immediately became the most important province of the Empire. It was the Empire's largest producer of agricultural goods, it generated more revenue for the state than any other province, and its capital was the second-largest city in the Empire after Istanbul. It was the gateway to the Red Sea and Indian Ocean and to North and sub-Saharan Africa, and it was a crucial hub for the management of the pilgrimage sites of Mecca and Medina. The basis for Egypt's wealth, population, and power was its land and water.<sup>9</sup> To understand its history, we must therefore begin here – in Egypt's mud.

As outlined in the Kanunname (Ottoman law code) of Egypt, almost all of the province's land from the sixteenth to the eighteenth centuries was legally owned by the Ottoman state.<sup>10</sup> For administrative purposes, all

<sup>9</sup> For particularly useful treatments of the status of land, agriculture, and landholding in the Ottoman Empire, see: Çağlar Keyder and Faruk Tabak, eds., *Landholding and Commercial Agriculture in the Middle East* (Albany: State University of New York Press, 1991); Huri İslamoğlu-İnan, *State and Peasant in the Ottoman Empire: Agrarian Power Relations and Regional Economic Development in Ottoman Anatolia during the Sixteenth Century* (Leiden: E. J. Brill, 1994); Huri İslamoğlu-İnan, ed., *The Ottoman Empire and the World-Economy* (Cambridge: Cambridge University Press, 1987).

<sup>10</sup> I consulted the following versions of the Kanunname-i Mısır: *Ḳānūn-nāme-i Mısır*, TSMK 1845 (E.H. 2063); Aḥmad Fu'ād Mutawallī, trans. and intro., *Ḳānūn Nāmah Mısır, alladhī Aşdarahu al-Sultān al-Qānūnī li-Hukm Mısır* (Cairo: Maktabat al-Anjli al-Miṣriyya, 1986); Ömer Lûtfi Barkan, *Kanunlar*, vol. 1 of *XV ve XVIinci asırlarda Osmanlı İmparatorluğunda Ziraî Ekonominin Hukukî ve Malî Esasları*, İstanbul Üniversitesi Yayınlarından 256 (Istanbul: Bürhaneddin Matbaası, 1943), 355–87. Mutawallī's Arabic translation contains a copy of Barkan's Turkish text. For discussions of the status of land under the Kanunname, see: Kenneth M. Cuno, *The Pasha's Peasants: Land, Society, and Economy in Lower Egypt, 1740–1858* (Cambridge: Cambridge University Press, 1992), 25–27; Stanford J.

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rural land was divided into plots known as *muqāṭa'āt* (singular *muqāṭa'a*) that were further divided into twenty-four parts (known as *qirāt*, with one *qirāṭ* roughly equaling 175 square meters). A *muqāṭa'a* generally consisted of a principal village, its surrounding villages and towns, and their cultivated areas. By the early seventeenth century, rights to the products of most *muqāṭa'āt* in Egypt were bought from the Ottoman administration by rural Egyptian peasant leaders as tax farms (*iltizāms*).<sup>11</sup> These *multazims* (those who held *iltizāms*) were responsible for paying the state treasury a basic yearly tax and for maintaining irrigation works and agricultural fields in areas under their control.<sup>12</sup> The incentive for a *multazim* to take on this responsibility of delivering to the state a set amount of revenue every year was the right to raise additional amounts of profit for himself (*fā'id* in Arabic, *faiz* in Turkish). Thus, the Ottoman state devolved authority over the day-to-day maintenance of agriculture to these local leaders, who, in turn, guaranteed the state's revenues and were also able to make a profit for themselves.<sup>13</sup> The ultimate cash remittance paid out by the vali (provincial governor) of Egypt to the Ottoman state

Shaw, "Landholding and Land-Tax Revenues in Ottoman Egypt," in *Political and Social Change in Modern Egypt: Historical Studies from the Ottoman Conquest to the United Arab Republic*, ed. P. M. Holt (London: Oxford University Press, 1968), 91–103. See also: G. Frantz-Murphy, "Parallel Cyclical Patterns in Pre-Ottoman and Ottoman Land Tenure in Egypt," *AO* 9 (1988): 17–24.

<sup>11</sup> On these shifts in taxation and the legal status of land, see: Baber Johansen, *The Islamic Law on Land Tax and Rent: The Peasants' Loss of Property Rights as Interpreted in the Hanafite Legal Literature of the Mamluk and Ottoman Periods* (London: Croom Helm, 1988), 85–97. For general discussions of *iltizāms* in the Ottoman Empire, see: Joseph E. Matuz, "Contributions to the Ottoman Institution of the *Iltizām*," *OA* 11 (1991): 237–49. On *iltizāms* in Ottoman Egypt, see: Umniyya 'Amir, "Nizām al-Iltizām: al-Taḥawwul min al-Milkiyya al-Ḥukūmiyya ilā al-Milkiyya al-Khāṣṣa," *al-Rūznāma: al-Ḥawliyya al-Miṣriyya li-l-Wathā'iq* 1 (2003): 267–85. On the *iltizām* system in Egypt during the French occupation, see: Naṣir Ibrāhīm, "al-Firinsiyūn wa Nizām al-Iltizām," *AI* 37 (2003): 31–54.

<sup>12</sup> For a clear statement of these dual responsibilities of *multazims*, see: DWQ, Rūznāma 4557 – Daftar Irifā' al-Miyāh bi-Baḥr Sayyidnā Yūsuf lihi al-Ṣalāh wa al-Salām 'an al-Qabḍa al-Yūsufiyya Tābi' Wilāyat al-Fayyūm (Raḡam al-Ḥifz al-Nau'ī 1, 'Ayn 59, Makhzin Turki 1, Musalsal 4557), p. 22, no case no. (28 R 1127/2 May 1715). These duties of *multazims* in Ottoman Egypt were quite similar to those of Han gentry landlords in early modern China. See: John F. Richards, *The Unending Frontier: An Environmental History of the Early Modern World* (Berkeley: University of California Press, 2003), 118–22.

<sup>13</sup> In Stanford J. Shaw's judgment, "The tax-farm system was ideal for Ottoman Egypt, given the conditions of the time. It assured the [imperial] Treasury of a continued flow of revenues with a minimum of administrative cost to itself. It gave the tax-farmers a permanent and continued interest in the fertility of the land, so that they would not over-exploit it and drive the peasants away. It subjected the cultivators to regular taxes, and protected them against arbitrary illegal impositions." Shaw, "Landholding," 102.



was known as the *irsāliyye-i ḥazīne*.<sup>14</sup> The profit garnered by the Empire from this payment – more than that from any other single province – was the ultimate reason for the Ottoman state’s control and maintenance of irrigation, land, and agriculture in Egypt.<sup>15</sup>

The annual cycle of agricultural cultivation in Egypt was, of course, timed to the Nile’s flood.<sup>16</sup> Summer rains in the Ethiopian highlands

<sup>14</sup> For references to the preparation and sending of the Egyptian *irsāliyye-i ḥazīne*, see: TSMA, E. 664/4 (n.d.); TSMA, E. 664/64 (1 C 1059/12 Jun. 1649); TSMA, E. 5207/57 (Evail B 1056/12–21 Aug. 1646); TSMA, E. 5207/58 (Evasit B 1056/22–31 Aug. 1646); TSMA, E. 7016/95 (n.d.); TSMA, E. 5207/49 (Evhair Ca 1056/5–14 Jul. 1646). The following case concerns problems with the delivery of this annual remittance: TSMA, E. 664/66 (n.d.). For an example of the accounting of the *irsāliyye-i ḥazīne* from the year 1649/1650, see: TSMA, E. 4675/2 (20 N 1061/6 Sep. 1651). The following case concerns the sending of two thousand *gurus* from the villages of Egypt as part of the *irsāliyye-i ḥazīne*: TSMA, E. 3522 (24 Ş 1148/8 Jan. 1736). For a detailed discussion of the *irsāliyye-i ḥazīne*, see: Shaw, *Financial and Administrative Organization and Development*, 283–312 and 399–401.

<sup>15</sup> Jane Hathaway, *The Politics of Households in Ottoman Egypt: The Rise of the Qazdağlıs* (Cambridge: Cambridge University Press, 1997), 6. Michael Winter claims that the Empire was content with any amount of autonomy or independence of its functionaries in Egypt as long as the *irsāliyye-i ḥazīne* was paid to the Ottoman state and Egypt formally recognized the sultan’s authority and contributed soldiers to imperial campaigns. Winter, *Egyptian Society under Ottoman Rule*, 20. For a detailed accounting of each component of the annual *irsāliyye-i ḥazīne* of 1596 to 1597, see: Stanford J. Shaw, *The Budget of Ottoman Egypt, 1005–1006/1596–1597* (The Hague: Mouton, 1968).

<sup>16</sup> The only direct archival evidence of the annual flood in the long eighteenth century is a series of two registers from the high divan (al-Diwan al-‘Ali) of Egypt in Cairo: DWQ, al-Diwan al-‘Ali 1; DWQ, al-Diwan al-‘Ali 2. For a study of these two registers, see: Jihān Aḥmad ‘Umrān, “Dirāsa Diblūmāṭiyya li-Wathā‘iq Wafa’ al-Nil bi-Sijillāt al-Diwan al-‘Ali ma’ Nashr Namādhij minhā,” *Waqa’i’ Tārīkhīyya: Dawriyya ‘Ilmiyya Muḥakkama* (2004): 347–81. As part of its assigned responsibilities, the Ottoman high divan served to certify the official height of the flood, as read by the Nilometer on the island of al-Rauḍa in Cairo, with an entry in its registers. The twenty-seven entries we have of this sort in the two surviving registers of al-Diwan al-‘Ali are spread over the period from 1741 to 1804. The magic number of sixteen cubits for the height of the annual flood represented the minimum flood level required to be able to assess taxes on the *iltizāms* of Egypt. Not surprisingly, none of the entries of this “official” level of the flood was less than sixteen cubits. The flood’s height was recorded in each of these cases either on the very same day of the flood or on the day after – an indication of the importance of registering an official record of the Nile’s height as soon as possible. For a study of the increase in the Nile’s maximum flood level over the course of the fifteenth century, see: Stuart J. Borsch, “Nile Floods and the Irrigation System in Fifteenth-Century Egypt,” *Mamlūk Studies Review* 4 (2000): 131–45. For a spectral study of long-term trends in the river’s flood levels, see: D. Kondrashov, Y. Feliks, and M. Ghil, “Oscillatory Modes of Extended Nile River Records (A.D. 622–1922),” *Geophysical Research Letters* 32 (2005), L10702.

For a detailed history of the Nilometer compiled from various historical sources, see: Amin Sāmī, *Taqwīm al-Nil*, 5 vols. in 3 pts. (Cairo: Dār al-Kutub wa al-Wathā‘iq al-Qawmiyya, 2003), pt. 1, 65–95. In this regard, see also: William Popper, *The Cairo*

swelled the river, causing it to rise in Aswan in Upper Egypt by June and in Cairo by early July. Water continued to rise through the summer, until its peak in Cairo in late August or early September. From then, it began to fall steadily, reaching half of its flood height by the middle of November and its minimum by May before the cycle began anew. The onset of the flood in the late summer was designated as the start of the agricultural year in Egypt. Lands in Upper and Lower Egypt watered at the beginning of the agricultural year in September or October produced the major annual harvest, consisting of wheat, barley, lentils, clover, flax, chickpeas, onions, and garlic. This was known as the winter crop (*al-shitwī*). Lands were also planted and harvested from January through May with stored water from basins and canals, thus producing a second major yield for the agricultural year known as the summer crop (*al-ṣayfī*), consisting mainly of wheat, barley, cotton, melons, sugarcane, and sesame. There was, of course, wide regional variation in the kinds and amounts of crops grown. Rice cultivation, for example, was concentrated in northern Lower Egypt, tobacco and sugarcane in Upper Egypt, cotton in Middle and Lower Egypt, and flax in the interior of the Delta and in the Fayyoun oasis. Wheat was grown almost everywhere.

The legal status of the water of Ottoman Egypt that grew foodstuffs and other crops was far more nebulous than the status of land. No single entity “owned” the waters of the Nile or a canal. At the same time, however, the equitable use of water was a priority maintained by the Ottoman administration at all costs.<sup>17</sup> Thus, although water was owned by no

*Nilometer: Studies in Ibn Taghrī Birdī's Chronicles of Egypt, I* (Berkeley: University of California Press, 1951); Nicholas Warner, *The True Description of Cairo: A Sixteenth-Century Venetian View*, 3 vols. (Oxford: Arcadian Library, in association with Oxford University Press, 2006), 2:123–25. On the identity of one of the Nilometer's earliest engineers, see: Iḥāb Aḥmad Ibrāhīm, “Muhandis Miqyās al-Nīl: Ma'lūmāt Jadīda fī Ḍau' al-Nuqūsh al-Kitābiyya lil-Miqyās,” *AI* 39 (2005): 1–8. Muṣṭafā 'Ālī, who visited Egypt at the end of the sixteenth century, describes the Nilometer as “indeed one of the rare creations of the world and of the curious works resembling magical devices.” Andreas Tietze, *Muṣṭafā 'Ālī's Description of Cairo of 1599: Text, Transliteration, Translation, Notes* (Vienna: Verlag Der Österreichischen Akademie Der Wissenschaften, 1975), 30.

For a detailed fifteenth-century account of the island of al-Rauḍa, see: Jalāl al-Dīn al-Sayūṭī, *Kawkab al-Rauḍa*, ed. Muḥammad al-Shashtāwī (Cairo: Dār al-Āfāq al-'Arabiyya, 2002).

<sup>17</sup> For a discussion of the management of water resources and irrigation during the Mamlūk period, see: Sato Tsugitaka, *State and Rural Society in Medieval Islam: Sultans, Muqta's and Fallahun* (Leiden: E. J. Brill, 1997), 220–33. For a very general geohydrologic history of water and irrigation in Egypt from the Pharaohs to the late twentieth century, see: Wizārat al-Ashghāl al-'Āmma wa al-Mawād al-Mā'iyya, *al-Nīl wa Tārīkh al-Riyy fī Miṣr* (Cairo: al-Lajna al-Ahliyya al-Miṣriyya lil-Riyy wa al-Ṣarf, n.d.). Similarly, see the relevant sections of the following: Akādīmiyyat al-Baḥṭh al-'Ilmī wa al-Tiknūlūjiyyā, *Tārīkh al-'Ulūm*