

This paper was drafted for the panel on "Rights in Common in Land and Water in Japanese History," at the annual meetings, American Historical Association, December 28, 1985, New York, NY.

Water Use, Water Management, and Water Rights in Tokugawa Japan (1600-1868)

I have recently returned to thinking about the forms and significance of water control in the Tokugawa state after working on other topics for several years. Where I had previously concentrated on a single region as a case study in irrigation management (Kelly 1982a), my interest now is in understanding more comparatively the distribution of managements forms across the Tokugawa countrysides and more broadly the consequences of water control patterns for the structure of political authority and mercantile wealth in those centuries. This brief paper outlines several themes that have emerged in the early stages of this research.

Rice and politics in Japanese history

Irrigation has been a politically-charged social fact in Japan for 2000 years because the wet-rice agriculture that it serves has, for that long, been rooted in an intricate ecological/political nexus. The Japanese inflection of what Geertz called in another context "the wet and the dry" has been a duality internal to the farming system - - between irrigated rice paddy and other, non-irrigated grains and legumes. The possibilities for water supply and control have frequently determined the balance struck between the two in a particular locale.

However, this agrarian ecology has been embedded in a larger dynamic of farming, fishing, and forestry, whose specific form varies across ecological regions, but whose common theme has been simultaneous competition and interdependency. In the mountains, where dry fields predominate over paddy, farmers and foresters are sometimes sworn enemies and sometimes one and the same person. On the plains, where paddy predominates over dry fields, cultivators have fought one another to exploit surrounding mountains and wetlands for feed grass, firewood, and fertilizer. With equal measure, they join together to manage in common these and other resources. Coastal people supplement fishing with small-scale farming made difficult by sandy soil, salt water, and sea wind problems. Both economically and ecologically, there are lines of necessary cooperation and inevitable antagonism within and between these zones of subsistence.

Thus the Japanese agrarian system has always been a composite one, but it is equally true that within farming, there has been a strong bias toward irrigated rice. This is not because the environment predisposes rice cultivation; in much of Japan, it has not been naturally favored by hydrology, topography, or climate. Rather, it has been political will, not physiographic endowments, that has put rice at the center of Japanese society. Political elites have promoted rice cultivation through their tribute demands, in the allocation of fiefs, as a measure of social status, and for its central place in rituals.

One may track the ties of rice, water, and politics in three interdependent movements through Japanese history. The first has been a shift in the political center of gravity from western (the Inland Sea region and the old imperial capitals of Nara and Kyoto) to central (the home basins of the 16th-century warlords) to eastern Japan (Edo, the capital of the Tokugawa shogunate from 1603, now Tokyo). There has been a corresponding shift through the centuries in the locus of agricultural development (i.e., the creation and expansion of paddy land) from west to central to northeastern Japan. Thirdly, such arable expansion was made possible by successive advances in water control technology (river training, ponding, water lifting, etc.) in the increasingly more challenging environments of central and northeastern Japan. This is not to posit a technoenvironmental determinism, but it is to insist on the shifting ecological context of Japanese political history and on the particular influence of patterns of water control and use.

The early Tokugawa rulers attempted to fashion a centralizing, hierarchical authority from feudal and bureaucratic loyalties, and they ingeniously counterpoised this by delegating responsibility for self-regulation to local groups (warrior squads, urban neighborhoods, cultivator villages). State authority was acknowledged by the collection of tribute and service, and maintained by the judicious distribution of fiefs and stipends among warrior retainers. Despite an ideological orthodoxy that elevated the warrior-rulers and denigrated the merchant-tradesmen, this tributary polity was inextricably bound to a vibrant mercantile economy (an argument developed in Kelly 1985).

Of all periods in history, it was probably during these Tokugawa centuries that rice was most central: economically, politically, and ideologically. It was the major commodity, mode of tribute, and measure of prestige and prestation. The thrust of state policy towards rice production was to privatize arable land, by assigning parcels to registered households as proprietors-cultivators; to collectivize access to surrounding nonarable lands and rivers, by legislating use through administrative village units; and to regulate rice delivery as tribute through a rural administrative hierarchy and sale as a commodity through licensing of shippers and dealers. While scholars have attended closely to the first and third dimensions of rice policy, the importance of the second has been too often overlooked.

Yama, yachi, and yōsui: The resource environment of rice paddies

We have long recognized that the rice paddy is a delicate microenvironment, in which soil layers, water levels, microbes, and organic matter must be skillfully manipulated for ion exchange, nutrient transfer, temperature regulation, and plant growth. It is less appreciated that paddy productivity and stability depended, in Tokugawa agriculture, on an extensive supporting environment of forests, wetlands, and rivers. These formed what one might call the "3 Y's" of the agrarian ecology: respectively, yama, yachi, and yōsui. Throughout these centuries, more than labor and flat land per se, these were the limiting resources on the expansion and intensification of rice production. The forested mountains and the scrub wetlands provided the food, fuel, feed, and fertilizer for cultivators, draft animals, and the paddy fields themselves.

Opening and improving paddy fields depended equally on a sufficient water source and on an adequate drainage flow. Even a minimal account of rice agriculture and resource management must capture these larger systemic relationships.

Of the three, water resources (yōsui) created the most complex patterns of use and control. These intricacies have been seldom treated in 20th-century research because irrigation has usually been addressed in the context of debates about the nature of the village "community," the kyōdōtai. This has engendered heated polemics among and between Marxists, modernists, and populists about the ways in which village solidarity arises from collective operation of village canals (Kelly 1982b:3-14). However, such a perspective doubly distorts the significance of water for regional political economy. By focusing on canal operations, it ignores other, equally critical aspects of water resource management, such as source control, major facility construction, and drainage. By concentrating on intra-village affairs, it obscures the fact that most cultivators and most paddy lands were actually part of multi-village, multi-level networks of irrigation and drainage. It was as a supra-village, regional level of organization that water resource management attracted the concern of shogunate and domain officials, large landholders, and the cultivators themselves.

The variables and variation in water management are indeed daunting to any effort to catalogue, characterize, and account for the thousands of irrigation-drainage networks of Tokugawa Japan. In appendices to this paper, I offer brief and tentative orderings of three levels of analysis that can only suggest the work to be done. Appendix A enumerates some of the main categories of environmental modifications and technical facilities by which water was appropriated for rice production. These include the many techniques of source control, delivery arrangements, field use, and drainage. Examples of the regional and period variants in the engineering aspects may be gleaned from official rural administration manuals (jikatasho), commoner farm manuals (nōsho), and the detailed documents and maps prepared by parties in the countless water disputes. They permit fairly accurate technical descriptions of many networks.

Appendix B outlines basic procedures and conventions of management for construction-reconstruction, operation, maintenance, allocation, and dispute resolution. Again, the permutations and variations are immediately striking. Underlying them was a polysemic conception of agricultural water use known as yōsui, which referred generally to irrigation, and contextually to physical networks of water delivery, the social organization of irrigation, and acknowledged full rights to river water for crop use. Water "rights" were seldom discussed abstractly, even in official treatises on administration and adjudication. Rather, they were expressed and defended concretely, often as the type of intake works that a user or user group had an accepted claim to maintain (e.g., a double-gated wood intake, 1 meter wide, angled from the delivery canal, with a 50 cm. diameter, notched log weir, sunk in the canal just downstream of the intake to raise the water level). Acknowledgement in exchanged documents, network charter, or official memoranda was necessary and sufficient to establish a continuing claim.

In this paper, however, I would like to draw particular attention to a third level of analysis, that of social organization, the structure of roles by which the irrigation-drainage networks were managed. A preliminary overview of a number of cases, drawn from both document collections and secondary literature, suggests at least three characteristics of Tokugawa irrigation management: typological variation, organizational entropy, and minimal performance. These are elaborated on in the following sections.

Typological variation: Four management forms

Given the shape of the tributary polity and mercantile economy in the countryside, it is not difficult to imagine four logical configurations of authority in water affairs:

- state management, in which shogunate or domain officials closely supervised source control, delivery, and drainage tasks in a network;
- local elite management, in which merchant or gentry-like large landholding households exercised principal decision-making authority in a network;
- collective water user management, in which units of water user-cultivators jointly and autonomously operated a network; and
- dispersed management, in which there is neither decisive elite intervention nor effective water user organization.

Indeed, I believe these four frame the possible management forms for Tokugawa irrigation, and in appendix C, I offer very brief descriptions of networks that illustrate each configuration. The shogunate and some domains played active roles in construction and expansion of irrigation-drainage works in many regions, but there are far fewer examples of continued state management of on-going networks. The Yoshida and Minumadai networks in the middle reaches of the Tone River were such cases. Into the 19th century, a hierarchy of officials under the Shikawa Magistrates' Office actively supervised maintenance and allocation through extensive canal systems. Fifty miles to the west, beyond Kantō Plain, warriors escaping the turmoil of the late 16th century settled in the small Shinshū mountain basin of Kitasaku. There they sponsored canal construction and paddy land development, and remained in the villages as commoner land proprietors, monopolizing direction of the water networks on which the villages depended.

The Twelve-gō network illustrates the third management type. Its claims on Takahashi River water, its canal system, and many of its procedures predated the Tokugawa era. Its internal hierarchy of service area units and structure of representatives, intake operators, and canal guards effectively protected its generous water supply against upstream mine operators, downstream irrigators and paddy land developers, and commercial boatmen.

Yet a fourth variant is exemplified by the Shōryūjigawa network in the Aka River basin in northern Japan. While roughly of the same scale as the Twelve-gō, there was little evidence of cohesive water user organization, nor of local or state intervention. All

participated in the necessary tasks of network operation, though with little initiative. It was at best a dispersed authority in water affairs.

I initially expected that these management forms would vary with scale or features of technology or the natural environment, but I have thus far been frustrated in establishing such correlations. More than such factors, the differences seem better explained by the political circumstances of paddy land development; the particular state encouragements, the initial leadership, and the course of settlement and land conversion across an area had decisive, long-term influence.

Organizational entropy

The polder lands along the coast of the great Nobi Plain in central Japan had endemic flooding and drainage problems, which were seriously exacerbated in the early 17th century by state-sponsored embankment construction upstream along the major rivers that flowed across the plain to the sea. Several domains responded with embankment projects to protect what now became large polder "islands" (wajū), and they actively coordinated upkeep and operation of the completed embankments and associated intake and drainage works. By the late 18th century, however, local requests for domain financial and technical assistance were increasingly ignored, and domain officials withdrew from an active role in these areas of wajū (Takamaki 1978).

One can observe similar entropic tendencies in other networks in late 18th and 19th centuries. There are of course counterexamples, but I would hazard the proposition that the common direction of organization change was toward more circumscribed involvement in water management by officials and commoners alike in the latter part of the Tokugawa period. One may suppose several reasons why this might be so. Certainly the shogunate and most domains faced sharp fiscal constraints that limited what they could and might want to do to maintain and improve water facilities. Moreover, for several reasons, most were unable to resurvey and raise tribute rates on paddy lands and could thus expect to gain little for their treasuries from direct management. Many of the wealthier urban and rural commoners shifted investments out of rice or else had developed dispersed parcel holdings that disinclined active intervention in a particular network. And in many regions, population movements and continual sales and other exchanges of paddy parcels among cultivators came to so undermine any earlier congruences of residency, landholding, and cultivation that the village unit had lost some of its disciplinary force. For these and other reasons, then, the 19th century probably saw less efficient and less effective water management than the 17th or 18th centuries.

If this is sustained by further research, it might seem to contradict the widely-held view of an expanding 19th-century rural economy. I do not however see the contradiction as a serious one. It implies that 19th-century agricultural productivity gains were largely due to individual rice practices, such as better tool design, labor intensification, and fertilizer substitution and more intensive composting, and to the rising productivity of non-rice crops. What declining organizational and network

efficiency does remind us, though, is that such output expansion was an aggregate measure. It did not frequently translate into stable prosperity for individual rice cultivators, who remained vulnerable to continual fluctuations in their market and natural environments.

Minimal performance

However, I do not want to paint too dire a portrait of water management. Networks may have tended toward organizational stasis, but not water anarchy. I have yet to discover a single case in which conditions deteriorated to the point of long-term productivity declines or severe environmental degradation. The reasons, I believe, lie in the nature of water resource use. Any network, whatever its configuration of management roles, was a field of cross-cutting interests. The multi-level construction of most networks created shifting situational patterns of cooperation and contention. While this frustrated decisive, unanimous, or autocratic action, it also constrained seriously debilitating conflicts, and insured at least minimal on-going operation.

The common wisdom about resource management in Tokugawa agriculture has been that arable land was held privately by competing households while the ancillary resources of forests, wetlands, and water were controlled communally through the village community. The solidary community devised and sanctioned rules of access intended to insure social harmony and ecological stability. Certainly, by historical practice, ecological imperative, and administrative fiat, water resources were managed collectively in Tokugawa Japan, with prominent roles accorded to village units. Yet it is equally clear that other features of hydrology, topography, and political economy combined to make irrigation a critical arena of state-cultivator articulation and of elite competition in the Tokugawa countryside.

**Appendix A:
Technical facilities and environmental modifications
in Tokugawa irrigation-drainage**

1. Water source control
 - managed watershed forest
 - river training techniques
 - channel straightening
 - embankments
 - current regulation works (suisei, shizuwaku, ushikura, etc.)
 - overflow basins
 - ponding techniques
 - catchment channels
 - intake valves
 - excess regulation cuts
 - outtake valves and siphons

2. Water delivery
 - river diversion weirs (seki, izeki)
 - construction forms (kusa seki, arai seki)
 - positioning (ichimoji seki, minote seki, fukuro seki)
 - dimensions
 - intake gates (suimon, irih, mido)
 - flumes (overhead, siphon)
 - canal weirs (makura, dogi, etc.)
 - pumping equipment (field wells, water wheels, pedal pumps, etc.)
 - canal lining

3. Water use
 - cold water holding basins
 - perimeter binding (permanent, temporary)
 - field intakes/outlets

4. Drainage
 - underground field drainage systems
 - excess water gates (akusuimon)
 - drainage pumping mechanisms

Appendix B: Management procedures and conventions

1. Construction/reconstruction

financing

state financing (gofushin: kokueki fushin, otetsudai fushin, onyuyo fushin)

service area financing (jifushin: sekiko fushin, etc.)

labor & materials

requisitioned from service area village units (in proportion to registered paddy "acreage," acknowledged irrigated acreage," or other formulas)

purchased through private contractor

supervision: state administrators, state technical officers, network roles, village headmen

2. Operation

maintenance: periodic cleaning, dredging, repairs

labor/materials requisition formulas

supervision procedures

allocation methods

time formulas (banmizu, etc.)

facility formulas (division by gate structures, channel width, flow obstruction devices, etc.)

allocation rights

holder of right: service area, administrative village, household

object of rights: irrigation water (yōsui), excess water (josui),

drainage water (akusui)

basis of right: legal decision, written agreement, "custom"

definition of right: land acreage, rice yield units, volume of water, order in rotation, control over facilities

seasonal variation: spring field preparations, transplanting, summer low water periods

3. Dispute resolution

conciliation (naisai)

directed conciliation (atsukainin naisai)

adjudication (so, sosho)

Appendix C: Four forms of Tokugawa water management

(1) State management: The Minumadai network of the middle Tone River (present-day Saitama Prefecture)

The shogunate capital of Edo lay at the coastal edge of the Kanto Plain, the largest expanse of flat land in the country, crossed by a number of high-discharge rivers. The development and protection of the capital and expansion of arable land required major river diversion, artificial channeling, and flood control projects that were planned and supervised by shogunate engineers and officials. One such example was the Minumadai yōsui, a network of over 50 kilometers of canals drawing water from the Tone River for a service area of about 13,000 hectares in more than 300 administrative villages. It was begun in 1728 by shogunate engineers to consolidate several older networks together with land reclaimed by draining the Minuma Swamp. The service area included shogunate lands, bannerman fiefs, fief lands of several domains, and numerous temple and shrine lands. After construction, operation continued under a hierarchy of shogunate officials in the Shikawa Magistrates' Office. Below them, 4 Irrigation Administration Officers (yōsui shihaiyaku) were appointed from local notables. These four were charged with normal maintenance and allocation along the main canal. they were on duty from the 78th day to the 210th day of the solar calendar year, opening the Tone River intake and managing turn-taking through the year. They were also responsible to the shogunate Finance Magistrates' Office for expense accounting and requisition of labor. Below them were representatives (sōdai) for each of the 58 branch canals, to whom reported various gate watchmen (sekimori) and canal guards (hiban).

Sources: Kikuchi 1966:70-71; Shinzawa 1955:241-358.

(2) Local elite management: The Shiozawa network in the Kitasaku Basin (Shinshū, present-day Nagano Prefecture)

The river that crosses the floor of the small mountain basin of Kitasaku, to the west of Kanto Plain, had so eroded its channel by the 17th century that paddy development depended on tapping large springs high in the surrounding mountains. In the first half of that century, a former samurai retainer of the defeated Takeda Shingen, Mukawa Chosaburō, negotiated permission with the local domain lord to open land in a western section of the basin. It took him two years to locate an adequate water source, below a high mountain peak, and another 20 years to wind a canal down its slopes. With this, he could support about 60 hectares of new paddy land in what became the several settlement clusters of Shiozawa Village. For 300 years, the Mukawa household

remained in effective control of this Shiozawa network, whose canals regulated flow by channel width and gradient drops to paddy areas measured by yield and water retention ability. The Mukawa head himself recorded all allocation and requisitions in private books, made all daily adjustments himself, and led the annual spring dredgings.

Sources: Tamaki 1970; Tamaki & Hatate 1974:176-89.

**(3) Collective water user management:
The Twelve-gō network in the Takahashi River basin
(Bitchū, present-day Okayama Prefecture)**

After assigning Okayama to the Ikedas and Hiroshima to the Asano house, the first Tokugawa shoguns parceled the intervening province of Bitchu among numerous small bannerman and minor lords as a buffer between two families whose loyalties to the Tokugawas were not beyond question. This patchwork of territories had little effect on local organization in Bitchu's principal plain, irrigated by the Takahashi River. Three canal networks on the plain drew Takahashi water; preeminent was the upstream Twelve-gō, whose main facilities predated the 17th century. A 1612 document signed by officials of area domains confirmed the specifications of its river intake and main canal by which its right to river water was defined. The Twelve-gō continually and successfully defended this right against numerous complaints from the other two Takahashi networks, challenges from mining interests in the headwater mountains and river boatmen, and plans for coastal reclamation and paddy development. By the late 18th century, it served 4000 hectares in 67 administrative villages; its surplus and drainage were also used by an additional 1300 hectares below this official acreage. The go by which the network was internally structured was an earlier regional unit, which survived as the basis for allocation of water and requisition of funds and labor for maintenance and repair (gobuwari). Network affairs were coordinated by a central council of 17 representatives (sōdai deyaku), typically village or village group headmen and frequently hereditary. This council supervised the intake guard, a salaried, hereditary position charged with daily responsibility for intake maintenance and operation. There were additionally a range of main and branch canal inspectors and operators, supervised by the council of 17 and by local village officers. The external challenges and the internal procedures generated an enormous corpus of written agreements and codifications (many collected in Fujii & Kohara 1976:401-738), which themselves illustrate the strength and autonomy of the Twelve-gō network.

Source: Fujii & Kahara 1976; Kitamura 1973:15-68

**(4) Dispersed management:
The Shōryūjigawa network in the Aka River basin
(present-day Yamagata Prefecture)**

In 1623, the small, sparsely settled northern plain of Shōnai was given in fief to a longtime Tokugawa ally, Sakai Tadakatsu, whose line held it as the house domain for the remainder of the Tokugawa period. Shōnai's major river basin, the Aka River basin, presented a geomorphology that was perhaps the most common in Japan: a mountainous, forested headwaters, an arable alluvial fan, built up where the river met the plain, and a very flat downstream expanse. The domain lord whom Sakai replaced had promoted a small scale embankment project in the alluvial fan midsection that stabilized Aka River flow and permitted the digging of a total of nine networks of branching, gravity-flow canals off this alluvial fan and across the central plain. The largest of these, the Shōryūjigawa, served 87 administrative villages through 37 branch canals, each with numerous tertiary channels and field ditching.

Service area boundaries mapped very poorly over administrative boundaries. A 1659 document listed service area lands with registered yields of 26,000 roku (= c. 2900 hectares); this remained the official capacity, though expansion through the 19th century brought another 1000 hectares into the unofficial irrigated acreage.

The major irrigation works in the network was the massive river intake gate; the domain soon delegated its periodic reconstruction to the six villages of that area. Thereafter, the repairs proceeded fitfully in the midst of wranglings between lower domain officials, headmen of the six villages (which were not themselves served by Shōryūjigawa), concerned Shōryūjigawa water users, officers of other, downriver networks (who continually suspected the repairs to increase Shōryūjigawa's intake efficiency), and the two Shōryūjigawa "main canal guards" (osekimori). "Guard" was something of a misnomer for these hereditary posts which inspected the main canal, supervised repairs, encouraged allocation adjustments, but which had no powers to initiate, revise, or penalize. Indeed, at the other levels of the network and in most Shōryūjigawa affairs, the documents suggest decision-making authority dispersed among a few specific water roles, village and village group headmen, and low-ranking domain officials -- none of whom showed much interest in decisive intervention and action.

Source: Kelly 1982a:104-59

References cited

Fujii Takashi & Kahara Kosaku

1976 Tatai jūnikagō yōsui shi [A History of the Tatai Twelve-gō Irrigation Network]. Okayama: Tatai jūnikagō kumiai.

Kelly, William W.

1982a Water Control in Tokugawa Japan: Irrigation Organization in a Japanese River Basin, 1600-1870. East Asia Papers Series 31. Ithaca: Cornell University China-Japan Program.

1982b Irrigation Management in Japan: A Critical Review of Japanese Social Science Literature. East Asia Papers Series 30. Ithaca: Cornell University China-Japan Program.

1985 Deference and Defiance in Nineteenth-Century Japan. Princeton: Princeton University Press.

Kikuchi Toshio

1966 Shinden kaihatsu [Paddy Land Development Projects of the Tokugawa Period]. Tokyo: Iwanami shoten.

Kitamura Toshio

1973 Nihon kangai suiri kanko no shiteki kenkyu: kakuron hen [A Historical Study of Japanese Irrigation Customs: Case Studies]. Tokyo: Iwanami shoten.

Shinzawa Kagato

1955 Nōgyō suiri ron [A Treatise on Agricultural Water Use]. Tokyo: Tokyo daigaku shuppankai.

Takami Makoto

1978 "Bakuhan ryōshu no chisui seisaku to wajū" [State Flood Control Policies and Polder Settlements], in Kitajima Masamoto (ed.), Bakuhansei kokka seiritsu katei no kenkyu: Kan'ei o chūshin ni, pp. 447-76.

Tamaki Akira

1970 "Kitasaku kagan dankyū no kaihatsu to tokui na suiri chitsujo no keisei: Shiozawa seki o chūshin ni shite" [The Formation of Special Water Use Procedures and the Development of Kitasaku Bottomland Terracing: The Case of Shiozawa Network], in Norinsho Kanto Noseikyoku (ed.), Nagano ken ni okeru nōgyō suiri no tenkai to nōgyō hatten, pp. 123-51.

Tamaki Akira & Hatate Isao

1974 Fūdo: daichi to ningen no rekishi [Culture and Environment: A History of Land and People]. Tokyo: Heibonsha.