The Development of Civil Engineering Projects and Village Communities in Tokugawa Japan

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Abstract

While in early modern Europe, entrepreneurial individuals made public investment for land improvement, in Tokugawa Japan, a village community or league of villages played an important role in many civil engineering projects. Honor and praise in each community gave villagers good motivation to perform “public” work, including constructing new facilities and maintaining them. Village communities had strong relationships with local governments through financial subsidization. Sometimes, in practice, village communities carried out many public projects subsidized by local government. In addition, the activities of village communities were connected technically with public investments by local governments through irrigation and drainage networks. Government projects made it possible for villagers to create new paddies and fields. Hence, the aggregate effects of the interconnected projects should be measured carefully through comparing the hectares affected by each project with the change of kokudaka (land values measured by the amount of rice yield) in each region.

1. Introduction

Civil engineering projects develop agriculture by expanding cultivated land and improving the land and/or labor productivity in many regions. In Europe, the projects usually have been carried out by “entrepreneurial” individuals; that is, “enlightened

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landlords,” “capitalist farmers,” and “innovators.” In England, landlords promoted enclosure of farm land in expectation of rising rent; in addition, farmers brought about land improvement through drainage, fencing, or the erection of new buildings; then, they had the “tenant right” to be compensated for their investment (Overton 1996: 162–184). In the Netherlands, wealthy town dwellers made large-scale investments to reclaim new polders; there, “large landownership was dominant from the outset” (Van Bavel 2001: 17). In other European countries, small numbers of “improving landlords” tried to advanced technologies in the 18th and 19th centuries (Blum 1978: 285).

Meanwhile, governments sometimes promoted large-scale projects, which the private sector was unable to complete. In Prussia, the government constructed dikes in in the upper Oderbruch to protect villages from floods (Kaak 2015). In France, a “royal agency” accomplished a reclamation project of the Ponts et Chaussées in the last year of the Old Regime (Rosenthal 1992: 94).

Peasants in village communities usually opposed the civil engineering projects. Villagers, who were afraid of having their land confiscated and losing their common rights, took exception to the plans for irrigation, drainage, and reclamation (Blum 1978: 292). Therefore, whether entrepreneurial individuals succeeded in land improvement projects depended on the establishment of well-defined property rights. In the Netherlands, the early growth of short-term leases in the middle ages based on “a crystallization of property rights” promoted agricultural development (Van Bavel 2001; 2009). In 18th century England, enclosure accelerated the improvement of productivity since “when land was under private property rights the return on investment made in that land by an individual would accrue to that individual and not to the community as a whole” (Overton 1996: 167). By contrast, in Old Regime France, landlord-planned water-control projects did not have well-defined property rights; the burden of proof was designated to landlords in litigation against villagers who disputed land ownership. Hence, many civil engineering projects were held up by endless litigation (Rosenthal 1992).

In Japan too, civil engineering projects played an important role in agricultural development. In the Tokugawa era (from the 17th to the 19th centuries), the Japanese extended their fields. By constructing strong dikes alongside turbulent rivers, paddy fields increased on alluvial plains where repeated floods had prevented peasants from cultivating the soil; by making dams, building canals, and digging tunnels, irrigated areas expanded substantially; furthermore, by draining lakes and the sea, much land was
reclaimed. These investments in field expansion as well as the rise of productivity per acre contributed significantly to advancing Japanese agriculture (Ishikawa 1967; Booth & Sundrum 1985).

The civil engineering projects in Tokugawa Japan were not opposed by village communities. Indeed, at the beginning of the Tokugawa era, large-scale projects by the government often promoted the establishment of close-knit rural communities. Government projects encouraged the growth of villages consisting of small autonomous households. Thereafter, the villagers accumulated wealth and started to carry out civil engineering projects by themselves. In the 19th century, village communities played a very important role in building facilities for irrigation, drainage, and reclamation. In contrast to villagers in Europe, Japanese villagers supported or initiated water management projects by making plans, providing labor, and sometimes, putting up capital.

To examine the relationship between the development of civil engineering projects and the growth of village communities, Section 2 of this paper provides an overview of the development of civil engineering projects in Tokugawa Japan. It analyzes the expansion of paddies and fields by comparing the hectares affected by civil engineering projects and the increase of kokudaka (land values measured by the amount of rice yield). Section 3 analyzes the relationship between the growth of villages and government civil engineering projects. Section 4 analyzes the communal functions of village communities. Section 5 concludes.

2. Comparison between the Progress of Projects and the Change of Kokudaka

In Research on the expansion and improvement of fields in the Tokugawa period in 1926, the Ministry of Agriculture and Commerce (MAC) of Japan conducted a survey of civil engineering projects in the Tokugawa era in order to examine the origins of customary irrigation rights. In 1936, the MAC’s research was revised by the Japanese Society of Civil Engineering (JSCE) and the number of listed projects increased from about 1,171 to 1,585 (Ogawa 1953). Based on the revised survey, some historians have estimated the acreage of cultivated area (Miyamoto 1999: 38) and the “real amount of production” (Nakamura 1968) in Tokugawa Japan. Nevertheless, the estimations are insufficient. First, they simply count the number of construction projects ignoring the scale of each. Therefore, a database is compiled in this study to record the year of
completion, names and titles of managers, and hectares of affected area of 2,857 projects registered by the MAC (1926), JSCE (1936), and some other documents. Figure 1 uses this database to show the amount of affected hectares according to the type of project; that is, controlling rivers, digging canals and ponds, and reclaiming land from sea, lakes, and marshes. However, this estimation remains unsatisfactory. Although some more projects were added to the database, the total hectares of affected area of the listed projects account for only 21.7 percent of the increment of arable land in the Tokugawa period. There are three reasons for this incompleteness. First, it is difficult to list all projects recorded or remembered for generations in the different villages; some omissions are inevitable. Second, as discussed in the Section 3, the list does not reveal the relationship between the projects; then, it is impossible to measure the total and integral effects of the several investments. Finally, villagers often increased their production simply by expanding their paddies to adjoining land (kirizoe-shinden) without records or increasing the yields per hectare of existing paddies. Thus, the list of civil engineering projects captures the peasants’ activities inadequately.

The problem could be overcome by the use of data from the kokudaka, which are land values measured by the amount of estimated rice yield based on land surveys. The increment of kokudaka, or total rice yield, could reflect the aggregate effect of the several interconnected investments, including omitted projects and peasants’ secretive efforts to expand their fields and raise land productivity. Indeed, there were five nationwide collections of kokudaka in c.1598, c.1644, c.1697, c.1831, and c.1873. However, not all scholars utilize the data from kokudaka. In general, historical geographers positively apply the data to their research (e.g., Kikuchi 1975, 1986; Hashimoto 2010). Kikuchi (1986: 731–9) states that the increment of kokudaka reflected the expansion of paddies sufficiently albeit not completely. Meanwhile, many historians are skeptical of the reliability of kokudaka data. They insist that kokudaka did not show the reality of agricultural production for two reasons. First, in land survey investigations, to evade taxation, peasants hid some paddies and fields, giving rise to the term “concealed paddies” (on-den). Second, local governments or han, which conducted the land surveys, did not report the real situation to the Shogunate. Kawamura (1984) states that in c.1644 and c.1697, han were requested to report only official values (omote-daka) and to exclude the value of newly developed paddies whereas in c.1831, han were ordered to provide the real values (jitsu-daka). However, even the real values did not reflect the reality; Kawamura (1984: 159, 246, 263) shows, for example, that Hagi-han in Nagato and Suoh manipulated the real values before reporting them to the
Therefore, the effects of civil engineering projects have to be examined carefully by comparing the increment of kokudaka with the acreage affected by civil engineering projects in each region. All the five nationwide collections have kokudaka data of 67 provinces (koku), while all but the first collection in c.1598 have the data of 630 districts (gun). The panels of Appendix show the change of kokudaka of each province or district. Figure 2 represents the relationships between the increase of kokudaka and hectares affected by civil engineering projects in each province from c.1598 to c.1873, and there is significant correlation between them; the correlation coefficient is 0.55.

Figure 1 reveals that paddies and fields expanded greatly in three periods. First, from 1600 to the 1680s, public investment in controlling rivers and the construction and maintenance of canals and ponds converted barren wasteland into fertile paddies and fields. Many Japanese rivers flowing from mountains usually changed their courses on alluvial fans and flood plains. Therefore, only after strong local governments constructed banks to control river flows did peasants start to cultivate fields and build new villages on former flood plains. The improvement of public infrastructure stabilized the production of peasant households, and encouraged them to create close-knit communities. Furthermore, while regional governments often dug great canals in order to clear forests, a village community or a cooperating group of village communities also built branch canals; in addition, some villages constructed small canals or ponds by themselves. However, the Tokugawa shogunate realized that a decline in woodland would cause floods and water shortages, and in 1666, it passed regulations prohibiting deforestation in mountains as well encouraging tree planting (Totman 1998). Hence, in the second stage of the expansion in the 1720s and 1730s, the Japanese extended paddies and fields without great deforestation; the governments carried out large-scale public works, such as reclaiming lakes. Moreover, merchants started to invest money in reclamation. Finally, in the third stage of the extension of fields from the 1820s, paddies and fields increased mainly by building canals and reclaiming the sea. Village communities that had accumulated wealth played an important role in this stage. They built canals using their own capital; furthermore, peasants sometimes organized joint stock projects for reclamation.

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2 This study adds the values of newly developed paddies in Izumi (2008) to the kokudaka of Shoho-gocho in c.1644.
3. Development of villages communities and civil engineering projects

3.1 The growth and decline of the projects of indigenous magnates

Before the Tokugawa period, village communities did not play particularly important roles in managing water resources. In the 16th century, powerful individuals carried out civil engineering projects. Indeed, in Kinai, the most advanced region, indigenous magnates usually controlled irrigation and drainage. Although historians refer to the magnates in several ways, that is, “dogo” (powerful local clans), “ji-zamurai” (vernacular warriors), and “sho-ryoshu” (small seigneurs), their central role was to perform large-scale cultivation by employing several genin (servants), who were personally subordinated to a magnate. The indigenous magnates engaged the servants to build ponds or canals for irrigation and drainage; furthermore, the magnates controlled the resources of woodlands. Private facilities for water management and the control of woodlands were important sources of the magnates’ regional power. In addition, in the local settlements, several small peasant households cultivated their fields using only family labor. Although the peasants were not personal subjects of the magnates, they had to follow the magnate’s orders to obtain permission to use the irrigation facilities and woodlands; therefore, in practice, the peasants provided labor for the maintenance of the facilities (Asao 1967).

Large-scale civil engineering projects by government, however, undermined the power of local magnates. From the end of the 16th century, the Toyotomi government and Tokugawa shogunate promoted several projects. For example, in 1608, the great repair work of Sayama pond in Kawachi of Kinai improved the irrigation of the surrounding regions. Peasants obtained the most benefit from the project since they became less dependent on the private facilities of indigenous magnates. Now, the peasants requested equal treatment for water management. Furthermore, Toyotomi Hideyoshi’s nationwide land survey from 1582 to 1598 registered many of the servants subordinate to indigenous magnates as holders of land titles. The former servants also obtained benefits from improved infrastructure and became independent. Then, in each village, a cooperative community consisting of autonomous peasant households emerged (Asao 1967; Mizumoto 2008).

In the advanced regions, the power of indigenous magnates declined as a result of the increase of government projects. Nevertheless, in the backward northeastern and
Hokuriku regions, *han* local government utilized indigenous magnates to develop many paddies and fields. For example, in Mutsu, Hirosaki-han from 1619 to 1687, if an indigenous magnate developed a new village at his own cost, he was given a fief or *jikatachigyo* of 30 to 50 koku and was employed as a lesser vassal or *shochigyo* samurai. The newly developed villages were called *kochigyo-ha*. However, since the increase of fiefs did not improve the finances of *han* local government, the fief system was abolished in 1687. Thereafter, the *shochigyo* moved to castle towns as samurai, continued to stay in the villages and obtained stipends, or became peasants by returning the title of samurai. Then, the *han* directly managed large-scale projects, called *mikura-ha*; by 1730, they had established 201 such projects by building canals and reclaiming marshes. This is in sharp contrast to the previous small-scale projects by the indigenous magnates (Kikuchi 1977: 70–7). In addition, in other backward regions, indigenous magnates and samurai vassals carried out civil engineering projects and expanded fields; for example, in Aizu-han, samurai vassals and indigenous magnates established *hokonin-shinden* and *mitate-shinden*, respectively; and in Akita-han, samurai vassals developed *sashigami-kai* (Miura 1983). Nevertheless, as in Hirosaki-han, in the later 17th century, the shogun and *daimyo*, or the head of local governments, removed the vassals and some of the magnates from their fiefs in order to control peasants directly. The *daimyo* provided samurai vassals staying in castle towns with “an amount equivalent to the expected income from that man’s original fief” (Gordon 2003: 15). Thereafter, village communities in cooperation with the *han* local government played an important role in public investment.

3.2 Civil engineering projects by local government and village communities

Village communities contributed to government projects in two ways. They were requested to bear some costs and to develop paddies and fields in surrounding areas. First, they provided labor and money to construct dikes and canals. The Tokugawa shogunate managed large-scale civil engineering projects encompassing several local governments. In these projects, called *kuniyaku-fushin*, the shogunate built dikes of major rivers, such as the Yoko, Uji, Kanzaki, and Nakatsu Rivers around Okasaka and the Toke and Ara Rivers around Edo (Kurachi 2008: 71). The dikes and canals were public goods that benefitted villages by preventing floods and improving water management; however, the villagers sometimes complained about an “excessive” burden. For example, in 1678, the villages in the shogun domain requested an exemption from providing labor since they had already undertaken other government
works (Murata 2009). Furthermore, local governments sometimes performed projects called *go-fushin* at their own cost. However, from 1735, even for *go-fushin* projects in the shogun domain, villages had to provide 50 workers per 100 *koku* (Otani 1996). When the scale of *go-fushin* projects was relatively small, wealthy villagers sometimes took the initiative for the project. In Mimasaka, the *han* local government made public investments to build irrigation ponds. From 1635, the Tsuyama-han provided each worker engaged in construction with 5 gou (i.e., 0.9 liters) of rice per day. In some projects, villagers also played an important role; for example, after the famine of 1675, Oka Motoemon, a village headman (*shoya*), managed the removal and construction of ponds and many ponds were built during this period. From 1698, the local government stopped this provision and paid only small subsidies to villagers who made “petitions” to build ponds (MAC 1926: 923–924). The policy change had a clear effect. As Figure 3 shows, the hectares irrigated by newly built ponds increased from 1635 to 1698, but stagnated during the 18th century. The *kokudaka* of Mimasaka changed correspondingly. They increased by 34.2 percent from c.1644 to c.1697, but only by 1.1 percent from c.1697 to c.1831.3

Second, village communities were requested to expand paddies in areas affected by government civil engineering projects. Thus, the activities of village communities were connected technically with public investments by local governments. In particular, river-controlling projects by *han* local government usually provided a basis for other projects. For example, in Muko-gun of Settsu, Amagasaki-han built the banks of the Muko River and dug new ponds and canals at the beginning of the 17th century. Thereafter, wealthy villagers invested in building branch canals and expanding paddies on the western side of the river (see Figure 4). In this process, village communities played an important role. Villagers in the irrigated areas cooperated to maintain the irrigation facilities and allocate water “equitably.” As Mizumoto (2002: 45) states, “The

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3 From the middle of the 19th century, several civil engineering projects were again undertaken. The local government dug Chikahira-ide canal and a villager, Niki Shoroku, built Katsube-ike pond. Figure 3 shows that affected hectares rose markedly again, although the *kokudaka* increased by less than 1 percent from c.1831 to 1873. In this case, *kokudaka* did not always reflect the reality of agricultural production. In this region, with the increase and decrease of government activities, civil engineering projects were promoted and stagnated, respectively.
civil engineering projects involved several villages in the new irrigation system and strengthened the mutual relationship between the villages.” Furthermore, in Echu, which has seven major alluvial fans, public investment by local governments or Kanazawa-han on the construction of the bank to control rivers promoted the expansion of paddies. For example, from the 1620s to 1630s, the local government constructed the _Ushi-ga-kubi_ canal, and ordered villagers in that region to expand paddies and build new villages in former wastelands (I. Imamura 2014: 6–8). Furthermore, from 1670, the government built a large dike for controlling the Sho River to prevent floods. This encouraged village communities to expand paddies and fields significantly (see Figure 5). Furthermore, from c.1600 to c.1644, the four districts of Echu, Niikawa, Nei, Imizu, and Tonami, increased their _kokudaka_ by 14 percent, 9.3 percent, 12.8 percent, and 9.3 percent respectively, by expanding new paddies. I. Imamura (2014) shows that the new arable lands were created not only by establishing new villages on the alluvial plains but also by increasing _kokudaka_ in existing villages. Several civil engineering projects for controlling rivers and digging canals continued to be carried out, and the amount of _kokudaka_ also continued to grow until the end of the Tokugawa period. Village communities supported the projects; they had to provide 30 workers per 100 _koku_ from 1660; furthermore, “in principle, villagers living downstream were in charge of cleaning the river bottom to maintain the banks (_kawayoke_) and maintaining canals, although the local governments provided subsidies if the cost was too large” (Saeki 2007: 153). In Echu, _kokudaka_ increased by 69.6 percent from c.1600 to 1872. This contrasts with a moderate increase of only 15.6 percent in Kaga under the same local government, Kanazawa-han. Since Kaga was a more advanced region, there was only small room for expansion of paddies.

3.3 Subsidization of government construction and maintenance

After samurai vassals and some of the former indigenous magnates moved to towns, village communities began to play an important role in developing paddies and fields. It is true that in some cases individual merchants promoted projects, as in Europe. However, their contribution was very limited; the acreage constructed by merchants was less than 10 percent. Furthermore, their projects were not welcome; for example in the advanced regions of Bizen Okayama-han and Nagato Hagi-han, merchants were excluded from civil engineering projects and expanded paddies and fields on a large scale. Only after the Tokugawa Shogunate gave permission in 1722 did merchants begin to develop new paddies and obtain rents from tenants (Oishi 1973). Kikuchi (1975: 516)
states that the Shogunate hoped that the villages newly built by merchants would stabilize rural society by absorbing surplus population in surrounding villages. However, even after the Shogunate’s authorization, many people, including illustrious scholars, criticized merchants. In an influential book, *Minkan-seiyo* (Private Ministry required), of 1721, Tanaka Kyugu blamed merchants for “deceiving and slandering others for getting money and engaging themselves only in obtaining their own profit” and recommended the utilization of “the knowledge in villages and hamlets” (Kurachi 2008: 75–78).

The majority of paddies and fields were developed by village communities. While villagers actively resisted land improvement projects in Europe, they promoted the projects by themselves in Tokugawa Japan. Their projects were called self-construction and maintenance (*ji-fushin*), as opposed to the previously mentioned government projects (*go-fushin*). However, the distinction between *ji-fushin* and *go-fushin* was sometimes not so clear. The previously mentioned Tanaka also criticized *go-fushin* for inefficiency. Instead, he recommended that, first, local villagers request a project; next, local governments assess it; and then, if the project was good, the government would subsidize it. Indeed, many *go-fushin* or government projects came to be carried out using this procedure. In these cases, the villagers provided labor and the villagers and government shared the financing burden. Nagatsuma (2001: 35) calls this “the subsidization of government construction and maintenance.”

In the 19th century, many *han* local governments suffered so severely from financial debts that they were unable to afford civil engineering projects. Meanwhile, some villagers had accumulated wealth and they sometimes formed a new type of organization for investment. Kikuchi (1975: 304) calls this *hyakusho yorai shinden* (peasant cooperation to develop new paddies), which collected money from many peasants, similar to joint-stock companies, and allocated new paddies according to the contribution amounts. For example, in Bizen in 1852, a peasant cooperative reclaimed sea to build 730 hectares of paddies; it collected silver worth 1,015 kan from 336 peasants. In such ways, wealthy peasants carried out large-scale project without support from local governments.

Furthermore, a village community or league of villages sometimes initiated projects and, in practice, they carried out many *go-fushin*. For instance, in Higo Kumamoto-han, a regional association of villages (*tenaga*) managed almost all civil engineering projects.
Then, wealthy peasants (sou-shoya) who managed the association were treated as local government officials. Since the tenaga was incorporated into the administrative system of the local government, the civil engineering projects usually were regarded as “public.” The MAC (1926) labels them “governmental” while Kimura (1964: 179–181) states that all projects in Higo were managed by the local government or Kumamoto-han. However, the tenaga, which proposed and conducted the projects, was the regional association of villages. The association rather than the local government carried out projects. Yoshimura (2013: 113) states that “in the early Tokugawa period, authorities of the shogun and daimyo performed civil engineering projects for river control and water management by organizing teams of vassals and the labor services of peasants; these were the greatest public activities and duties by such authorities in order to justify their control over peasants. Nevertheless, in later periods, the civil engineering projects were conducted not by authorities of the shogun and daimyo but by the tenaga.” The development of regional associations promoted civil engineering projects. Yoshimura (2013) indicates that in Kumamoto-han, the 19th century was “the age of civil engineering for water management.” Some tenaga built several canals for expanding new fields, and others reclaimed Yashiro Bay on a large scale. For example, in the construction of Nanahyaku-cho shinchi (literally, the “new land of 700 hectares”), leaders of groups of villages (sou-shoya) were appointed as supervisors along with officials of the local government. Then, the hectares affected by the reclamation projects increased significantly, as Figure 6 shows. Thus, kokudaka were augmented proportionally. In fact, kokudaka in 1873 were 39.1 percent higher than those in 1831. Thus, village communities or leagues of villages conducted many civil engineering projects subsidized by local government.

4. Communal Functions of Tokugawa Villages

4.1 Functions of village communities

Village communities or leagues of villages played crucial roles in many civil engineering projects. While in Europe, entrepreneurial individuals undertook land improvement projects, in Tokugawa Japan, village communities contributed greatly to the projects. The principal reason for this difference is that paddy cultivation in Japan necessitated close cooperation within and between villages. Since every paddy in a village shared an irrigation system, mismanagement of one plot adversely affected the entire village; one household’s negligent water management could obstruct the water
supply of its neighbors (Watanabe, 2008: 81–85). Furthermore, since villages were interconnected through canal networks, they had to cooperate to maintain facilities and allocate water.

Reflecting on the communal character of cultivation, Japanese peasants had different ideas about property rights compared with Europeans. Even though Japanese peasants cultivated plots, they did not consider they had exclusive rights to them. At the end of the 19th century, a Japanese peasant stated, “the surface layer of the land belongs to me, the middle layer belongs to my village, and the deepest layer belongs to Heaven” (Sakane 2011:137). They still accepted the notion of common possession of the village. Yanagida (1910/1976; 187-188), a famous folklorist, states, “The idea that ‘land in a village should be used by the [members of] the village’ has historical origins that still have a surprisingly strong influence in today’s society” (see also Sakane 2011: 140; Watanabe 2008: 140–142). This notion of property rights did not match the European view. Therefore, even after the Japanese enacted the Meiji Civil Code by studying European laws in 1898, customary rules continued to control life in each village. Peasants were expected to work together and help each other. At the beginning of the 20th century, village officials still had effective control over land transfers and field utilization. Even if some outsiders, such as town merchants, became absentee landlords in leasing land to villagers, the officials required the landlords and tenants to follow the village’s rules of cultivation (Kawaguchi 1990). Thus, property rights in Meiji and Taisho Japan did not crystallize. Although the Meiji Civil Code clearly defined the absolute and exclusive property rights of landlords and owner-cultivators, landlords’ decisions were severely restrained by the idea of cooperative village community. The landlords were unable to trade their land freely. In 1947, Kawashima (1949: 62) deplored the lack of modern property rights: “In our country, especially in rural areas, there is little to none of this [modern legal] ethos… The property rights are not based on ‘free’ and rational ethos, but are deeply connected to a hierarchical and community-based mentality.” Nevertheless, the lack of “rational” property rights did not prevent agricultural development in the Tokugawa era. While in Europe, property rights were regarded as a necessary condition for land improvement projects, in Japan, cooperation in villages based on communal property supported the construction and maintenance of public goods.

Village communities were suitable for improving and maintaining irrigation facilities. Hayami and Godo (2002) state that, in the supply of “local public goods,” usually
communities were superior to markets and the state because “the community relationship is effective in preventing free riders.” Members who did not join collective works, such as construction and maintenance of irrigation canals, would be sanctioned severely by the village. In addition, Yanagida (1926/1969) states that “the slack of just one or two people will cause failure in community-based works, such as destroying insects and weed seeds and repairing canals and roads… Japanese villages avoid this risk by old customs, while many other law-governed countries do this by enactment (of law)” (see also Sakane 2011: 138–139). Since maintenance systems based on village communities worked well, local government and wealthy villagers invested in water-management facilities in Tokugawa.

4.2 Honor in village communities

Interestingly, even purely “private” investments by individuals had communal aspects. In the aforementioned research on projects in the Tokugawa period, the MAC categorizes all non-governmental projects as “private,” and explains the incentive of managers as follows: “The private projects provided managers with opportunities to obtain special favors from local governments or han to raise the prestige of their families or to earn salary increases or promotions; then, they worked hard for the success of the projects” (MAC 1926: 1). According to this explanation, the managers usually were not motivated by profit but by honor and praise in local society. Therefore, “private” projects sometimes seemed to be selfless services. As the MAC states, “benevolent people carried out projects by spending all their property; when they failed, they sometimes committed suicide (hara-kiri),” and in other cases, “a project manager always held his testament and wore white cloth (costume for committing hara-kiri)” (MAC 1926: 1). It is a misunderstanding that peasants committed hara-kiri in the way of the samurai; the MAC’s explanation reflected the distorted perception of a samurai’s morals (bushido) (Kanno 2004). However, it is certain that it was shameful not to accomplish the projects and peasants who failed to build new facilities usually left their villages.

Of course, Tokugawa Japan did not comprise only altruistic social workers. Many civil engineering projects must have been carried out on the basis of cost–benefit calculations. As mentioned before, from the 18th century, merchants developed new paddies. On the east side of the aforementioned Muko River, merchants from Osaka and Amagasaki invested in building new paddies in the 17th century (Mizumoto 2002: 48–
The merchants were not altruistic; they made their decisions with expectations of earning profits. Furthermore, wealthy peasants who invested in building new paddies were not benevolent. They could not have spent their money digging canals and making ponds without anticipating profits. Nevertheless, it is certain that expectations of obtaining honor in society encouraged wealthy peasants to risk their fortunes on such investments. In fact, peasants in village communities praised such successful projects for many generations by naming the land and facilities after their builders, erecting monuments celebrating such accomplishments, and passing down stories of such “benevolent” people. Japanese villages consisted of perpetual family (ie), which held the same land for many generations. As Sakane indicates, “Japanese agricultural families are surprisingly steady compared with other nations in the world.” In many villages “families that have their own yago, or family name, continue to stay for a long time” (Sakane 2011: 74). Then, in Tokugawa Japan, the same families lived together in village communities for generations, which is why it was very important to raise the prestige of their families by achieving socially beneficial projects by their “own efforts and property.” Thus, strong village communities promoted the construction of public goods by the rich.

Village communities or leagues of villages played crucial roles in many civil engineering projects. They supported or were supported by local government projects. However, at the beginning of the 20th century, the well-developed irrigation systems based on cooperation between and within village communities became regarded as an obstacle to agricultural growth in Japan. The MAC considered that customary irrigation rights of village communities prevented the expansion of paddies and caused unstable water supply, which caused rice yields to fluctuate. In 1899, the MAC enacted the “Arable Land Readjustment Law” to encourage landowners to conduct land improvement projects. Then, in 1923, the MAC gave notice that “projects to improve the main facilities of irrigation and drainage” would receive national government subsidies to cover up to half the costs (less for projects of 500 hectares or more). Therefore, the purpose of large-scale public investment from 1923 was “to modernize irrigation facilities and effectively to deny customary irrigation rights” (N. Imamura 1977: 138). While in the Tokugawa period, the investment by han local government promoted and was supported by the community-based irrigation mechanism, in the 20th century, the government made investments to abolish the traditional irrigation system.
5. Conclusion

While in early modern Europe, entrepreneurial individuals made public investment for land improvement, in Tokugawa Japan, a village community or league of villages played an important role in many civil engineering projects. Honor and praise in each community gave villagers good motivation to perform “public” work, including constructing new facilities and maintaining them. Village communities had strong relationships with local governments through financial subsidization. Sometimes, in practice, village communities carried out many public projects subsidized by local government. In addition, the activities of village communities were connected technically with public investments by local governments through irrigation and drainage networks. Government projects made it possible for villagers to create new paddies and fields. Hence, the aggregate effects of the interconnected projects should be measured carefully through comparing the hectares affected by each project with the change of kokudaka in each region.
Bibliography


Imamura, Naraomi (1977) “*Tochi-kairyo heno Kokka no Tojo (The entry of national government into land improvement projects)*” in Imamura et al. (eds.) *Tochi-kairyo hyakunen shi (One hundred years of history of land improvement)*, Tokyo: Heibonsha.


MAC (Ministry of Agriculture and Commerce) (1926) *Kyuhan-jidai no kouchi-kakcho-kairyo-jigyo ni kansuru chosa (Research on the expansion and improvement of fields in the Tokugawa period)*, Tokyo: MAC.


Oishi, Shinzaburo (1973) “Kinsei-chuki no shinden seisaku (The policy of creating new paddies in the middle of Tokugawa period),” Gakushuin Daigaku Keizaironshu 10(3), 59–76.


Saeki, Yashukazu (2007) Kinsei Tonami-heiya no kaihatsu to sanson no tenkai (The exploitation of the Tonami plain and the development of dispersed villages in the early modern period), Toyama: Katsura-shobo.


thousand hectares

Figure 1 Civil engineering projects in Tokugawa Japan
Source: the database mentioned in the text

Figure 2 Relationship between civil engineering projects and increase of Kokudaka from c.1598 to c.1873
Source: the database mentioned in the text
Figure 3  Hectares affected by civil engineering projects in Mimasaka
Source: the database mentioned in the text
Figure 4   Development of new paddies on the western side of the Muko River

Source: Mizumoto (2002: 43)
Figure 5  Hectares affected by civil engineering projects in Kaga, Noto, and Echu
Source: the database mentioned in the text

Figure 6  Hectares affected by civil engineering projects in Higo
Source: the database mentioned in the text
Appendix, Increase of kokudaka in provinces (koku) or districts (gun)

Source: Kikuchi (1986: 731–751) and Izumi (2008)