Japanese Cadastral Mapping in an East Asian Perspective, 1872-1915

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Abstract

Japan was the first country in East Asia to carry out a series of reforms for the establishment of a modern cadastral system. In 1872, the Meiji Government started to implement several policies related to the Land Tax Reform, including the preparation of cadastral maps. However, it had to change the initial reform plan and remold the form of cadastral maps several times up to 1890. The complete replacement of the old regime for the registration and taxation of land with a modern system was an unexplored task in East Asia, and the Meiji Government had to search for a proper course. This study traces the complicated process of these reforms and follows up on the application of the lessons from this progression in East Asia.

In Japan, farmers usually participated in the survey of taxed land during the Tokugawa period. The Meiji Government carried on this old practice under many constraints. As a result, modern technology such as plane-table surveying was introduced gradually and applied unevenly, according to local conditions. In many areas, cadastral maps produced on the basis of early modern cartography were utilized for land registration even after 1890.

In Japanese colonies (Taiwan, Korean Peninsula, and the Kwantung District), the bureaucrats in charge of land registration profited from this experience of reform in mainland Japan and established organizations made up of specialists including surveyors for this task. The plane-table survey in combination with triangulation became standard.

Key words: cadastral map, Japan, the Land Tax Reform, the Meiji period, Tanetarō Megata, Japanese colonies

I Introduction

With the Meiji Restoration in 1868, a new government was established in Japan. For this government, the conversion of land taxation based on conventional local rules to that of a uniform and modern system was assumed to be one of the most urgent and important tasks. Before the Meiji Restoration, the tax called “*Nengu*” (annual tribute) was paid in kind by way of the village community, for which landholders contributed the share of the tax imposed, whereas the new government aimed to collect cash directly for “*Chiso*” (land tax) from the individual owner of the land.

For this reformation, cadastral maps and related books were prepared in every village. Every parcel was investigated: the size was measured, the land price assessed, and the location mapped. Maps produced were generally large scale (1/600) and illustrated several categories of

the land in detail.

Although these maps were made 130 years ago, they are still widely used by local governments for tax collection and by the Regional Legal Affairs Bureau to affirm the location and the demarcation of parcels. They are also highly regarded by historical and geographical researchers as a record of past landscapes. However, the fundamental features of these maps have not been elucidated until now, and frequently their accuracy is discussed not only among local administrative workers and real estate agents but also among researchers. In addition, their role has not yet been properly recognized in Japanese cartographical history in spite of their importance. The complicated and locally varied process for the making of cadastral maps has hampered proper understanding of their basic features.

One of the most important causes of these problems is that the Meiji Government formed the cadastral system, including maps, in a process of trial and error. The complete replacement of the old regime for the registration and taxation of land with the modern system was an unexplored task in East Asia, and the Meiji Government had to search for a proper course. It could not initially make a coherent plan for the establishment of the system and tried to improve it by searching for a way out of successive difficulties. As a result, similar kinds of land surveys were ordered several times, and plans of the Meiji Government were not always carried out as ordered in many prefectures. Accordingly, maps that did not meet the prescribed quality standards were frequently utilized as cadastral maps. The lack of uniformity among those in current use is a natural result of this complicated course. We have to scrutinize the features of each set of maps and specify their preparatory processes to make proper use of them not only for administration and registration but also for our research.

In order to understand this course of events, it is necessary to trace the preparatory process of each set of maps and the techniques applied to it along with the changes to the Meiji Government's land tax policy. The main purpose of this paper is to provide a sketch of this process for the establishment of the modern cadastral system in Japan. It also tries to describe the formation of cadastral systems in Japanese colonies as an application of the lesson obtained from the experience in its mainland.

As is well known, Kain and Baigent (eds. 1984) reviewed the cadastral mapping of Western European countries and their colonies. No such review of cadastral mapping in East Asia has yet been published. This paper was prepared to provide an overview of cadastral mapping in Japan and its colonies. In this issue, Kobayashi (2015) provides a brief description of modern cadastral mapping in Western colonies in East Asia, namely Hong Kong and Tsingtao (Qingdao), in comparison to the Japanese colonies. He points out that the modern land system in these areas was formed replacing the old regime for traditional lands. The transition from the old regime to the modern system is also one of the most important topics to be discussed in this paper.

In the following, the constraints that the Meiji Government confronted in the establishment of the cadastral system are first examined briefly. Second, the transition of policies concerning the land tax and preparation of cadastral maps is outlined. Third, a brief description is provided of the process by which the legal base for the cadastral system was established. Finally, the development of the cadastral system in Japanese colonies is reviewed in relation to lessons from the Meiji Government's experience.

II A pioneering process towards the establishment of the modern cadastral system

For the Meiji Government, which succeeded to the financial systems of the Tokugawa Shōgunate and daimyos' domains, the establishment of a new fiscal basis was an urgent task. During the Tokugawa period, these feudal domains had developed tax collection systems, which were fundamentally similar, but considerably divergent in detail. One of the vital missions of the Meiji Government was to transform them into an integrated, equitable, and efficient system. After a period of preparation, when the old fiscal regime was maintained, from 1872 on, it started a series of reforms to shape the new system.

However the Meiji Government faced many limitations in carrying out these reforms. For example, during the Tokugawa period, the actual survey of lands at field sites had to be left to local leaders and inhabitants whom local officers instructed in the method of investigation. These hastily assembled nonprofessionals engaged in the measurement of parcels and drawing the maps of fields and settlements (Ario 1914: 70-78). In most cases, local communities also had to shoulder the expense for materials, tools, and hired laborers to conduct the surveys (Furuta 1988).

The actual survey reflected this heavy dependence on locals. The techniques employed were fundamentally those of the Tokugawa period, because modern tools were not available in the early phase. Although local officers checked the results, their inspections covered only a limited part of the measurement.

In addition, the organizing office of this reform was not settled. Although it was initiated by the Ministry of Finance (*Ōkura-shō*), the Bureau for Land Tax Reform-over which Toshimichi Ohkubo (1830-1878), an outstanding statesman, presided-was jointly established with the Ministry of Home Affairs in 1875, because the range of responsibility of this bureau was extensive. The Ministry of Finance engaged in this work mainly because lands that were classified according to the object of taxation were the target. As will be mentioned, the Ministry of Home Affairs, which concerned itself with public lands, also tried to make another kind of cadastral map to register them. It should be also noted that the registry offices for lands were finally affiliated with the Ministry of Justice in 1886, because registrars were required to have legal knowledge (Kuroda 1986).

The relationship between the Meiji Government and prefectural offices was also an important matter. Following provisions and orders from the Bureau for Land Tax Reform, prefectural officers played an important role in leading locals to carry out the registration and mapping of lands. They had to consider the local customs and regulations dating back to the Tokugawa period in order to advance this work without interruptions. However, it was frequently reported that their instructions and orders to locals deviated from the intention of the bureau.

In addition, provisions concerning cadastral proceedings were enacted and revised in quick succession as needed. Although the delivery of land certificates to confirm private land ownership was started in 1872, its implementation encountered unforeseen obstacles. The first regulation of the Land Tax Reform made public in 1874 was amended several times. It was replaced by the new land tax regulation, which was announced in 1884. After the enactment of the registration law, land certificates, which played an important role during the Land Tax Reform, were declared invalid in 1889 along with the announcement of the rule for the land register.

The brief sketch above suggests that the establishment of the modern cadastral system in Japan was advanced without a consistent and deliberate plan. The final object of the project had not been known clearly in the initial stage. Learning by trial and error in the course of implementation, its goal was gradually recognized.

The transitional role of land certificates represents this process symbolically. The chronological description of cadastral mappings in the next section should be read, taking notice of this process as a pioneering endeavor toward the modern land system in East Asia.

It should be also noted that the author does not support the traditional view of the formation of the Japanese cadastral system, in which its establishment has been equated with the end of the Land Tax Reform in 1881 (Koseki 2009). Many tasks for the establishment of the modern cadastral system were left after the end of the Land Tax Reform, and they were accomplished fundamentally through the enactment of the provisions creating the land register in 1885 and that of the registration law in 1886 (Kuroda 1986).

III Cadastral mapping successively carried out during the early Meiji period

The Land Tax Reform has been considered essential to the process of the establishment of the modern cadastral system, and the undertakings carried out in advance and after this reform did not attract the attention of researchers. However, from the viewpoint of cadastral mapping, these undertakings are important enough to be scrutinized. In the following, brief descriptions of each are provided, in addition to the concise mention of the role of the Land Tax Reform, and the main features of cadastral mapping carried out with them are examined.

(1) The delivery of land certificates (*Chiken hakkō*)

Before the start of the Land Tax Reform, the Meiji Government approbated private ownership by announcing the termination of the land trade ban of the Tokugawa period and its intention to introduce a system to set the land tax on the basis of its market price. As of February 1872, *Chiken* (land certificates) were delivered to buyers of land in concurrence with the investigation of its market price.¹ On each certificate, the category, size, price, location, and amount of land tax were recorded. However, the government soon changed the plan in July to deliver the *Chiken* for every plot of private land (Ario 1914: 42–48). The price of land in these cases was recorded according to the declaration of owners. As a matter of course, this order soon confused the situation (Fukushima 1993: 87–90).

At the same time, a land investigation was ordered. However, the measurement of each parcel was not ordered because of people's opposition to land surveying (*Kenchi*), which had been considered to bring a concurrent increase in taxation. Accordingly, maps were prepared to indicate the location of each parcel along with lists of parcels in which the identical items written in land certificates were recorded (Satō 1982). The size of every parcel was based on the old cadastral register (*“Kenchi-chō”*) dating back to the Tokugawa period or the declaration of the owner.

Figure 1 is a part of a cadastral map prepared in 1874 for Une village of Shiga prefecture (the present Takatsuki Town), which normally received delivery of land certificates. This kind of map is called *Jinshin-chiken jibiki-ezu*. “Jinshin” designates the year in the sexagenary cycle, and “chiken” means land certificate, whereas “jibiki-ezu” refers to the cadastral map. It is remarkable that the size of lands was written on each parcel with the lot number. The land use of every

Figure 1. A part of the *Jinshin-chiken jibiki-ezu* of Une Village, Shiga Prefecture.

Source: A collected map of the Takatsuki Kannon museum (Nagahama City, Shiga Prefecture)

parcel was classified by color: yellow and greyish green refer to paddy and upland fields without irrigation, respectively.

As mentioned above, the change of policy for the delivery of land certificates initially confused the situation. In addition, it was reported that in many areas the documents indispensable for knowing the size of every parcel were not available for several reasons. In most areas where joint ownership of arable land was found, cadastral registers (“*Kenchi-chō*”) had not been produced during the Tokugawa period.² In many areas that had suffered hazards such as fire and floods, these kinds of registers had perished together (Satō 1982). Even if they were available, subsequent changes meant that it was not easy to collate the statement in the old cadastral register (“*Kenchi chō*”) with actual parcels. Researchers presume that the preparation of the *Jinshin-chiken jibiki-ezu* was not carried out in many prefectures. However, the delivery of land certificates continued in most prefectures even after the start of the Land Tax Reform.

(2) The Land Tax Reform (*Chiso kaisei*)

A full-scale land survey was ordered during the Land Tax Reform, which was carried out on the basis of the *Chiso-kaisē jōrē* (Ordinance for the Land Tax Reform), announced in 1873. Not only the measurement of the size, but also the ranking of value for every parcel were carried out in order to set the price, and finally maps called *Chiso-kaisē jibiki-ezu* were produced. The survey was carried out actively since 1875 and finished in 1881. Several methods were employed to measure every parcel. The easiest one was the *Jūji-hō*, which had been popular during the Tokugawa period. To measure a field, survey team members stretched two lines at right angles so that they crossed in the center of the field (Figure. 2). Another man ensured that the lines crossed at right angles using a large cross-shaped instrument. In this way, the length and breadth of a parcel were measured, and results were recorded. In the case of the irregularly

Figure 2. Farmers' survey during the Edo period

Note: The man in black clothes (on the right and center) is the chief officer, and most of the others are farmers.

Source: Andō (1915:204-205).

Figure 3. a. *Jūji-hō* (left) and b: *Sansha-hō* (right)

Note: Solid line: Land boundary. Dotted line: Survey line.

Source: Ōkura-shō (1882:23-25).

shaped parcel, surveyors constructed an imaginary rectangle that might have the same area and measured its assumed length and breadth (Figure. 3a) (see Brown 1987). As the figure suggests, this way of measuring was not precise, and consequently another method called *Sansha-hō* was recommended.

In the *Sansha-hō*, the area of a parcel was subdivided into triangles (Figure. 3b), and three sides of each triangle were measured in the field (Figure. 4). However Heron's Formula was not applied to find the areas of triangles, probably because careful calculation, including the finding of the

Figure 4. An example of the measurement of the *Sansha-hō* from a field note of Shiga Prefecture.

Source: The Nishiōji District's collection (Hino Town, Shiga Prefecture)

square root, was necessary. Instead, a perpendicular line was drawn on the triangle concerned, and its length was measured to calculate its area. Then the area of each parcel was found by adding and subtracting the size of triangles concerned.

In order to survey a parcel efficiently, another instrument called *Bunken ryakuki* was introduced. According to Satō (1986:204-212), it was a handmade plane table without spirit level and U-fork, with a plumb bob for centering the table. The area of a parcel was found by the *Sansha-hō* through measuring the base and height of triangles on the surveyed drawing.

Figure 5 is a part of the *Chiso-kaisē jibiki-ezu* concerning the identical area shown in Figure 1, compiled after the survey of every parcel. In every parcel, the lot number and the rank in each land category were indicated. It is remarkable that the shape of some plots was corrected according to the application of the *Sansha-hō*.

It should be also noted that the role of the original map of Figure 5 was an index to indicate the location of every parcel in Une village. Generally, to make this kind of map, the external boundary of a village or that of its subsections was surveyed by a method that was called "Mawari kenchi." This method is a type of traverse survey with a magnetic compass to obtain the bearing and a scale rope to measure the distance to landmarks on the route to be surveyed (Narumi 2007, see also Andrews 2009: 141-144). During the early Tokugawa period, this method was applied only to official surveys of major cities and daimyos' territories (Kobayashi et al. 1992). However, it came into use gradually in rural areas until the 19th century and became a standard technique for land surveys³. In the *Chiso-kaisē jibiki-ezu* prepared in Shiga Prefecture, the reduced shape of each parcel was drawn conforming to boundary lines of a village or that of its subsections, which were surveyed by this method.

Although the measurement of parcels was better than that by the *Jinsihin-chiken jibiki-ezu*, considerable regional difference in the application of the measuring method was found. The permissible range of errors in measurement suggests its variation. According to Norishige Ario,

Figure 5. A part of the *Chiso-kaisē jibiki-ezu* of Une Village, Shiga Prefecture.

Source: A collected map of the Takatsuki Kannon museum (Nagahama City, Shiga Prefecture)

who participated in the Land Tax Reform as a government officer, it was set at 10 percent of the area of the land measured in the early phase. However, it was reduced to 3.3 percent later. If its value was found to deviate from this range when samples were checked by local officers, a resurvey was ordered (Ario 1914:76-77).

Although the attempt to establish a uniform land system was not successful, the area of major taxable lands such as arable lands and residential lands increased 48.7 percent in 39 prefectures, where this reform was carried out (Ōkura Shō 1882:103-145). However, it should be noted that the calculation of land price did not always directly reflect the measurement of parcels in the Land Tax Reform.

The land survey in this reform had provoked antipathy among farmers, because this kind of survey during the Tokugawa period had brought a general tax increase. For most townspeople, this reform brought an imposition of new taxes on their plots, which had been exempted from land tax for a long time. It was not possible to carry out this kind of reform without regard for the long interaction between feudal lords and the people, in which bargaining had been normal. Local officers had to compromise with them for the tax assessment. In some areas, concessions were given to the inhabitants without notice to the Bureau for Land Tax Reform. In such cases, the officers concerned were dismissed.

In several prefectures, where negotiations concerning the assessment of land prices and consent of land owners had failed, riots broke out, especially in 1876. Fearing the spreading of riots, the Bureau for Land Tax Reform announced in 1877 a reduction of the tax rate from 3.0 percent to 2.5 percent of the land price (Fukushima 1993:134-136). In addition, readjustments of the amount of land tax were carried out in some areas even after this reform ended in 1881, because the government's promise in 1874 to reduce the land price after five years was not executed (Ario 1914:94-100, 132-138).

The review of the Land Tax Reform published in 1882 revealed a significant regional

Figure 6. Skills and devices used for the measurement of every plot by prefectures

Source: Ōkura-shō (1959-1964)

variation in the implementation of the land survey. As for the method of land measurement, the *Jūji-hō* was employed extensively in eastern prefectures, in contrast to western prefectures in which the *Sansha-hō* prevailed (Figure. 6). This kind of variation became one of the important reasons to carry out another land survey after 1885.

(3) The registration of state lands by the Ministry of Home Affairs (*Chiseki hensē*)

The registration of lands under the Land Tax Reform covered only those lands liable for taxation such as arable land and residential land. In order to register the other lands such as roads and rivers and their embankments, the Ministry of Home Affairs had planned a land

Figure 7. The measurement of waterways for irrigation and roads for registration.

Source: A map for survey of a subsection in Hino Murai Town, Shiga Prefecture (1885).

survey in 1874. However, the implementation of this project was postponed, because of the enforcement of the Land Tax Reform and the lack of funds. In 1883, two years after the completion of the Land Tax Reform, it was launched on a full scale.

This project aimed at the demarcation of administrative districts and government lands on the basis of the land survey by the Land Tax Reform. In Shiga Prefecture, investigation results were touched up on new copies of maps and books prepared under this preceding reform. Figure 7 was produced to measure the width and length of waterways and roads. However, in some prefectures, subsequent projects concerning cadastral surveys were launched soon thereafter, and final results of this project were transferred to one of them. Accordingly, this project was not completed nationwide (Koseki 2009).

(4) The inspection of results of the Land Tax Reform (*Jioshi chōsa*)

For the formation of a modern state, the preparation of the constitution was ordered in 1876, and in 1881 the establishment of the National Diet was scheduled for 1890. As for the establishment of modern land system, however, it was acknowledged that there was a large discrepancy between the description in maps and books prepared by the Land Tax Reform and the then situation of actual lands, especially in several prefectures, where the land survey was insufficient. Moreover, the notification of the change in land use, namely that in land category, had not been carried out faithfully, and updating of maps and books was needed urgently. At the same time, the Ministry of Finance started to improve the cadastral system, including maps and books toward establishing modern land registration (Ōkurashō Shuzē-kyoku 1903:193-204).

In order to answer these needs, an inspection to detect the discrepancy between actual lands and cadastral documents, including maps, was ordered in 1885. This was called *Jioshi chōsa*, because the description of the parcel in the map and book was collated with the actual situation on site (*Jioshi* means checking every parcel, and *chōsa* means investigation). Newly reclaimed arable lands were also mapped and registered. For the measurement of parcels, the *Sansha-hō* was strongly

Figure 8. A part of the corrected map by *Jioshi chōsa* of Une Village, Shiga Prefecture (1886).

Source: A corrected map of the Takatsuki Kannon museum (Nagahama City, Shiga Prefecture)

recommended, according to the Land Tax Regulations (“*Chiso jōre*”) and its instruction manual announced in 1884 (Zeimu daigakkō sozei shiryō kan 2007: 37–49). Figure 8 shows a part of cadastral maps prepared for this correction concerning the identical place represented in Figure 1 and Figure 5. It indicates that some lots had been subdivided and converted for different land use.

In five prefectures, where an inadequate survey had been conducted at the time of the *Chiso-kaisē*, an extensive resurvey was carried out, and the taxable lands increased more than 30 percent (Ōkurashō Shuzē-kyoku 1903: 197–198).

(5) Corrected maps (*Kōsē chizu*)

At the time when the full-scale *Jioshi chōsa* was advanced, the Ministry of Finance announced a guideline for making new cadastral maps in 1887 (Suzuki 2000: 24–35). In many areas, where inadequate mapping had been found at the time of *Chiso-kaisē*, a complete resurvey was progressing, and the ministry decided to take this rare opportunity to improve the accuracy of cadastral maps. A plane-table survey of the regular style was recommended for the preparation of new maps. In the guideline of this recommendation, illustrations of alidade with spirit level and U-fork with plumb bob were included.

However, in many areas where the preparation of new maps had been planned, already the survey work by other means had started, and consequently the recommended plane-table survey was applied only in limited areas (Suzuki 2000). In prefectures where most parcels were measured with the *Sansha-hō* in the survey of the *Chiso-kaisē*, such as Shiga Prefecture, the maps corrected by the *Jioshi chōsa* were newly copied for the *Kōsē chizu*.

For the preparation of this kind of map, newly simplified forms were designated. For example, characters were entered to designate the land category, instead of the coloring that had been applied for old maps. Only the waterways and ponds were colored blue in the new form (Figure. 9).

Figure 9. A part of the copy of the *Kōsē chizu* of Une Village, Shiga Prefecture.

Note: A collected map of the Takatsuki Kannon museum (Nagahama City, Shiga Prefecture)

Table 1. The outline of five phases of land investigations

Description	Period	Competent authorities	Main objects
(1) <i>Chiken hakkō</i>	1872-1875	Ministry of Finance	The confirmation of land ownership
(2) <i>Chiso-kaisē</i>	1873-1881	Ministries of Finance and Home Affairs	The Land Tax Reform The measurement and assessment of the price of every parcel
(3) <i>Chiseki hensē</i>	1874-1889	Ministry of Home Affairs	The registration of state lands
(4) <i>Jioshi chōsa</i>	1885-1888	Ministry of Finance	Inspection of every parcel
(5) <i>Kōsē chizu</i>	1888~	Ministry of Finance	Correction of maps

This process of preparing the *Kōsē chizu* caused a variation in the cartographic features of cadastral maps. In many areas, fresh copies of the revised version of those maps prepared for the *Chiso-kaisē* were made for the *Kōsē chizu*. In some areas, new maps prepared in the old style were submitted. In other areas, completely new maps were produced on the basis of the plane-table survey. Accordingly, the regional variation of the *Chiso-kaisē* maps was not cleared even in the preparation phase for the *Kōsē chizu*, and inequality in measuring lands as the basis of land tax was not completely remedied.

In Table 1, the process discussed above is summarized. The Ministry of Finance initiated the development of the cadastral system in order to establish the financial basis of the government. However, the Ministry of Home Affairs, which was concerned with the demarcation of administrative districts and government lands, also took part in this process. The two ministries did not always keep in step, and local officers coordinated their instructions and orders. It is also remarkable that policy changes were frequent, and they ended with many problems unsolved.

IV The preparation of the legal framework for the modern cadastral system

In addition to the improved measurement of parcels and the making of maps, the preparation of a legal framework was also necessary to establish the modern cadastral system. The above-mentioned Land Tax Regulation (“Chiso jōrē”) and its instruction manual announced in March and April 1884 (Zeimu daigakkō sozei shiryō kan 2007:37-49⁴) were important, although they have been considered remedial measures in regard to the Land Tax Reform (Anon. 2007). Provisions ordered owners to faithfully report changes to their lands such as those involving land category and reclamations to update maps and books. The imposition of a fine was prescribed against violations of these rules. However, the announcement of the forms of ledgers for land tax in December 1884 (Naikaku Kanpō Kyoku 1976:619) became a trigger for work to begin to realize this framework. The land register for every parcel was designated to take the place of the land certificate, which had been distributed to landowners since 1872. One purpose of the *Jioshi chōsa* was to prepare the basis of this new register.

It is remarkable that the Belgian land register was used as a model for a new register, as proposed by Tanetarō Megata, a high officer of the Ministry of Finance (Megata 1903; Zeimu daigakkō sozei shiryō kan 2007:49-52). Megata was a lawyer who studied at the Harvard Law School from 1872 to 1874, and, after returning home in 1879, worked as an advocate and subsequently as a judge. In 1883, he took a position in the Ministry of Finance and was involved in work on the land tax from 1884 on. Although the source of his knowledge of the modern cadastral system at that time is not known, his concern with the cadastral system in Western countries was consistent, as will be mentioned.

In connection to this reference to the Belgian land register, it is important that at that time the Tax Bureau of the Ministry of Finance translated several books on taxation from Western countries and printed them in 1887. Among them, those specialized in the cadastral system such as “Règlement pour la conservation du cadastre du Royaume de Belgique” (1877⁵) were included (Yoshimuta 2013). Although the use of these books for policymaking is still under scrutiny, these facts suggest that the Ministry of Finance was preparing relevant laws on modern taxation by consulting precedents in Western countries. The promotion of Megata, who had studied law in the United States, to a high position in the Bureau of Tax was also a part of this policy. In 1888, he suggested to superiors a plan to establish new offices for cadastral service (a draft of the plan is quoted in Zeimu daigakkō sozei shiryō kan 2007:174-189), in which French and German classification of lands and the Prussian and Belgian offices for cadastral service were mentioned.

In 1889, several rules for the modern cadastral system were announced: first, the abolition of land certificates; second, new rules for land registers concerning the mortgaging of a land plot; third, the depositary office of maps and land registers; fourth, the revision of the Land Tax Regulation; and fifth, the operational regulations of the revised Land Tax Regulation (Naikaku Kanpō Kyoku 1978a: law 99, 145-148, imperial ordinance 85; 1978b: ministerial ordinance 231-233, official instruction 39-40, 75-76, 200-201). The enactment of the registration law in 1886 complemented them in completing the cadastral system as a legal framework (Kuroda 1986).

It should be noted that Megata had a critical vision of the assessment of the market price of land as the basis of taxation and regionally biased rates of land tax (Imamura 2008). Although he had proposed remedial measures for these problems, he was named director of the Yokohama

Customs Office in 1891. However, he was promoted to director of the Tax Bureau in 1894 and played an important role in the establishment of a cadastral system in Okinawa Prefecture and Japanese colonies (Matsumoto 1938: 248-252, 498-499).

V The establishment of a modern cadastral system in Okinawa Prefecture, Taiwan, Korea, and the Kwantung Province

The Japanese Government absorbed several lessons from the post-1872 process to establish a modern cadastral system. As for the land survey, Western techniques such as plane tables and alidades were useful not only for measuring parcels but also for making index maps. A specialized organization with skilled surveyors was desirable to carry out the survey uniformly. Accordingly, expenditure from public funds was necessary for the survey instead of dependence on the labor and expense of locals. Furthermore, the exhaustive survey of taxable parcels ensured a considerable increase in land tax without raising its rate owing to the addition of those newly registered. These lessons were applied for planning new land surveys carried out not only in Japan proper but also in its colonies.

The first place to apply these lessons was Okinawa Prefecture, where the Land Tax Reform had not been carried out because the administration differed from that of the mainland during the Tokugawa period. However, plans of surveys proposed by the prefectural office were those that followed the Land Tax Reform and were rejected by the Ministry of Finance. Meanwhile, officers of the Bureau of Tax had made inquiries and recommended the survey by a specialized organization supported by public expenditure. Megata, who had taken the office in the Bureau of Tax, had participated in planning this survey since 1895 and directed Tatsumi Iwai, high official of the Tax Bureau, to conduct a thoroughgoing study of the traditional land system in Okinawa Prefecture. In 1899, a new survey plan was approved in the Diet, and the Provisional Office for the Land Survey in Okinawa Prefecture was established.

When the land survey started, a plane-table survey was carried out on the basis of control points, whose positions were measured with triangulation. Every parcel was measured on the map using the *Sansha-hō*, whereas for forests and grassland parcels, planimeters were used (Kobayashi and Narumi 2007).

The land survey in Taiwan, the first colony of Japan, fundamentally followed the model of Okinawa Prefecture, and measures to cope with the traditional land system were prepared on the basis of careful study. Tatsumi Iwai, who was transferred from Okinawa Prefecture in 1896, played a leading role in the execution of the whole plan (Jiang 1974).

Concerning the land survey in Korea, the initial role of Megata should be mentioned. After the Russo-Japanese War, he was appointed financial advisor of the Korean Government and promoted financial modernization in such areas as taxation, the monetary system, and credit institutions. Expecting land surveys to be executed, he promoted the establishment of a surveyors' school in the major Korean cities and formulated the standard for surveys (Matsumoto 1938: 498-499).

The full-scale land survey was started after the annexation of Korea to Japan in 1910, and many surveyors and officials who had worked in Okinawa Prefecture and Taiwan were transferred to Korea. Among them, Tsunero Kawakami, who had worked at Okinawa Prefecture, played an important role in survey planning (Miyajima 1991).

In Kwantung province, which was leased territory transferred from Russia, the land survey

had been carried out since 1914. In this area also, the plane-table survey on the basis of triangulation was applied. However, the increase of land tax was not realized because of the traditional land system of the Chinese mainland (Enatsu 1987).

It should be pointed out that for the land survey in these areas, native people were hired not only for surveying but also for clerical works. Special schools were set up to train young workers for this purpose (Kobayashi and Watanabe 2009). This mobilization of native people brought a technology transfer in areas in which the survey was carried out.

VI Conclusion

As the first country in East Asia to reform the land system, Japan had to start it without a credible model to follow. Following the tradition since the Tokugawa period, the dependence on locals not only for the labor and expense of the survey but also for the skill to measure the land necessarily caused inadequate and inconsistent results. Regional variance, which prevailed in the measurement of lands, brought a lack of uniformity in cadastral maps.

However, the quality of maps and books improved gradually in order to allow them to transform into proper parts of the modern cadastral system, for which a Western model was applied, even if they were not always equitable and efficient⁶. It is remarkable that lessons from this process of trial and error on the mainland were applied to areas where the new land survey was carried out. The system transplanted was the latest in those days, although it was developed in Japan.

For areas in which it was applied, the system was external in origin and had to be modified for smooth transplanting (Jiang 1974; Miyajima 1991). Land surveys in Taiwan and Korea, which were carried out just prior to colonization, were scrutinized thoroughly as precedents. The offices responsible for the land reform chose some of the results of these precedents that were relevant for their plan. The processes to search for the proper course similar to that on the mainland were also repeated for the modification.

From the viewpoint of imperial mapping, the searching of unregistered land and the survey of every parcel were advanced forcibly along with the conversion of the old land system to the new one. They not only overcame the inadequacy and inconsistency of the previous surveys but also accomplished an increase in revenue for the new colonial government. Concerning the impact on society and the economy of these land surveys, a controversial view has been disseminated and is still prevalent. However, the revisions of the old schema seem to be noticeable to understand its nature (Gragert 1994: 159–161; Shin 1996: 40–43).

Finally, it should be also mentioned that land surveys on the Japanese mainland and its colonies were referred to as the most important precedents by a Chinese government committee established after the Chinese Revolution in 1915 for the planning of the cadastral survey. Those in Vietnam, Hong Kong, France, Germany, and the United States were also studied. However, the policy adopted by this committee failed soon because of the opposition of inhabitants in model districts. The cadastral survey in China was reopened in a new framework from the middle of the 1930s. However, the Sino-Japanese War since 1937 hindered its progress greatly (Sasagawa 2002: 23–38, 279–286).

Notes

1. The following description conforms to the case of lands in rural areas. For lands in town, another provision was enacted.
2. On the joint ownership of arable lands that accompanied their redistribution, see Brown (2011).
3. In Shiga Prefecture, this method was applied also to considerable areas at the preparation of the *Jinsihin-chiken jibiki-ezu*.
4. As for the manual, Naikaku Kanpō Kyoku (1976:620–653) duplicated it faithfully including sample forms for reports including figures.
5. The author has seen only the old version of this book, published in 1835.
6. Although the new cadastral survey has been gradually extended since 1951, the area it covered is still about half the size of Japan proper. The inconsistency among them is still pointed out frequently. However, it attracts little attention because of the significant decline in the importance of land tax in revenue.

Reference

- Andō, H. (1915). *An Outline of prefectural administration of the Tokugawa Shogunate* [*Tokugawa bakufu kenchi yōryaku*]. Tokyo: Akagi Shoten. (In Japanese)
- Anonymous (2007). Commentary [Kaisetsu], in *A collection of historical documents concerning land tax* [*Chiso kankei shiryō shū*] I, ed. Zeimu daigakkō sozei shiryō kan, 7–35, Tokyo: Ōkura Zaimu Kyōkai. (In Japanese)
- Andrews, J. H. (2009). *Maps in those days: cartographic methods before 1850*. Dublin: Four Courts Press.
- Ario, N. (1914). *A history of land tax in our country* [*Honpō chiso no enkaku*]. Tokyo: Nihon Kangyō Ginkō Maigetsukai. (In Japanese)
- Brown, P. C. (1987). The Mismeasure of land: Land surveying in the Tokugawa period. *Monumenta Nipponica*, 42 (2): 115–155.
- Brown, P. C. (2011). *Cultivating commons: joint ownership of arable land in early modern Japan*. Honolulu: University of Hawai'i Press.
- Enatsu, Y. (1987). A land survey in the southern Liaotung Peninsula by the Japanese colonial government [Kantō Totokufu oyobi Kantō Chō no tochi chōsa jigō ni tsuite], *Ikkyō-Ronsō* 97(3): 367–384. (In Japanese)
- Fukushima M. (1962). *A research of the Land Tax Reform* [*Chiso kaisē no kenkyū*]. Tokyo: Yuhikaku. (In Japanese)
- Fukushima, M. (1993). *Selected writings of Masao Fukushima* [*Fukushima Masao chosaku shū*]. Volume 3. Tokyo: Yuhikaku. (In Japanese)
- Furuta, E. (1988). The preparation process of cadastral maps in Sagami-hara, Kanagawa Prefecture [Kanagawa ken Sagami-hara ni okeru chisekizu [zibiki-ezu] no sakusē katē], in *Ezu no kosumolōji* volume 1, ed. Katsuragawa Ezu Kenkyū-kai, 226–247, Kyoto: Chijin Shobō. (In Japanese)
- Gragert, E. H. (1994). *Landownership under colonial rule: Korea's Japanese experience, 1900–1935*. Honolulu: University of Hawaii Press.
- Hino town (2015). *The history of Hino, Ohmi Province* [*Ohmi Hino no rekishi*] Volume 9. Shiga: Hino town. (In Japanese)
- Imamura, C. (2008). The revision of land price during the early parliament period: on the vision of Tanetarō Megata [Shoki gikai-ki no chika shusē: Megata Tanetarō wo chūshin ni]. in *the taxation in the formation of modern Japan* [*Kindai nihon no keisei to sozei*] ed. Kindai sozē-shi kenkyū-kai, 140–166, Tokyo: Yūshisha. (In Japanese)
- Jiang, B. (1974). *A study of the Land Tax Reform in Taiwan* [*Taiwan Chiso-kaisē no kenkyū*]. Tokyo: Tokyo Daigaku Shuppan-kai. (In Japanese)
- Kain, R. J. P. and E. Baigent (1984). *The cadastral map in the service of the state: a history of property mapping*. Chicago: University of Chicago Press.
- Kobayashi, S. (2012). Japanese mapping of Asia-Pacific areas, 1873–1945: an overview. *Cross-Currents: East Asian History and Culture Review*, 1(1): 137–171
- Kobayashi, S. (2015) Imperial cartography in East Asia from the late 18th Century to the early 20th century: an overview. *Jimbun Chiri [Japanese Journal of Human Geography]*, 67(6): 4–26.
- Kobayashi, S. and K. Narumi (2007). The preparatory process for the cadastral survey in Okinawa Prefecture [Okinawa-ken ni okeru tochi seiri jigō no junbi katē]. *Machikaneyama-ronsō* (Japanese Studies) 41: 1–24. (In Japanese)
- Kobayashi, S., K. Saeki, N. Iso and S. Shimoyama (1992). The magnetic azimuth in official maps of Fukuoka in the middle of the Tokugawa Era [Fukuoka-han sakusē no Genroku-ki ezu ni mirareru chijiki hōi], *Chizu [The journal of the Japan Cartographic Association]* 30(3): 24–33. (In Japanese)
- Kobayashi, S. and R. Watanabe (2009). The map making in regard to land registrations in modern East Asia [Kindai higashi Ajia no tochi chōsa jigō to chizu sakusē]. in *Japanese modern cartography concerning Asia-Pacific ar-*

- eas: approaches to gaihōzu* [Kindai Nihon no chizu sakusei to Ajia Taiheiyō chiiki: Gaihōzu eno Apurōchi], ed. S. Kobayashi, 246-255, Osaka: Osaka Daigaku Shuppankai. (In Japanese)
- Koseki D. (2009). The manufacturing process of the cadastral map and a change of function in Shiga Prefecture [Shiga-ken ni okeru meiji zenki chisekizu no sēritsu to sono kinō no henka], *Rekishi Chirigaku* 51(1): 21-36. (In Japanese)
- Kuroda, N. (1986). The termination of land certificates: a milestone toward the modernization of landownership [Chiken seido no shōmetsu: tochishoyū kindaika eno riteihyō]. *Hō to Seiji* 37(4): 781-824.
- Matsumoto S. (1938). *Baron Tanetarō Megata* [Danshaku Megata Tanetarō]. Tokyo: Ko Megata Danshaku Denki Kankōkai. (In Japanese)
- Megata, T. (1903). An address of the director of the Bureau of Tax at the short course of land survey [Tochi sokuryō-hō kōshū-kai ni okeru Megata shuzē kyokuchō no enzetsu], *Marugame Zeimu Kantoku-kyoku Kyoku-hō*, 145:482-484. (In Japanese)
- Miyajima, H. (1991). *A study of the history of land survey in Korea* [Chōsen tochi chōsa jigyo shi no kenkyū]. Tokyo: Kyūko-shoin. (In Japanese)
- Naikaku Kanpō Kyoku (1976). *A collection of laws and ordinances* [Hōrē zensho] 18.(1). Tokyo: Hara Shobō. (In Japanese)
- Naikaku Kanpō Kyoku (1978a). *A collection of laws and ordinances* [Hōrē zensho] 22(1). Tokyo: Hara Shobō. (In Japanese)
- Naikaku Kanpō Kyoku (1978b). *A collection of laws and ordinances* [Hōrē zensho] 22(2). Tokyo: Hara Shobō. (In Japanese)
- Narumi, K. (2007). *Indigenous land surveying techniques and their diffusion process in early modern Japan* [Kinsē nihon no chizu to sokuryō: Mura to "mawari kenchi"]. Fukuoka: Kyūshū Daigaku Shuppan Kai. (In Japanese)
- Ōkura-shō (1882). *The report of the Land Tax Reform* [Chiso Kaisē Houkoku Sho]. Tokyo: The Ministry of Finance. (In Japanese)
- Ōkura-shō (1959-1964). *A report of the Land Tax Reform from prefectures* [Fuken chiso-kaisē kiyō] vols. 1-3, Tokyo: Meiji Bunken Shirō Kankō-kai. (In Japanese)
- Ōkura-shō Shuzē-kyoku (1903). *A collection of documents on the land tax* [Chiso kankei shorui isan]. Tokyo: Ōkurashō Shuzē-kyoku. (In Japanese)
- Sasagawa, H. (2002). *A study of the history of land policy in rural area under Nationalist China* [Chūka Minkoku ki nōson tochi gyōsē shi no kenkyū]. Tokyo: Kyūko-shoin. (In Japanese)
- Satō, J. (1982) Cadastral maps during early Meiji period (1) [Meiji zenki no chisekizu(1)]. *Rekishi Chirigaku* 149: 24-39. (In Japanese)
- Satō, J. (1986). *The Cadastral Map of the Meiji Era* [Meijiki Sakusei no Chisekizu], Tokyo: Kokon-shoin. (In Japanese)
- Shin G.-W. (1996). *Peasant protest and social change in colonial Korea*. Seattle: University of Washington Press.
- Suzuki, Y. (2000). Corrected maps prepared by Fukushima Prefecture during the early Meiji period [Meiji zenki Fukushima-ken sakusē no kōsē chizu], *Zeimu Daigakkō Ronsō* 35:421-470. (In Japanese)
- Takatsuki town (2006). *The history of Takatsuki Town, The volume of landscape and cultural property* [Takatsuki chōshi: kēkan bunkazai hen]. Shiga: Takatsuki town. (In Japanese)
- Zeimu daigakkō sozei shiryō kan (2007). *A collection of historical documents concerning land tax* [Chiso kankei shiryō shū]. Tokyo: Ōkura Zaimu Kyōkai. (In Japanese)