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Oshima, Taichi / YAGUCHI, Akira

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Taichi Oshima* and Akira Yaguchi**

Abstract

The descriptions in the land registry records in Japan are Predominately based on survey results of more than one hundred years ago. They have been corrected according to the results of the Cadastral Survey which was started in 1951. The Survey has covered an area of about 84,000km by 1984, which is thirty percent (30%) of the entire area to be surveyed. The survey results have been utilized in various fields of abministration besides the land registration.

National Land Surveys are aimed at providing basic materials for efficient and reasonable land utilization and establishing a reliable cadaster through a scientific and comprehensive investigation of National Land.

Included in National Land Surveys are fundamental surveys, cadastral surveys, land classification surveys and water use surveys. Cadastral surveys deal with the borders, size, ownership and lot number of each parcel of land; land classification surveys, with land-use situations, topogarphy, surface geology, Pedology and productivity of land; and water use sueveys, with the hydrology and hydraulics as related to use of national land.

It was recognized soon after World War II that definite comprihension of real land states was an urgent requirement, so the National Land Survey Law was enacted in 1951 through the preparatory examination of the Land Survey Preparation Committee of the Economy Stabilization Center. Land surveys, however, did not progress as scheduled until the National Land Survey Promotion Special Measure Law was enacted in 1962 and a 10 year plan of the national land surveys including cadastral survey, control point survey, land classification survey started in 1963 to insure a steady progress thercof. In May 1970, the 2nd National Land Survey 10-year plan was laid out and in June 1980, the 3rd National Land Survey 10-year Plan was laid out. The land surveys now underway are based on this plan.

1. Introduction

(1) Accurate and updated information concerning the title, acreage, boundary location and category of parcels of land is indispensable to proper land management such as safe purchase and sale of land, fair taxation on land, sure protection of various rights related to land, reasonable planning of land use etc.

The most official land records in Japan are the land registry books and maps kept in the registry offices according to the Immovables Registration Law (Law No. 24, Feb. 24, 1899). In the registry book, the matters relating to the indication of land such as the administrative division name, the lot number, the category, the acreage. the name and adress of the owner, as well as the matters relating to rights such as ownership, mortgage, etc. are recorded on a registry folio for each parcel of land. The division and the lot numbers of par-

* College of Eng., Hosei University.

** Geographical Survey Institute, Construction Ministry.

cels of land are made distinct on the registry map.

There are about 1300 registry offices all over the country, where not only the registration of land but also the registration of buildings are dealt with.

In Japan registration is not compulsory for the owner. However, one is unable to assert his/her ownership right against other persons uless the registration is properly completed.

Any person may apply for a copy of the necessary part of the land registry book and map at the registry office. By law, the registry office must inform the relevant municipal office of every alteration of the registry books and maps mainly for the purpose of taxation on the real estate.

(2) The description in the land registry books, however, is mostly based on the survey results carried out at the time of extensive revision of the land taxation system in the Meiji Period more than one hundred years ago and especially the acreages of parcels of land are often incorrect because of poor measuring techniques at that time unless they were remeasured accurately since then.

Further, most registry maps are nothing but inaccurate sketch map which were also originally prepared in the Meiji Period. They are so inaccurate that the absolute locations of parcels of land in terms of the geodetic coordinate system are not definitelg indicated and they are so short of uniformity that it is often impossible to join the adjoining sheets.

These kinds of shortcomings of the land registry records increase the administration cost because, for example, many conflicts relating to boundaries occur and much time and effort are needed for purchases of necessary land for public works.

(3) To improve the poor situation of registry records, the Ministry of Justice, which is in charge of the real estate registration, has been preparing new accurate registration maps. Because of budgetary limitation, however, only two or three square kilometers can be covered every year.

So, the Ministry of Justice has also been adopting survey results prepared with accuracy standards better than certain standards used by other public organs to correct the description of the registry records. And the main supplier of such survey results is the Cadastral Survey. In this paper the outline and the present state of the Cadastral Survey are reviewed.

2. Characteristics of Cadastral Survey

(1) The Cadastral Survey has been carried out as a part of the National Land Survey project. The National Land Survey Project is aimed at providing basic data concerning land of the whole country for more efficient and reasonable land utilization through the scientific and comprehensive investigation of the actual state of the national land.

Included in the National Land Survey are the Land Classification Survey, the Water Survey, and the Cadastral Survey. The Land Classification Survey collects data concerning land-use situations, soil conditions, topographic and geological characteristics, and productivity of land from the view-point of classifying land in terms of the land use potential.

The Water Survery collects hydrological and hydraulic data as well as data concerning water use from the view-point of controling and using water.

The Cadastral Survey is the most basic part of the National Land Survey, and it consists of the investigation of the owner, the lot number, and the category, and surveying boundary location and the acreage for every parcel of land. The Cadastral Survey is very costly and time consuming because it includes detailed investigation of land and large scale mapping. The biggest share of the budget of the Project has been allocated to the Cadastral Survey. As a result of the survey the cadastral book and map are compiled.

(2) Historically, the urgency of comprehensive land survey was recognized soon after World War II, because there were no reliable data concerning land available for the purpose of making reconstruction plans for the economy of the country which was completely destroyed during the war.

Then the National Land Survey Law (Law No. 180, Jun. 1, 1951) was enacted in 1951 through the preparatory examination by the Land Survey Preparation Committee of the Economy Stabilization Center, and the National Land Survey Project was started.

The Project however, didn't progress as scheduled until the National Land Surver promotion Special Measure Law (Law No. 143, May 19, 1962) was enacted in 1962, and a ten year plan of the National Land Survey project, which determines the quantity of the Cadastral Survey and part of the Land Classification Survey to be carried out during the coming ten years, was made in 1963 to ensure the steady progress thereof.

Further the second ten year plan was introduced in 1970 in accordance to the revison of the National Economic Development Plan.

Presently the Project is carried out based on the third ten year plan which was prepared in 1980.

3. Organization of Cadastral Survey

(1) There are three administrative levels in Japan, namely the national, the prefedtural and the municipal levels. The whole country is divided into forty-seven (47) prefectures, and each prefecture is divided into municipalities like cities, towns and villages. There are 3,255 municipalities now.

The Cadastral Survey has been carried out by the municipalities in cooperation with both the national and the prefecturai governments. (There are exceptional cases where the prefectural government or a public association such as the land consolidation project association becomes the executing body of the Cadastral Survey.).

(2) In the national government, the National Land Agency of the Prime Minister's Office, is responsible for the National Land Survey project. Although the Economic Planning Agency had been the responsible agency for twenty years since the start of the Project, the division in charge was transferred to the National Land Agency in 1974 which was established at that time with the object of promoting comprehensive national land administration.

Main Responsibilities of the National Land Agency:

1) making the ten year plan at the national level in cooperation with poefectures.
2) coordination for proper execution of the Survey every year.
3) budgeting and appropriation for subsidy to municipalities through prefectures, and for the cost of the basic control point survey by the Geographical Survey Institute, Ministry of Construction.
4) provision of technical specifications.
5) approval of certification of the survey results.

(3) As the National Land Survey Project was started from the view-point of the reconstruction of destroyed economy after the World War II, especially from the view-point of increasing food production, the divisions dealing with agricultural matters are in charge of the Cadastral Survey in most prefectural governments.

The Cadastral Survey sections, however, have been transferred to the planning divisions in several prefectures, because the importnce of the basic data concerning land such as the cadastral information has been recognized in various fields of administration.

Main responsibilities of the prefectural government:

1) making the prefectural version of the ten year plan in cooperation with municipalities.
2) coordination for proper execution of the survey every year.
3) budgeting and appropriation for subsidy to municipalities.
4) provision of technical guidance for municipalities.
5) certification of the survey results.
6) sending copies of the survey results both to the registry offices and to municipalities.
7) keeping the original survey results in custody.

(4) As mentioned above, the municipality is the executing body of the Cadastral Survey. Usually each municipality assigns three to four personnel for the survey of the area of three to four square kilometers every year.

Although the land surveying and measurement of acreage are contracted to surveyors in private practice, it is necessary for the municipality personnel by themselves to investigate the owner and boundary of parcels of land because the cooperation of the owners will not be obtained easily otherwise.

Other main jobs of the municipality personnel in charge:

1) pursuading the people of the project area to cooperate in the survey.
2) reconnaissance of the project area.
3) making survey plan.
4) quality control checks on contract returns.
5) preparation of the final survey results.

(5) Although the cost of the Cadastral Survey is dependent upon the land condition of the project area, the average survey cost is about four million ven(100yen=0.75US dollars) per square kilometer excluding the in-house personnel cost.

Both the national and prefectural government subsidize the municipalities for the Cadastral Survey.

The cost sharing is as follows (as changed in 1985):

National Government Subsidy	6/10
Prefectural Government Subsidy	2/10
Municipality Burden	2/10

In addition eighty percent (80%) of the burden share of prefecture and municipality will be refunded by a grant of special subsidy tax revenue from the national government. The net burden share of the local goverment is very small.

the total survey cost in 1984 : 11,962 million yen

the area surveyed in 1984 : 3,323 km^2

4. Progress of Cadastral Survey

(1) The history of the Cadastral Survey dating back to 1951 may be divided into the following five periods. Table 1 shows the progress of coverage of the Survey in each period.

(a) Fiscal 1951——1956.

During the initial period from the start of the Project to 1956, the Cadastral Survey was carried out by the municipalities on a voluntary basis without a definite long term plan. The survey execuaed during this period covered an area of only 1,840, km^2.

(b) Fiscal 1957——1962.

In view of prompting the tempo of the Cadastral Survey, the National Land Survey Law was amended partially to initiate a special plan of the survey for the period of the coming ten years from 1957.

Besides the subsidy rate of the national government was raised to 2/3 from 1/2 and the sharing rate of the survey cost for the national, prefectural and municipal governments were mentioned definitely in the law for the first time.

Under this special plan, the Cadastral Survey was carried out to cover an area of 5,562 km^2.

(c) Fiscal 1963——1969.

Notwithstanding the introduction of the special pian system, the Survey failed to progress as expected. Therefore, the ten-year plan of the National Land Survey Project was shaped for acceleration of the progress of the Survey. This ten-year plan was to be approved

Tabie 1 Progress of Cadastral Survey

Period	Planned (km^2)	Executed (km^2)	Achievement rate (%)	Remarks
1951-1956	.....	1,840	.....	
1957-1966	35,000 (1957-1966)	5,562	16	Special Plan
1963-1969	42,000 (1963-1972)	18,909	45	1st 10 year Plan
1970-1979	85,000	38,238	28	2nd 10 year Plan
1980-1989	60,000	18,324 (1980-1984)	31	3rd 10 year Plan
Total		82,873		

by the cabinet. In consequence the first ten year plan achieved forty five percent (45%) in 1969 and the accumulated coverage reached 18,909 km².

(d) Fiscal 1970——1979.

According to the revision of the National Economic Development Plan in 1970, the first ten-year plan was switched over to the second ten-year plan.

(e) Fiscal 1980——

Presently the Cadastral Survey is progressing based on the third ten-year plan, under which an area of 60,000 km² is expected to be surveyed. The planned area consists in the most part of the unsurveyed agricultural and residential area and the neighbouring forestry area.

(2) The total area to be covered by the Cadastral Survey is about 285,000 km² which is the area of whole national land excluding the national forestry area and all the lakes, ponds and rivers.

By the end of fiscal 1984, the Cadastral Survey had completed an area of about 84,000 km² (including the area surveyed prior to the reversion of Okinawa Prefecture (1,259 km²)). This means the entire progress rate is about thirty percent (30%).

The progress, however, is not uniform all over the country. The best prefecture achieved eighty-one percent (81%) progress, while the worst one did less than one percent. The most serious problem is that the progress in the urban area is very poor.

Table 2 shows the number of municipalities completed and executing the Cadastral Survey.

5. Procedure of Cadastral Survey

(1) The procedure of the work of the Cadastral Survey is illustrated in Figure 1. As seen the Cadastral Survey consists of the parcel investigation and the land surveying which are closely related with each other.

(2) The geodetic control network of the first, second and third order control points was established more than sixty years ago by the army mapping agency and has been maintained by the Geographical Survey Institute after the World War II for the purpose of the topographic mapping of the medium scale.

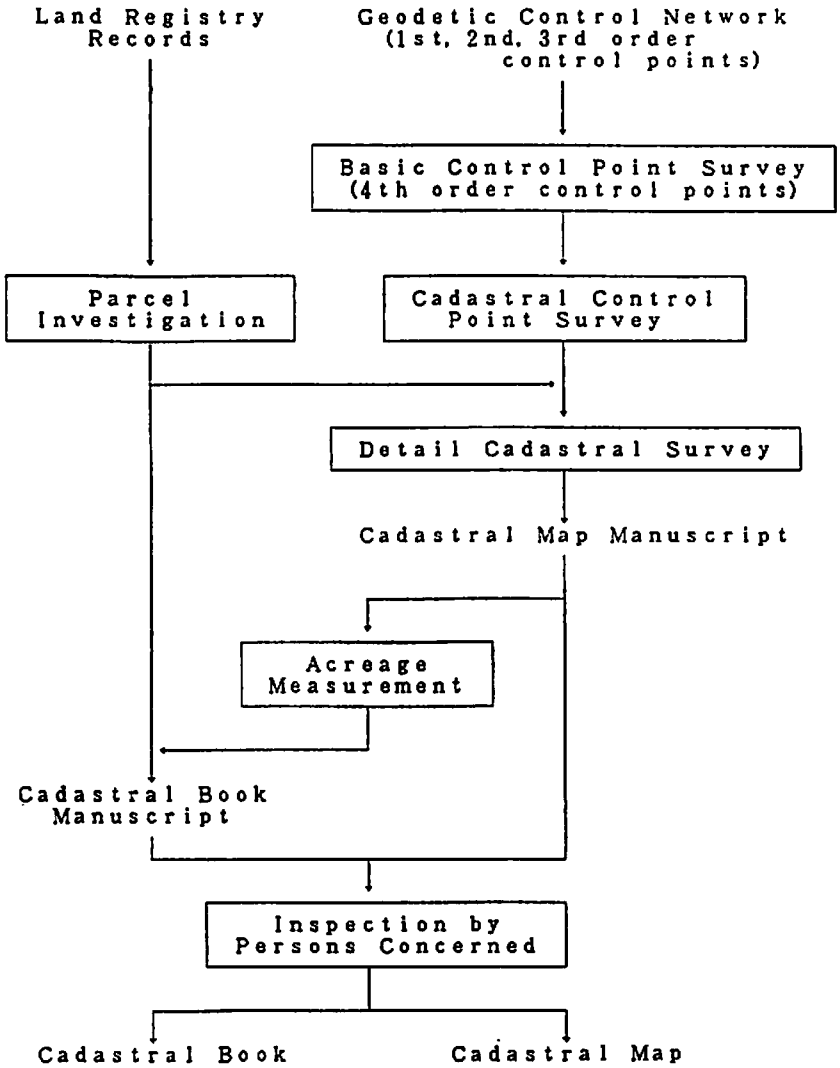
As the existing gedetic control network is not dense enough, additional geodetic control points must be monumented and measured in advance before the Cadastral Survey. These control points are conventionally called the fourth order control points, and the determination of the location of these points is done by the Geographical Survey Institute.

(3) During the parcel investigation, the display marks for boundaries of parcels must be

Table 2 Municipalities completed and executing Cadastral Survey

All Municipalities A	Completed Entirely B(B/A)	Completed Partly C(C/A)	Executing in 1935 D(D/A)	Started by 1985 B+C+D ((B+C+D)/A)
3,255	520(16%)	361(11%)	1,070(33%)	1,951(60%)

Fig. 1 Flow Chart of Cadastral Survey.



set by the relevant owners. The municipality personnel are not allowed to decide the position of those marks without approval of the land owners concerned. When a conflic concerning a boundary location is not settled, the boundary will be treated as "unsettled" and it will not be indicated on the cadastral map.

(4) There are six grades of accuracy standards for the Cadastratl Survey. Depending on the land use condition of the project area, appropriate grade of accuracy standards will be applied. (Table 3).

The scales of the cadastral map are 1/250, 1/500, 1/1000, 1/2500, 1/5000. The application rule is as follows:

residential area : 1/250 or 1/500

agricultural area : 1/500, 1/1000 or 1/2500

mountainous, forestry and wasteland area : 1/2500 or 1/5000

There are seventeen (17) different plane coordinate systems to cover the whole country for the purpose of large scale mapping. Therefore, these coordinate systems are used for the cadastral mapping.

Table 3 Grades of Accuracy Standards

Grade	Positional Error*	Applicable Area
A1	2cm	Urban area of the large scale city
A2	7cm	Urban area of the medium scale city
A3	15cm	Other urban area, Town, Village, Agricultural area
B1	25cm	Agricultural area
B2	50cm	Forestry area, Wasteland area
B3	100cm	Mountainous area

* R.M.S. positional error of the boundary point in relation to the given point concerned.

The Projection system is the UTM projection with the scale factor 0.9999 at the reference meridian. The origin of each plane coordinate system is located on the respective meridian.

As for the method of land surveying, the ground method using plane table is still dominant (70%), while the digital method using the so-called total station surveying instrument consisting of the theodolite, the opt-electoric distance measuring device and the digital data recorder is introduced and its share is increasing (5%). The rest is surveyed with the help of photogrmmetrical means.

(5) The products of the Cadastral Survey, i.e. the cadastral book and the cadastral map, are sent to the respective prefectural governor for their certification or in other words, official announcement of the accurateness of the survey results, The prefectural governors are required to call for the prime Minister's approval of their certification in advance when they have ascertained the accurateness. Upon receipt of the approval, the governor acts certification, and makes official announcement to this effect. The reason why the above-described two-step procedure is required is that the registry offices, if the duplicates of survey results are sent to them after certification, revise the description of land registry books accordingly and replace the old registry maps with respective cadastral maps.

The certified original cadastral books and maps are taken into the certifier's custody and copies of the survey results are sent to the respective relevant registry office and the municipality office.

6. Use of Cadastral Survey Results

(1) As the results of the Cadastral Survey contain the most basic information concerning land, they contribute in various fields of administration as follows:

1) To correct the registry records (Table 4).
2) To save time and cost otherwise necessary for planning and execution of other development projects.
3) To clarify the rights related to land and to reduce conflicts concerning land.
4) To realize fair land taxation (Table 5).
5) To realize reasonable and efficient administration concerning land.

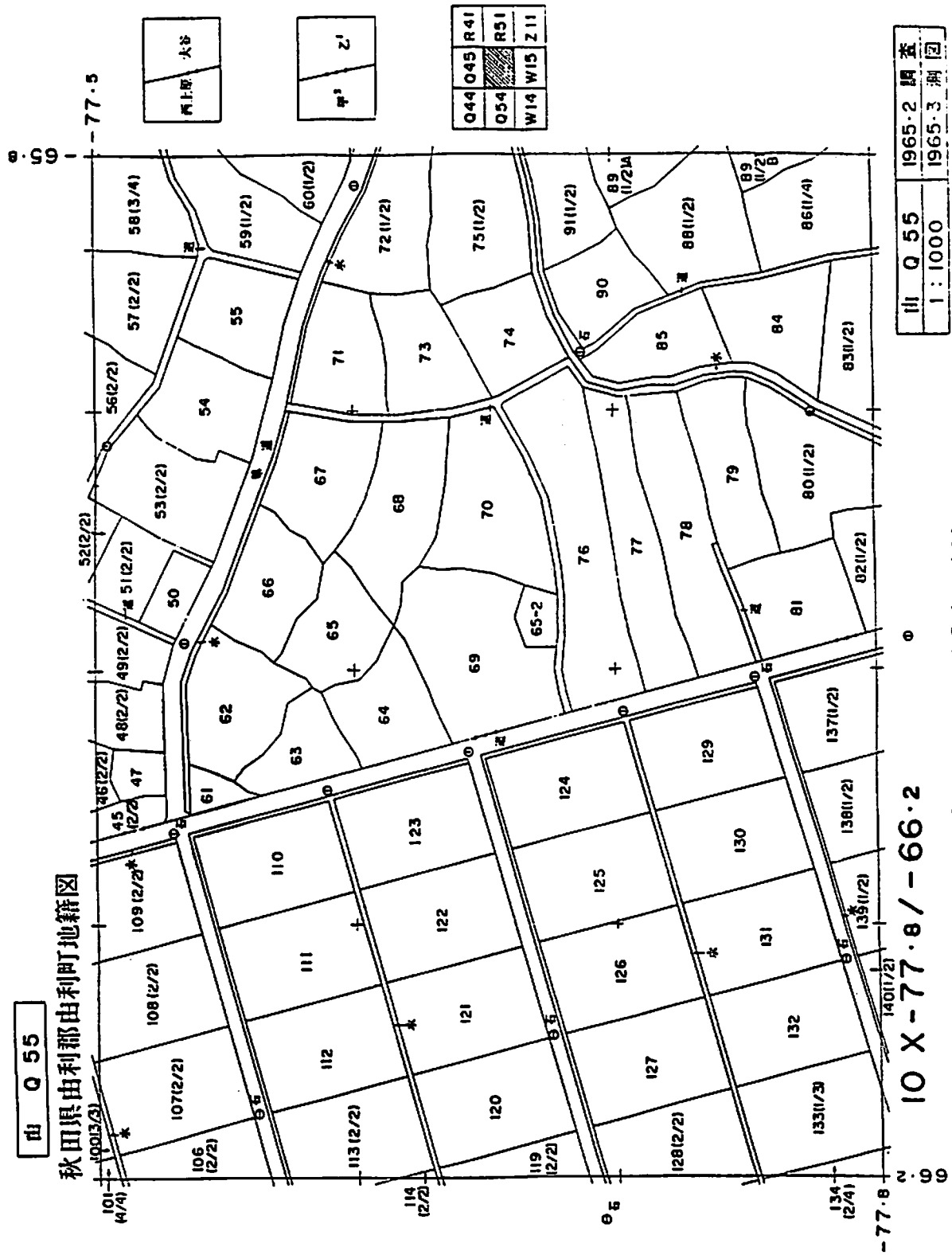
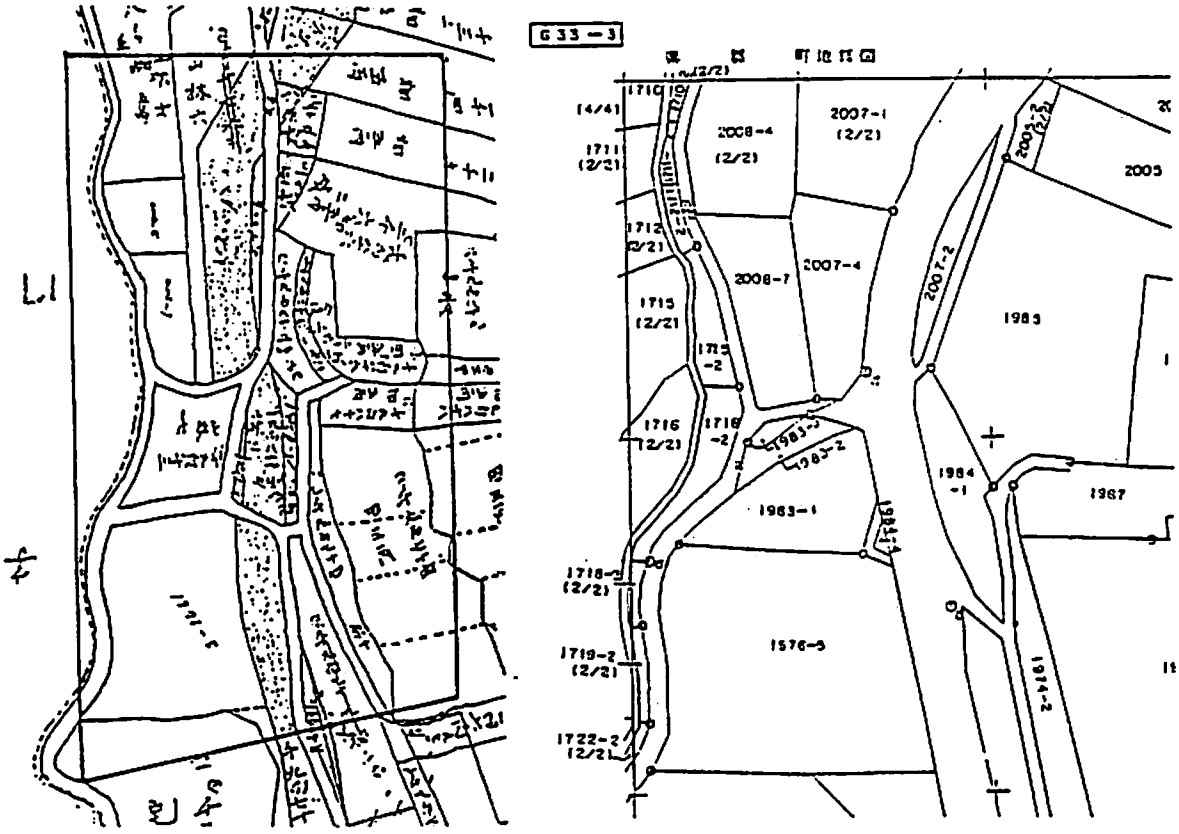


Fig. 2　Exmple of Cadastral Map.

Fig. 3 Registry Map, Cadastral Map and Collective Cadastral Map.

(1) Registry (old) (2) Cadastral



(3) Collective Cadastral Map (overlapped on the topo-map)

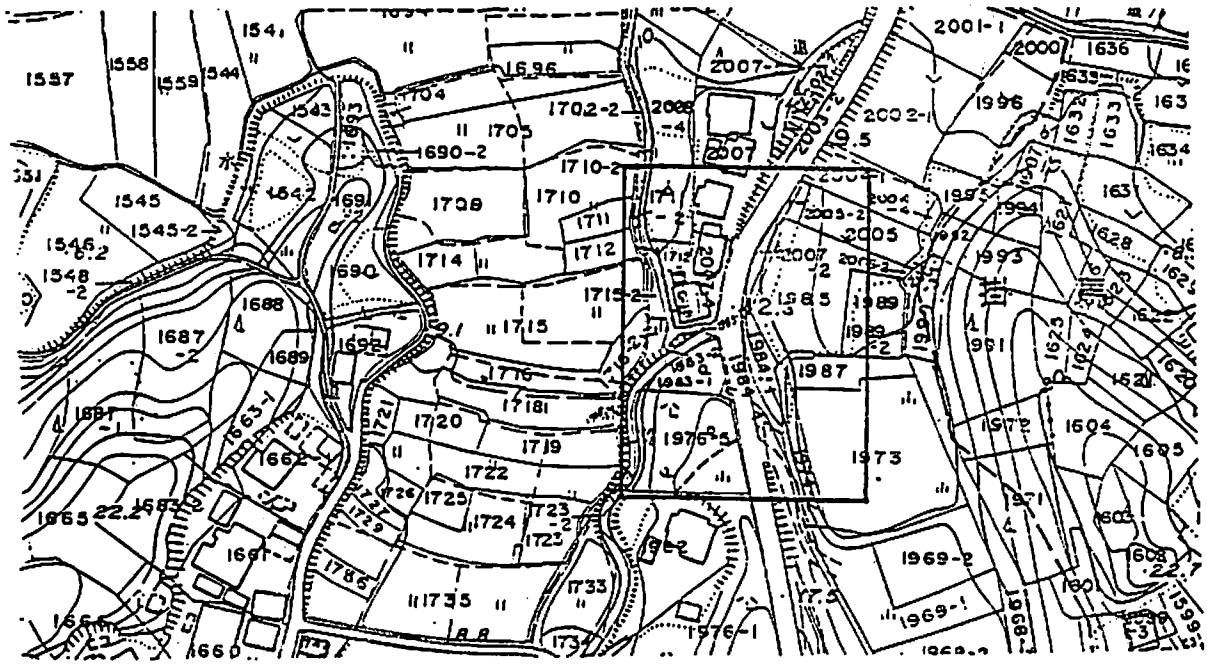


Table 6 Example of Cadastral Book Description

Land Indication before Cadastral Survey					Land Indication after Cadastral Survey						
Aza	Lot No.	Category	Acreage m²	Owner's Address & Name	Aza	Lot No.	Category	Acreage m²	Owner's Address & Name	Cause and its Date	Map No.
Koma-tsu	560	Forest	2125	65 Ichiro Yamada		560 -1		1115		Exact date unknown except year 1945. Partially changed in category. Divided into 560-1 & 560-2.	Matsu-J 11-2
						560 -2	Upland field	1050		Divided from 560	do
Koma-tsu	561	Paddy field	116	39 Sabro Oshita				793		562 and 563 were fused	Matsu-J 11-4
do	562	do	203	do						Fused with 561	
do	563	do	411	do						Fused with 561	
do	564 a	do	316	62 Taro Yamashita		564 -1		350		Lot No. changed. Former acreage indication is not correct.	Matsu-L 11
do	565	Residence site	272 09	11 Taro Oyama						No change	do
do	566	do	292 00	105 Ichiro Yamada			Upland field	965		Changed in category on April 15, 1955. Former acreage indication is not correct.	Matsu-K 13
						Provi-sional 567	Waste land	116	121 Toshio Honda	Cause is unknown. (Not yet registered.)	do
do	568	Upland field	116	135 Kazuo Suzuki				121	155 Kazuo Suzuki	Address changed on Dec. 1, 1961. Former acreage indication is not correct.	do

'Aza' is the smallest administrative division.

Table 4 Number of Registry Maps (thousand sheets)

Accurate Registry Maps			Others	Total
From Cadastral Survey	From Ministry of Justice	From Other Projects		
1,124	2	144	3,288	4,558

Table 5 Change of Acreage of Land Categories

Land Category	Before Survey (A)	After Survey (B)	Rate of Change (B/A)
Paddy Field	7,162 km²	8,263 km²	115%
Other Field	9,267	9,471	102
Building Land	1,478	2,013	136
Forest	18,467	29,263	159
Waste Land	8,081	3,461	43
Miscellaneous	1,823	2,831	155
Total	46,278	55,302	119

(These data are based on the approved results during 1970-1984)

(2) To promote the utilization of the cadastral information, some attempts to enhance the original cadastral data have been tried.

(a) Collective Cadastral Map

As the cadastral map is of rather small size (30×40cm) and is inconvenient for use, collective cadastral maps have been prepared. A collective cadastral map is compiled from several sheets of original cadastral may by scale reduction. The size is usually 4 times of that of the cadastral map.

As the scale and the size of collective cadastral maps are selected the same size as those of other topographic and/or thematic maps, it is possible to overlap these maps on top of each other.

(b) Digital Cadastral Information

The cadastral data are changing every day. The municipality office has been updating manually the cadastral books and maps since the completion of the survey. This effort, however, is so laborious that some municipalities gave up updating the cadastral records.

To make the updating work easier, several municipality offices recently introduced computer systems. They converted the information in the cadastral books and maps into digital form and stored it on magnetic memory devices like magnetic tapes and floppy disks. Although the system available now is rather small and is designed only for the administration of the cadastral data, more advanced systems where several kinds of administrative data, including cadastral information are processed jointly, will appear soon. Then the utilization of the cadastral information will be considerably, extended.