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The history of Tameike in Inamino Tableland

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HYOGO PREFECTURAL GOVERNMENT

** ABSTRACT **

In Inamino table land, which is located in the southeastern part of Hyogo prefecture, there are about one hundred Tameike (reservoirs). The amount of those water surfaces is as same as 30% of agricultural land in this area. The irrigation system in this area is characterized by the large number of Tameike. Although ordinary paddy fields in Japan are irrigated by river water, almost of the paddy fields in this district are irrigated by Tameike.

First this report deals with the outline of Tameike in Japan. And then this report studies the reason why they constructed such a number of Tameike in this area. Constructing Tameike and the land reclamation in this area are closely connected each other. Considering these relationship, this report studies the history of Tameike, and shows the Tameike played an important role to make the community of this district.

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§ 1. THE OUTLINE OF TAMEIKE IN JAPAN

Our forefathers made a great effort to keep the water resources for paddy rice fields in order to develop the method of farming.

Fig.1 shows various ratios concerning the source of water supply to the paddy fields in Japan. Most of fields are irrigated by river water. But 10% of fields are irrigated by Tameikes (reservoirs).

The rivers are short and steep, so rainfalls flow out quickly. It is difficult to keep stable irrigation requirement. In order to solve this problem they constructed many Tameikes to reserve rainfalls. The amount of irrigation areas by Tameike is 290,000 hectares in Japan, it is as same as 10% of total paddy fields areas of Japan. Considering irrigation areas by small river water, Tameike relative area is 1,100,000 hectares, it is as same as 38% of total paddy fields of Japan.

They constructed many Tameikes in the Setonaikai District (the land faces to Seto-inland sea), due to small rainfall. Fig.2 shows the map of iso-precipitation line in Japan. We can find there are less precipitation in Setonaikai-district than other district of Japan. In the other district there are no need of constructing Tameikes because of big rivers which have constant ran-off. Only Setonaikai District needs a great numbers of Tameike.

Fig.3 shows the distribution chart of Tameike. From this chart we can find the concentration of Tameike in Setomaikai District (Hyogo, Kagawa, Yamaguchi, Hiroshima, Nara, and Osaka Prf.) than other district. The total number of Tameike in those prefectures are as same as the half of whole number of Tameike in Japan.

Tameike has distinguished characteristics comparing high-dam as follows.

1) Tameike is smaller in scale than high-dam. Dam-hights for 80% of Tameike in Japan are shorter than 10 metres . The average storage is only 8,000 m^3 .

2) Many Tameikes were constructed between the Tokugawa Shogunate Era and the Meiji Era. About 75% of them were constructed in those period.

3) Because most of them were constructed using an empiric technique and man power, as the fill-type dam before Japanese modernization.

Those Tameikes were developed with farmer's activity. New paddy fields were reclaimed and new village were constructed with newly designed Tameike.

Fig.1 The source of water supply for fealds in Japan
(survey in 1977 data source ref.8)

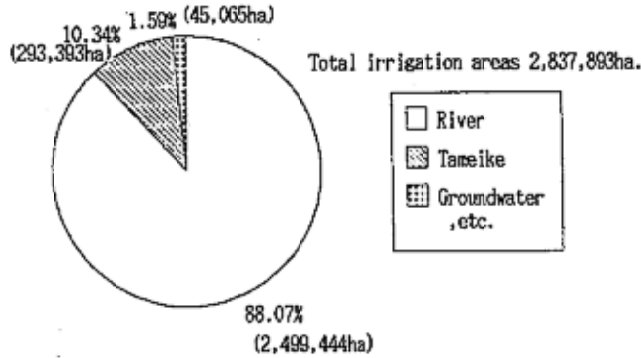


Fig.2 The map of iso-precipitation line in Japan
(data source ref.1)

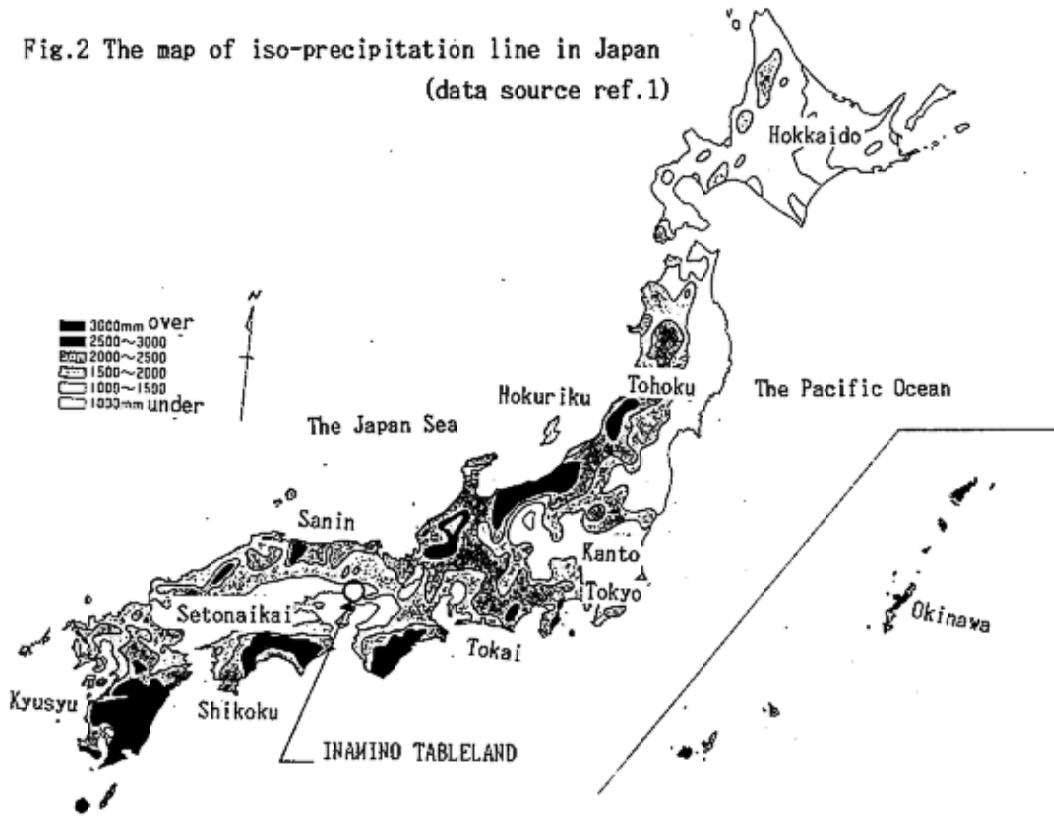
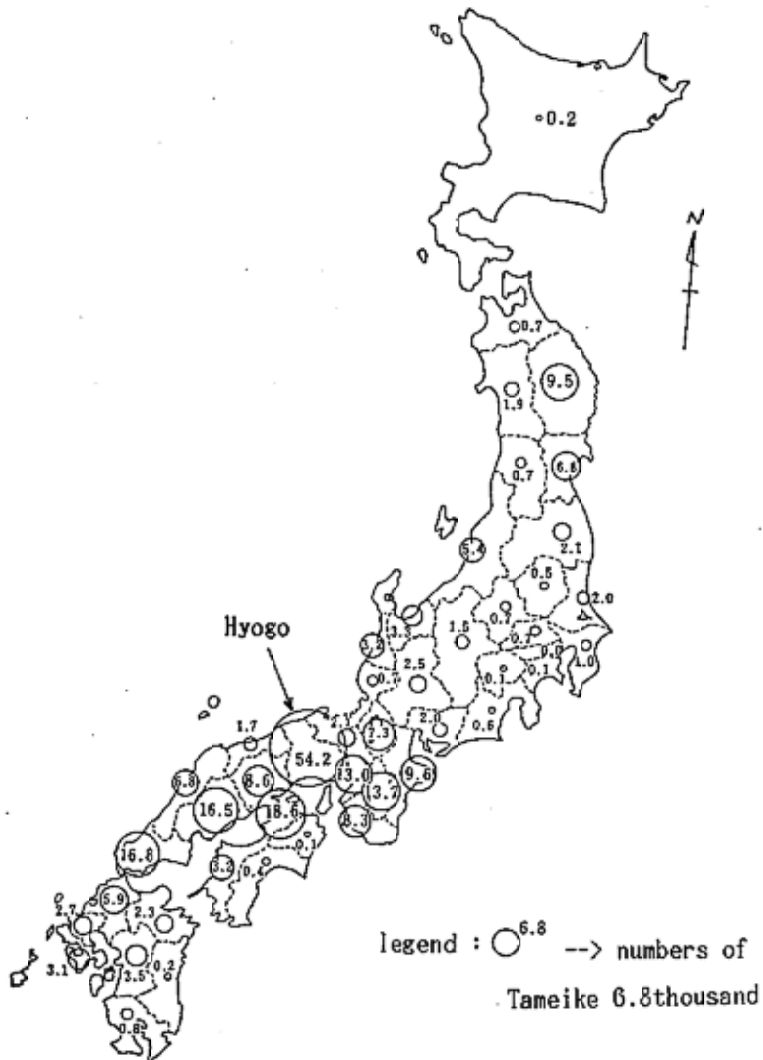


Fig.3 The distribution chart of numbers of Tameike in Japan
(survey in 1978 data source ref.7)



§2. PRIMARY FACTORS OF TAMEIKE IN INAMINO TABLELAND

Inamino table land is located in the southeastern part of Hyogo prefecture, the western boundary is Kako-River, eastern boundary is Akashi-River, northern boundary is Mino-River, and southward is limited by Setonaikai (the Inland Sea). This tableland is as if a big mesa. There are about one hundred Tameikes here. The amount of those water surfaces is as same as 30% of agricultural land in this area. The irrigation system in this area is characterized by the large number of Tameike. Although ordinary paddy fields in Japan are irrigated by river water, the paddy fields in this district are irrigated by Tameike. As you can see Fig.4, no other district in Japan has such a numbers of Tameike.

Why have they made such numbers Tameikes?

1) Little precipitation

This district belongs to Setouch-climate zone. There are few rainfalls. Though the average of precipitation in Japan is about 2000 mm/year, in this area the average of that is only 1000 mm/year.

2) Small watershed

This table land is limited to all sides, the range is 20km from east to west, 15km from south to north. In addition to this, there are several streams on this table land. These streams are consist of basins small and smaller.

3) Difficult to lift the water from river basin

The edge of this tableland is formed a terrace by the river. It is too high to receive gravitationally the water by canal from the adjacent point of river. Eastern part of this tableland is 100 metres high from the river water level, even though on western side is 10 metres high. In addition to this serious situation the tableland slopes gently down from east to west. So it is difficult to get water through canal from another river basin so far. In 1661 they construct irrigation canal from Kusatani River which exists far from here. It's length was 4.5km.

Fig.4 The map of Inamino tableland

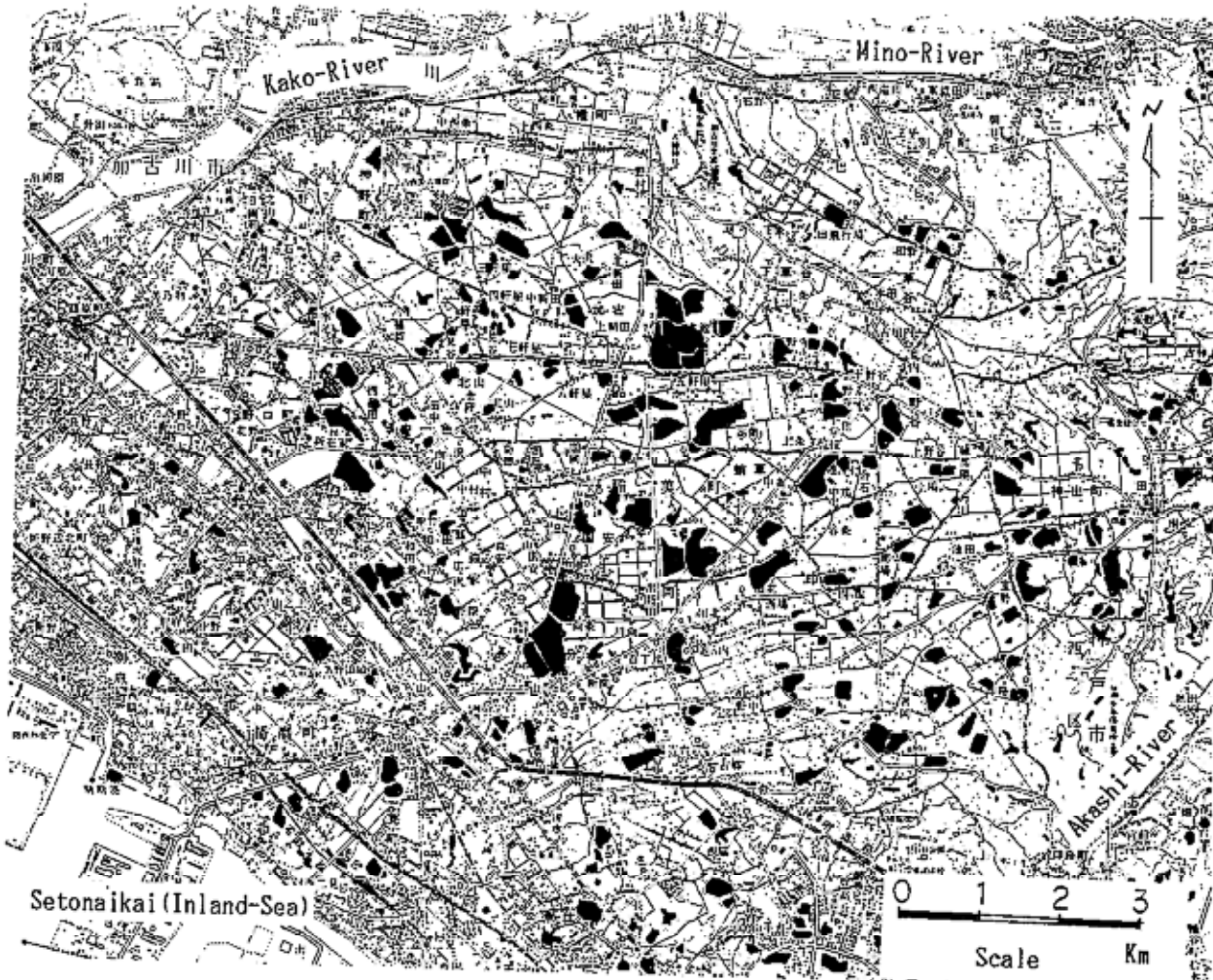


Fig.5 The model of Inamino Tableland

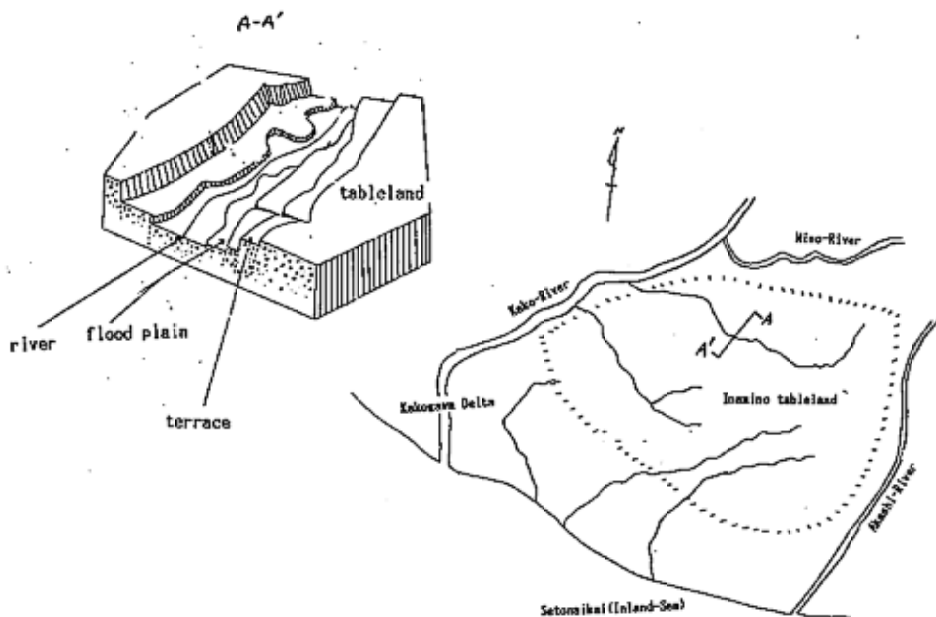
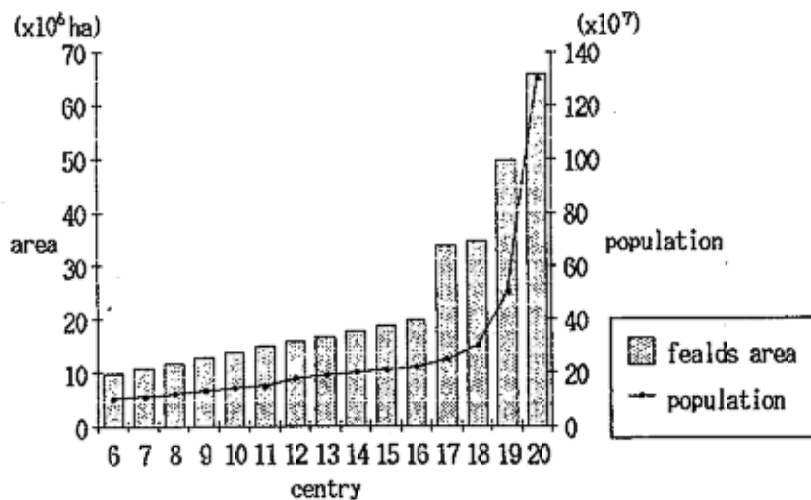


Fig.6 The development of fealds and increasing population in Japan (data source ref.1)



In 1861 they again constructed another canal (Yamada-Ohgo Sosui) to get the water from the different river which was remoted 26km from here.

4) Low groundwater table

This tableland which was formed about 500,000 years ago, contains silt, sand and gravel. This gravel layer is almost 10m thick and permeable layer. So groundwater level in this tableland is very deep. Some streams on this tableland flow the ground scored deeply to gravel layers.

Those factors has delayed the reclamation of in this tableland than other flood plain. They gave up making paddy fields until they could find the idea of the constructing of Tameike.

§ 3. THE HISTORY OF CONSTRUCTING TAMEIKE AND RECLAMATION IN INAMINO TABLELAND

The history of development of water supply in the tableland is divided into three periods.

1) The First period (before 15th century)

This stage was the beginning of reclamation of the tableland. The oldest irrigation system in this district was called Gokai-Iseki headwork made in 7th century. It had dammed up Kako River and irrigated 750 hectare. And we could find only five Tameikes in the period as shown in Fig.8. They reclamated the tableland using thoes water resources. But irrigation was limited on flood plain where was easy to get the water.

Population in Japan did not increase very much in this period from 8th to 14th century. (shown Fig.6) Because a serious drought occured sometimes, and there were lack of technology to increase yields. We could not find the idea of new Tameikes and new villages through this period. This tableland was almost a remoto land through this period.

2) The second period (15th~the middle of 19th century)

In the period which was called the age of civil wars (15th~16th century) many loads

made banks controlling flood, reclaimed lands in order to keep their territories and to establish their economical foundation. Technology for water resources made a great progress in this age. With increasing economy capacity and growing the standard of living, the population increased very much. Under such background paddy fields extended from small marshy ground to flood plain by big rivers. And for economical and social needs, paddy fields extended to such a tableland where was difficult to get waters so far.

Also in Inamino tableland, we could find the constructoin of many Tameike. Kako-Shinden village was established in 1658. The villagers made one big Tameike which watersurface was 49 hectare and irrigation canal which length was 4.5km. It is remarkable thing that they persisted such a big project when there was no big machines. Innami-Shinden village was also established in 1710. We could find two peaks of reclamations in the history.

In that time the present irrigation system was nearly complete. They connected streams to Tameikes, connected Tameikes and Tameikes each other. They caught the water from streams in non-irrigation season, and tried repeating use of water in irrigation season. This system was already advanced one. We could find many arguments concerned water right in this period. This argument was the discussion between old water rights and new one. Sometimes the argument caused quarrel.

Although they need hard labors to construct Tameike and had to struggle with other village about water right, they had hard in stand themselves or against outside.

3) The third period (after middle of 19th century)

In this period, the water utilization on the tableland was saturated, so they began to look about for new water sources on quite different basin. In 1771 one of far-seeing farmer designed a canal which drow water from Yamada-River located quite different basin to the tableland. But this plan has not realized. For the lord who rules Yamada-River basin was different from who rules the tableland. But in 1868 Tokugawa-Shogunizum was over. The government centralized its administrative powers by abolishing the feud system and setting up more modern unit of local administration called ken (prefecture). The time to construct the canal had arrived at last. In 1878 farmers on this tableland had petition the Hyogo prefectural governor to help constructing the canal. And at last in 1891 the canal called Ohgo-Sosui was

Fig.7 Typical method of constructing Tameike in Inamino tableland

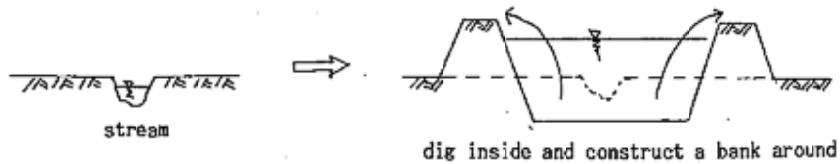


Fig.8 Location and constructed year of Tameike, feed canals and new village in Inamino tableland (data source ref.1)

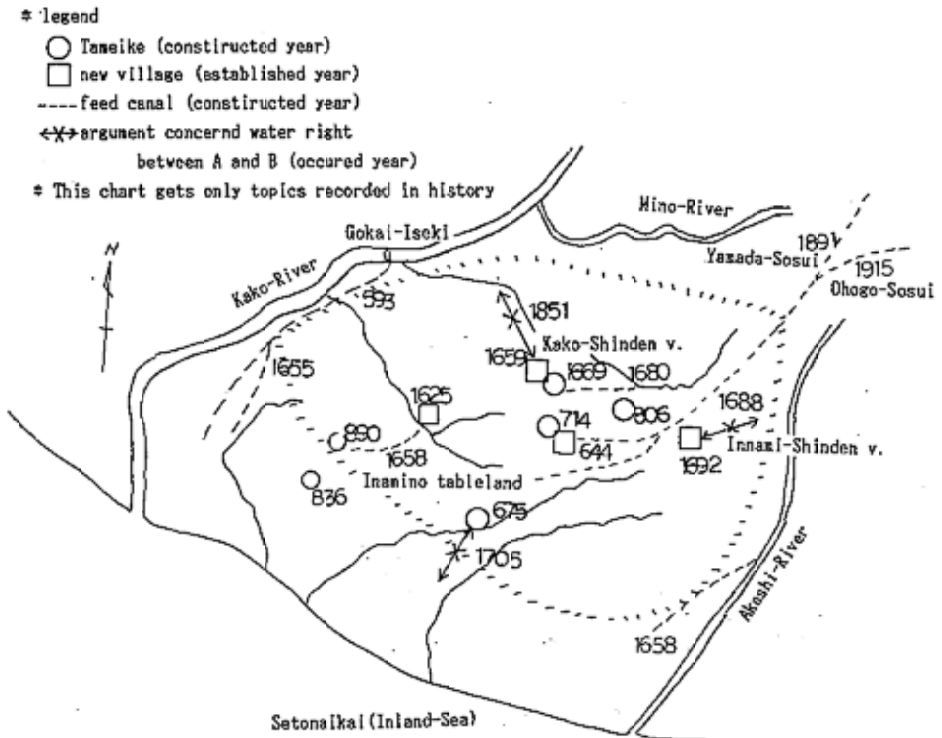
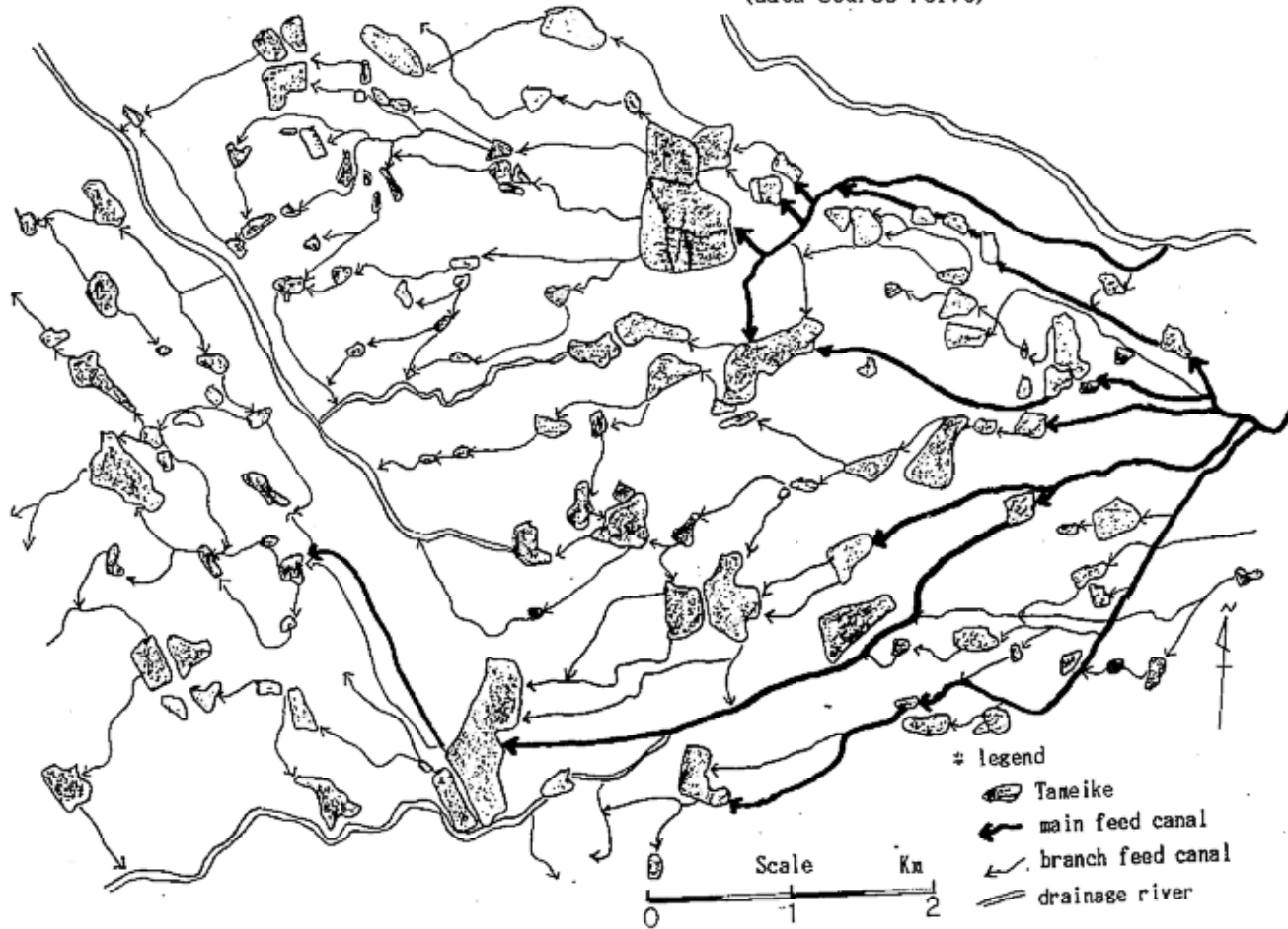


Fig.9 The network of canals, streams and Tameike
in Inamino tableland
(data source ref.6)



completed. It's length is 26.3km. Moreover, in 1915 another 11km-length feed canal called Yamada-Sosui was completed. Those two big canals have brought enough water to Tameikes. The fields on the tableland were turned rich ones by those projects.

Next factors to promote those projects.

1)The government centralized in 1868 had promoted to get new water sources from remote river basin.

2) New western technology which was brought by modernization had helped to carry out big projects.

3)So far, on Inamino tableland cotton was cultivated on a large scale. But after 1853 cheaper cotton imported from overseas. So they gave up to cultivate cotton and changed crops from cotton to rice. Rice needs more water than cotton.

4)The new government wanted increasing tax, so this stimulated the increase of paddy fields.

In this way Inamino tableland has been change into rich paddy fields.

§ 4. CONCLUSION

1)Many Tameikes in Inamino tableland were constructed by farmers groupes between 18th and 19th century. They are fill-type dams and those dam-hight is shorter than 10 metres.

2)Many paddy fealds were reclamated and many villages were established as constructing Tameike.

3)As irrigation system was nearly completed, they connected streams to Tameikes, Tameikes and Tameikes each other. They stored water in Tameikes from streams in non-irrigation season, and tried repeating use of water in irrigation season. This system was really advanced one.

4)Although they need hard labor to construct Tameike and had to solve the disputes with other villages about water right, they kept hard together themselves or against outside. Constructing Tameike played an important role to make the community of this district.

5)New western technology which was brought by modernization after Meiji Era

had helped the construction of long feed canals from other water basin. The canals could bring enough water to this tableland.

6) In present as paddy fields decrease, many Tameikes are reclaimed. From now those Tameikes contribute to flood control and a good ecological conditions and beautiful landscape around Tameikes.

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