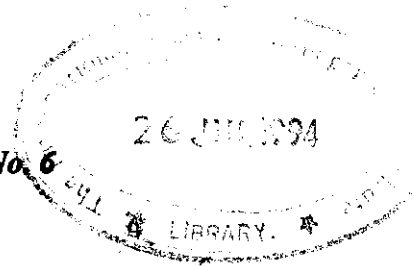


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**on**  
**Locally Managed Irrigation**

**Report No. 6**



**EVOLUTION OF LAND IMPROVEMENT**  
**DISTRICTS IN JAPAN**

**Keijuro Nagata**

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**Program on Local Management**

**INTERNATIONAL IRRIGATION MANAGEMENT INSTITUTE**

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## Purpose of the Series

The *Short Report Series on Locally Managed Irrigation* is designed to disseminate concise information on the role of local management in irrigation and irrigation management transfer or turnover experiences and policies. The *Series* is distributed worldwide to a broad range of people—policymakers, planners, researchers, donors and officials in both public and nongovernmental organizations—who are concerned with the irrigated agriculture sector. IIMI's goal is not to promote policies such as irrigation management transfer, but to enhance the knowledge base available to decision makers and advisors as they face questions of policy adoption and strategies for implementation.

Locally managed irrigation can be of many types, such as traditional farmer-constructed diversion or tank schemes, indigenous and often new lift irrigation, government-constructed but farmer-managed irrigation systems and systems where management is or has been transferred from an outside agency to a local user organization.

By "irrigation management transfer" we mean some degree of transfer of responsibility and authority for irrigation management from the government to farmer groups or other nongovernmental entities. This generally involves contraction of the role of the state and expansion of the role of the private sector and water users in irrigation management. In other words, there is a shifting upstream of the point where management responsibility and control of the water supply are transferred from the irrigation authority to local management. This may involve changes in policies, procedures, practices and the performance of irrigated agriculture. It may or may not involve "privatization" of ownership of the assets of the irrigation system. The *Short Report Series* addresses questions such as the following:

*What are the necessary conditions which support viable locally managed irrigation?*

*What socio-technical conditions, institutional arrangements and change processes lead to sustainable locally managed irrigation?*

*What is the range of different models that are being applied worldwide for turnover or transfer of responsibility for local management for recently developed irrigation?*

*What are the effects of management transfer on the productivity, profitability, financial viability, equity, efficiency and sustainability of irrigated agriculture?*

*What are the perspectives of farmers, managers, policymakers, urban consumers and other stakeholders in irrigated agriculture about irrigation management transfer?*

*What adjustments in government may be needed as a result of turnover to provide support to locally managed irrigation systems and to improve productivity in the public sector?*

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## **Land Improvement Districts in Japan**

Large-scale farmer-managed irrigation systems have been functioning successfully in Japan since the 17th century. These irrigation systems are managed by stratified water user associations with village-level water user groups at the terminal-canal level, intermediate water user associations representing a number of village-level groups at the main-canal level and an association responsible for overall management and conflict resolution for the entire system.

In Japan, irrigation management has historically been the responsibility of the water users themselves, with a limited role played by the government. In particular, it is recognized that irrigation water is managed by the farmers. Water users are responsible for paying an irrigation fee that covers the entire operation and maintenance costs. In addition to paying fees, water user groups contribute voluntary labor to keep the canals clean.

After the war, the institution of Land Improvement Districts led to Japan's accomplishment of self-sufficiency in rice. Compared to the previous water user associations, Land Improvement Districts consist of cultivator-farmers. This is in contrast to the older associations which were composed of landowners. These districts are in charge of the operation and maintenance of irrigation and drainage facilities.

Many countries that wish to privatize larger irrigation systems, or develop jointly managed irrigation systems, are particularly interested in the creation of active federated irrigation organizations. Japanese Land Development Districts provide one successful example of such a system. Learning more about the organizational and administrative structure of the Land Development Districts will provide valuable insights into the process of crafting viable federated water user associations.

The ability to provide timely information about such an important aspect of local management of irrigation is the reason the *Short Report Series* was created. The editors welcome comments and reactions to this and other reports in the Series.

# EVOLUTION OF LAND IMPROVEMENT DISTRICTS IN JAPAN

*Professor Keijuro Nagata*<sup>1</sup>

## I. Introduction

Historically, irrigation management in most of Asia has been the responsibility of the government, with a limited role assigned to the water users. The major exceptions to this are found in Japan and Taiwan where irrigation management has been the responsibility of the water users themselves, with a very limited role played by the government. In particular, in Japan, it is recognized that irrigation water is managed by the farmers. For this reason, the Japanese farmers bear all the expenses of operation and maintenance by paying water fees. In contrast to other Asian countries, Japan does not have a historical tradition of institutional subsidies for irrigation.

Given the recent commitment by many governments to transfer irrigation management responsibility to the water users, and in some cases to privatizing irrigation completely, there is considerable global interest in learning how successful farmer-managed irrigation systems, such as those in Japan, operate. Many countries are particularly interested in the organization of the Japanese stratified or federated irrigation organizations that represent series of villages within a river basin, along a section of a river, or in the service area of a large reservoir.

In order to understand irrigation organizations in Japan, it is first necessary to briefly review the history of the country. The Edo Government's policies, the feudal lords, the transformations of society during the Meiji period, and the role played by the US Occupation Forces in Japan's land reform program and economic modernization have all influenced irrigation organization and management in the country. With respect to irrigation management after World War II, it is important to study the functions of the Land Improvement Districts as Japan's accomplishment of self-sufficiency in rice can be traced directly to the activities of these districts.

The final section of the paper discusses the impacts of the economic transformation on the Japanese economy and identifies some issues that will have to be addressed if irrigation water user groups are going to continue to play an effective role in irrigation management in Japan.

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## II. Development of Irrigation Systems and the Formation of Agricultural Water User Organizations in the Edo Period (1603-1867)

Rice-based agriculture began in Japan about 2,300 years ago when rice cultivation and irrigation technology were imported from China and Korea. It is estimated that only about 2 million hectares of arable land had been developed from the tenth to the fifteenth centuries. However, the expansion of rice fields by draining marshes and reclaiming land by draining sea and lake water advanced rapidly from the seventeenth century to the first half of the eighteenth century. By the late 1880s, there were more than 4 million hectares of rice land (JNCID 1984).

Political cohesion and the development of civil engineering technology were supportive components in the advancement of rice land development. It was during this period that national integration in Japan was secured after a period of civil wars. Civil engineering as related to mining and structure technology was a positive outcome of this social change. These technological advancements made the control of large rivers and the construction of large-scale irrigation facilities possible. With the construction of large-scale irrigation facilities located in the downstream reaches of large rivers, agricultural water user organizations became necessary for the management of these new facilities.

The Edo Government, including feudal lords under the control of the government, used rice as a form of land tax. It is important to note that the land tax was imposed on the village, not individual farmers. Accordingly, the entire village was required to work together to produce rice. The villagers also worked together to build dams and ponds, and to develop the irrigation canals. In addition, they were responsible for the operation, maintenance and management of these facilities. The village was a territorial community for earning a livelihood and at the same time, a water user group, called *igumi* or *mizugumi*. The water user group of the village was based on the unit of land tax payment of the village as mentioned above. This group occupied the lowest level of the political structure.

At the second level above the village, several water user groups worked together to form a large-scale water user group. This Water Management Association of associated villages, had two functions for implementing organized irrigation:

- 1) Operation and maintenance of water use facilities.
- 2) Water distribution and water use adjustments.

The most important task in the operation and maintenance of water use facilities was to maintain the headworks, main canals, main division works, and other facilities serving the irrigation requirements of the entire area covered by the Water Management Association. The labor force necessary for performing the task consisted of farmers from the area, mobilized by individual villages. However, those facilities which were used for local (terminal level) irrigation use, such as tertiary canals, ditches, etc., were operated and maintained independently by the respective villages. Thus, irrigation management evolved into a stratified agricultural water user organization which consisted of village water user groups at the lowest level, Water Management Associations controlling branch canals at the intermediate level, and a Water Management Association controlling a main canal at the highest level. This organization worked together to manage large-scale irrigation systems.

The most critical point in the water distribution system is the control of the flow between upstream and downstream areas. Naturally, the interests of different areas in the system often conflict, and water disputes occurred very often between upstream and downstream villages. These disputes reflected the power relationship between the villages involved and sometimes

erupted in violence. As a result, an authority in a "higher position" was required to negotiate the different interests of the disputing villages. The political power of a feudal lord symbolized this authority. But even the feudal lords lacked the ability to resolve the disputes by themselves, since they normally could not understand the conditions sufficiently to evaluate judiciously all aspects of the conflict. Eventually, a Water Management Association positioned at the top of the stratified agricultural water user organization appeared as an entity capable of resolving water disputes. As the Water Management Association operated and maintained a main canal over and above the local interests of each village, it was able to adjust and resolve water disputes from a system-level position.

By the second half of the eighteenth century, rules of water distribution came to be established. These rules were in keeping with the customary water use within or between Water Management Associations. The legal right of water use based on customary water rights was recognized in the **River Law** of 1896.

Stratified agricultural water user organizations were typically formed in river irrigation areas in the eastern part of Japan. Under this system, the Water Management Association at the top was the dominant authority. Individual villages could use water only if they were incorporated into the social order created by this authority. This organization operated on the basis of strict collective regulations, the details of which could be observed at the village level. Key functions were to:

1. Operate and maintain terminal water use facilities.
2. Clean ditches (*Mizosarae*) in the spring.
3. Cut water grasses (*Mogari*) in the summer.

*Mizosarae* was the work of removing mud from canals to maintain a necessary cross-sectional area of the canal. *Mogari* was the cutting of water grasses in canals and weeds on banks to facilitate flow of water through canals. Both were indispensable tasks for securing water for rice fields, and therefore the necessary labor was supplied by voluntary labor (*bueki*) provided without remuneration. Provision of *Bueki* labor is a mandatory duty for the villagers.

Conditions in a reservoir-irrigation area differed considerably from those in a river-irrigation area. In many cases, reservoir management was the task of a group of villages and conflicts over water distribution were few. Accordingly, a stratified agricultural water user organization as seen in a river-irrigation area did not develop there. However, in both areas, it was common that the village concerned was the organ performing water management and that water use by individual farmers was subject to strict collective regulations. Such collective regulations on the part of the village in a reservoir-irrigation area was evident in the rigid control of water distribution. In a reservoir-irrigation area, rainfall was usually sparse and water supply unstable. The village concerned was forced to implement strict control over water distribution. For example, in the Kako Plateau in Hyogo Prefecture, the village controlling a reservoir employed a full-time water distributor who was given full authority over water delivery to individual farms. Individual farmers were prohibited from operating canals or inlets for irrigation. This practice continued until recent times.



### III. Establishment of Agricultural Water User Organizations in the Meiji Period (1868-1912)

The government established in the Meiji Reformation initially had no consistent policy for agricultural water use. This is because a policy for agricultural water use was not an urgent necessity in the process of constructing a new modern state; control of agricultural water use could be left to the discretion of already existing organizations.

Not until the enactment of the **Ordinance on Water Management Associations** in 1890 did the Meiji Government establish an agricultural water use system and begin to exercise administrative control over agricultural water user organizations. There were two fundamental reasons why the Meiji Government, which was initially indifferent to policy for agricultural water use, was forced to establish an agricultural water use system.

1. The first reason was the need to create new local administrative organizations. The reform of the local administration system, which began with the *Haihan Chiken* (abolition of feudal domains and the establishment of a prefectural system), was completed in 1890 with the implementation of a system of cities, towns and villages. This reform was also part of the process in which old, traditional villages were reorganized into an administrative system in which villages were the lowest administrative unit. As a result, there was a problem of how to reposition the old agricultural water user organizations as associations of early modern villages within the new local administrative system.
2. The second reason was the need to establish private land ownership in accordance with the land reform tax. As described above, an agricultural water user organization in the Edo period was composed of village units, not individual farmers. This organizational structure, however, needed to be changed to one based on individual landowners in accordance with the establishment of private ownership of land.

According to the reorganization of modern agricultural water user organizations by the **Ordinance on Water Management Associations**, Irrigation Associations (*Suiri Kumiai*) were established for the purpose of operating and maintaining water use facilities. Unlike the old agricultural Water Management Associations, which were composed of village units, the new associations were composed of individual landowners. This provided the organizational conditions leading to the control of agricultural water use in keeping with the specific concerns of the land-owning class (landowners as upper-class people in rural areas).

By the middle of the Meiji period when the landowners' land and property system was constructed, Irrigation Associations were organized throughout the country. The enactment of the **Irrigation Association Law** in 1908 confirmed this development as a legally sanctioned system.

An Irrigation Association was organized when the operation and maintenance of the irrigation facilities concerned could not be included directly in the administrative framework of a city, a town or a village; therefore the area covered by an Irrigation Association included several cities, towns and villages. This meant that only those old stratified agricultural water user organizations that controlled main canals were reorganized into new Irrigation Associations. Almost all the smaller Water Management Associations that controlled branch canals and ditches were excluded from the reorganization. Therefore, the Water Management Association at the level of the village still performed the traditional operation and maintenance of irrigation facilities and distribution of water. Kunio Yanagida, a scholar of agricultural

policy in the Meiji period, in his paper published in 1907, stated that *the subject of the right for irrigation water is a village and not an individual*. His statement seems to be based on the fact that Water Management Associations at the village level still had the characteristics of the early modern age, although new Irrigation Associations had been organized with individual landowners as members.

It must also be emphasized that the agricultural water user organizations established during the Meiji period included not only Irrigation Associations but also "Arable Land Readjustment Associations." The administration of agricultural water use focused on the organization of Irrigation Associations similar to those for the administration of river controls established by the **River Law** of 1896, which came under the jurisdiction of the Ministry of Internal Affairs. At the same time, the Ministry of Agriculture and Commerce began the administration of land improvement thirty years into the Meiji period and established the **Arable Land Readjustment Law** in 1899 to encourage Arable Land Readjustment Associations to also implement irrigation and drainage works. Thus, the administration of agricultural water use was partly included in the jurisdiction of the Ministry of Agriculture and Commerce. This resulted in factional quarrels between the Ministry of Internal Affairs and the Ministry of Agriculture and Commerce. The enactment of the **Law on Irrigation Associations** in 1908 meant that the Ministry of Internal Affairs could compete with the Ministry of Agriculture and Commerce by establishing and strengthening the organization of Irrigation Associations. In turn, the Ministry of Agriculture and Commerce enacted a new **Arable Land Readjustment Law** in 1909 to intensify the organization of Arable Land Readjustment Associations.

Arable Land Readjustment Associations were local nonprofit business organizations formed to implement land improvement projects, including irrigation and drainage works. They differed in purpose from the Irrigation Associations which were in charge of the operation and maintenance of water use facilities. As in the case of the irrigation association, only landowners could become members. Therefore, the leadership and decisions of the association were determined by landowners only. They demonstrated a positive attitude towards the organization of Arable Land Readjustment Associations because irrigation and drainage works could lead to the stabilization and increase of farms rents. In addition, the cost of the works was partly subsidized by the government (see Table 1). Irrigation and drainage works were operated and maintained by an Irrigation Association, a city, town or village. Thus, until the creation of Land Improvement Districts of the postwar period, a dual system continued. According to this system, irrigation and drainage works were carried out by Arable Land Readjustment Associations under the jurisdiction of the Ministry of Agriculture and Commerce, while operation and maintenance of completed facilities were managed by Irrigation Associations under the jurisdiction of the Ministry of Internal Affairs.

However, in the Meiji period, Hokkaido Reclamation Associations (*Hokkaido Doko Kumiai*) were organized by the **Law on Hokkaido Reclamation Associations**, enacted in 1902. These reclamation associations had the function of both the Arable Land Readjustment Association and the Irrigation Association.

#### **IV. Establishment of the Land Improvement System (in the Postwar Period) and Land Improved Districts**

The most remarkable change in Japanese agriculture after World War II was the farmland ownership reformation (rural land reform). This reformation was thorough and had no

precedent in Japan. Under this program, farmland ownership was reorganized on the basis of a private property system. Implemented during the period from 1946 to 1950, tenant farmlands totalling 1,930,000 ha were purchased by the government and sold to 4,750,000 farm households at low prices. Tenant lands, which had occupied about 50 percent of the nation's farmland before World War II, decreased to about 10 percent under the farmland ownership reform. Thus, the landowners' property system which had prevailed in Japanese rural areas since the Meiji period was abolished and a new Japanese agriculture was initiated based primarily on owner-farmers.

In 1949, when the farmland ownership reform was coming to an end, the **Land Improvement Law** was enacted to abolish the prewar land-improvement system which depended mainly on landowners. This law created a new land-improvement system based on owner-farmers. One major achievement of the **Land Improvement Law** was the creation of Land Improvement Districts. This concept was suggested by the General Headquarters of the post-World War II American Occupational Forces when a draft of the **Land Improvement Law** was first drawn up. Compared to the previous water user associations, this concept was a radical change as the Land Improvement District consisted of cultivator-farmers, in contrast to the old Irrigation Association or Arable Land Readjustment Association composed of landowners. This reflected the spirit of the farmland ownership reformation.

A Land Improvement District is an irrigated agricultural water user organization which qualifies as a legal entity. In compliance with the **Land Improvement Law**, it is in charge of the operation and maintenance of land improvement facilities, including the control of irrigation and drainage structures. The Land Improvement District is called a **district** rather than an **association**, because it is a legal corporate body based on a specified geographical area. This is in contrast to the old village-based Irrigation Management Associations that traditionally held regulatory power based on the community, but did not hold legal rights since it could not qualify as a legal entity.

Major characteristics of the **Land Improvement Law**, which became the principal regulation defining the postwar land-improvement system, were as follows:

1. A legal status (lacking in the past), was assigned to government- and prefecture-operated irrigation and drainage works. Land improvement projects were implemented within a system of works operated at government, prefecture and local organization levels.
2. Arable Land Readjustment Associations, Irrigation Associations, and Hokkaido Reclamation Associations, based on the **Arable Land Readjustment Law**, the **Law on Irrigation Associations** and the **Law on Hokkaido Reclamation Associations**, respectively, were all dissolved. Land Improvement Districts were created as a single integrated organization. Accordingly, the administration of agricultural water use which had previously been under the jurisdiction of the Ministry of Internal Affairs was transferred to the Ministry of Agriculture and Forestry.
3. In principle, a Land Improvement District was to be set up with farmer cultivators as the members. Thus, a new agricultural water user organization was created with quite different characteristics from the old Arable Land Readjustment Associations and Irrigation Associations whose members were landowners (i.e., not necessarily cultivators).
4. A Land Improvement District could be established by obtaining the approval of the Governor when 15 or more farmers who had the prescribed qualifications

wanted to implement a land improvement project. For the implementation of a land improvement project, an application was required with the agreement of two-thirds or more of potential beneficiary farmers. When the project was implemented according to the application, dissenting farmers were also obligated to participate in the project. Accordingly, the assessment for general expenses in a Land Improvement District could be collected mandatorily like a tax.

5. As the land improvement project was considered beneficial to individual farmers, it was defined as a subsidiary project and part of its cost was assigned to beneficiaries as a surcharge on the farmers concerned.

The postwar land improvement system established by the enactment of the **Land Improvement Law** played a key role in the development of agriculture. This achieved the expected aim of increased food production, especially for rice. Substantial government funds were continuously and systematically invested in agriculture through this system. Farmer-cultivators who were emancipated from the burden of paying the landowners for the right to use their property, augmented the government funds invested in land improvement projects to improve and further develop their own farm management.

Land improvement facilities which are operated and maintained by a Land Improvement District are limited to diversion weirs, main canals, main division works and the like. The operation and maintenance of branch canals and other smaller facilities are handled by village water user organizations, which are organized on the basis of villages and are not juridical entities. The same is true for the control of irrigation and drainage. In other words, at present in Japan, two kinds of agricultural water user organizations exist: the Land Improvement District (a legal entity), and a contracted cooperative arrangement (a non-legal entity). The latter is in fact subordinate to the former, and represents a stratified organizational structure.

Land Improvement Districts have two functions:

1. The first function is that of promoting land improvement projects. Cultivator-farmers, having received the benefit of the farmland ownership reformation, were anxious to increase productivity, and tried actively to set up Land Improvement Districts to promote land improvement projects. These projects can be classified into national, prefectural, and organizational levels (farmers' association, municipal and government) according to the size or public nature of the projects. Part of project costs were subsidized by national or local governments, while the rest of the costs were borne by farmers (see Table 1). As the **Land Improvement Law** contributed to the establishment of Land Improvement Districts, new districts developed rapidly after the enactment of the new law. According to the data of the Ministry of Agriculture and Forestry, the number of Land Improvement Districts established as of the end of March 1958 was 6,302. Of these, 3,163 were reorganized from old Irrigation Associations and Arable Land Readjustment Associations, and 3,139 were newly established. That is, about half of the Land Improvement Districts were set up by farmers themselves for the purpose of implementing land improvement projects. This shows their strong response to the new policy. Table 2 shows that the number of Land Improvement Districts decreased from 11,664 in 1970 to 8,224 in 1989.
2. The second function of the Land Improvement District is the operation and maintenance of the facilities completed by the land improvement projects. This function has greatly contributed to the realization of results from land improvement projects. In other words, the proper operation and maintenance of land

improvement facilities has enabled the rational control of irrigation and drainage, contributed to establishing the intensive rice-production technique developed in the postwar period, and constituted a basic condition to increase productivity in agriculture. Thus, the Land Improvement Districts have not only had the hardware to provide infrastructure (land improvement facilities), but also the software (management and institutions) to complement it. In this way, they have played an important role in the development of agricultural production in Japan since World War II.

Linked to the formation of the Land Improvement Districts, a **New River Law** came into effect in 1964. According to this law, every customary water right had to be registered. The rights permitted under the old **River Law** were registered within two years from the date when the **New River Law** was enacted. However, the content of the right itself remained unmodified; therefore, the **New River Law** provided a mechanism for formally registering customary water rights.

## **V. Organizational Function of Land Improvement Districts and Future Problems**

Most Land Improvement Districts include areas of 100 ha or less, but there are also 17 large-scale Land Improvement Districts, each of which includes an area of 10,000 ha or more. Typical examples of such large-scale districts are the Hokkai Land Improvement District in Hokkaido, the Nishikanbara Land Improvement District in Niigata Prefecture, and the Minuma Land Improvement District in Saitama Prefecture.

The important role played by Land Improvement Districts as mentioned above, has been supported by the stratified organizational structure of agricultural water user organizations in Japan. As mentioned above, a Land Improvement District includes agricultural water user organizations within its substructure, each of which is organized on the basis of a village and is not recognized as a juridical entity. The Land Improvement District can easily perform the operation and maintenance of facilities, as well as the control of irrigation and drainage by having these village-based irrigation organizations as its substructure. Land Improvement Districts have thus played a key role in postwar agriculture in Japan.

Operation and maintenance of facilities and irrigation and drainage have been performed in many cases in accordance with the traditional manner dating from the Edo period. The labor force necessary for operation and maintenance was mobilized as "*Bueki*" (mandatory labor), and the control of irrigation and drainage was also exercised principally in compliance with the water use practices which emerged in the Edo period. Accordingly, the formation of a rational water use system at the level of individual farmlands was often prevented and the development of agricultural productivity was frequently restrained. This is because the traditional manner of water use dating from the Edo period aimed at adjusting conflicts of interest between different areas rather than supporting the development of individual farm management.

Postwar agricultural water user organizations, however, are able to reflect in their operation the needs of cultivator-farmers, in contrast to the prewar organizations which gave priority to the interests of the land-owning class. Therefore, farmers have made efforts to realize an appropriate water use system at the level of individual farmlands in order to guarantee the development of their own farm management. As a result, the traditional operation and maintenance system of village-based irrigation organizations has changed, and

a water use system called "individual water use" was formed in the later 1950s. This change also affected the Land Improvement Districts, the superstructure of village-based Irrigation Organizations, and made operation of the district more democratic than in the prewar period. The Land Improvement Districts supported the development of agricultural productivity only by being connected with this change, which allowed greater local flexibility in agricultural production.

The example of the large-scale Niigata Plain illustrates the impact of increased accumulation of investment on land improvement on rice production. Figure 1 shows a rising trend in rice production during the time that investments in land improvements took place. Although country-wise data on these correlations are not available, it can be assumed that the overall rise in Japanese agricultural productivity, as shown in Figure 2, is strongly related to investments in land improvement.

Various gaps appeared between the land improvement administration in postwar Japan, promoted strongly by the government, and the needs in agricultural production of cultivator-farmers. This in turn has enabled the postwar land improvement administration to achieve the expected aim of an increase in food production. At the same time, however, the functions of village-based Irrigation Organizations, which carried out the operation and maintenance of land improvement facilities and the control of irrigation and drainage, have been disturbed substantially by radical changes in the agricultural structure during the recent period of rapid economic growth. This has given rise to various difficult problems in the operation of Land Improvement Districts, which need to be resolved by the districts in the near future.

By the early 1970s, although Japan had attained self-sufficiency in rice, the social structure in the villages was changing due to industrialization. This led to the rapid spread of a commodity economy and an increasing number of part-time farmers. Under the rice-oriented economy, the existence of water user groups was inevitable. However, after the transformation of the Japanese economy, it became more rational for part-time farmers to engage in off-farm jobs rather than join in O&M work activities. Even though farmers paid monetary compensation to the group for their absence, the water user groups have been confronted with a crisis due to a change in farmer attitudes. Farmer attempts to improve their living standards through off-farm economic activities create difficulties for maintaining viable water user groups, which basically require cooperative activities between farmers for O&M.

The transformation of the economy has led to the following problems:

- \* A first major problem is the increase in the number of part-time farmers, which consequently causes careless management of irrigation channels, discharges of water without regulating sluices and a decrease in the mowing of grasses or dredging. Moreover, the management of main channels pertaining to Land Improvement Districts, once compulsory, became contract work which brought about increases in management costs.
- \* A second problem with the increase in number of part-time farmers is that it makes the control of irrigation water by traditional means difficult. As a result, an imbalance in water use arises because most farmers work on holidays, which is the peak time in water demand. The districts are required to operate irrigation facilities in accordance with this new pattern of water needs. However, it is difficult for the district to distribute an adequate quantity of water to each farmer.

- \* The third problem is that, especially in suburban areas, many rice fields are transferred into residential areas. As a result, pollution of irrigation water has worsened and the dumping of waste has increased.

These problems have to be addressed if the irrigation systems in Japan are to be sustainable. Competition between the use of water for irrigation and its use for municipal and environmental purposes means that a new type of water user association is required. System improvements are indispensable in order to maintain irrigation water supplies as well as produce surplus supplies to be used to meet municipal and recreational demands. In turn, new water user associations that can address the needs of all water users will be required to efficiently manage the available water supplies (Mizutani 1992).

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Figure 1. Investments in land improvement in the Niigata Plan and the development of rice production.

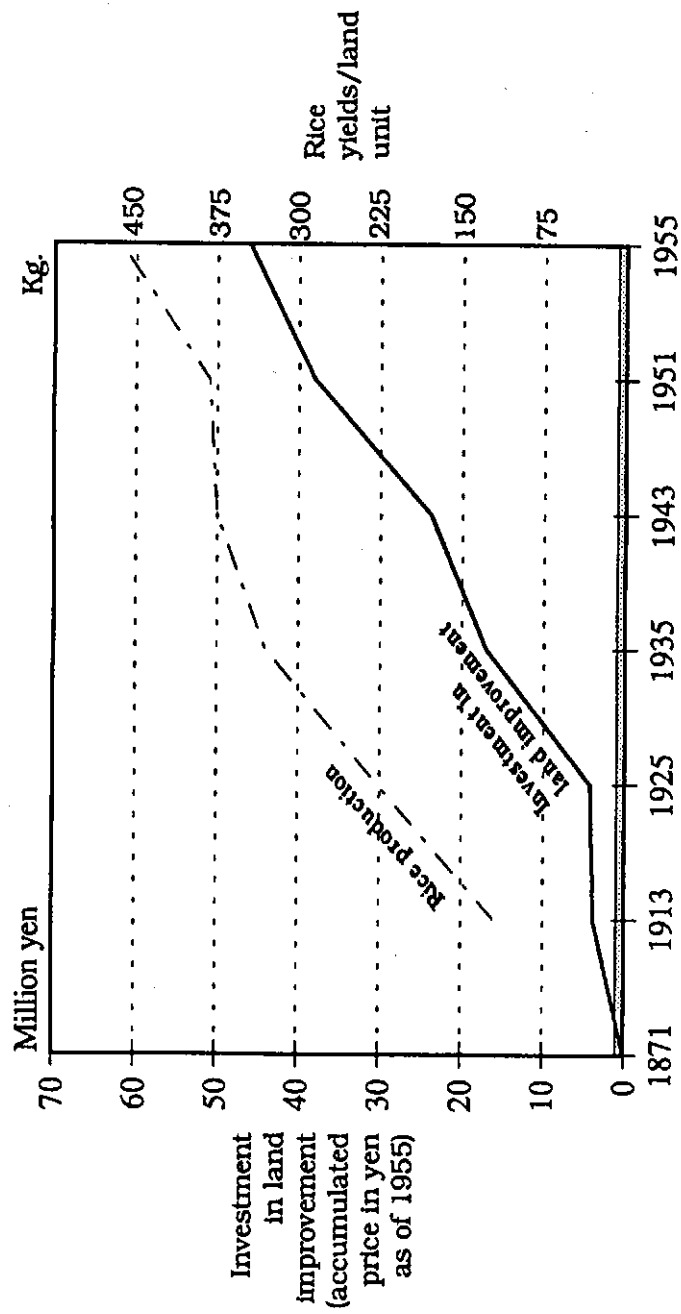
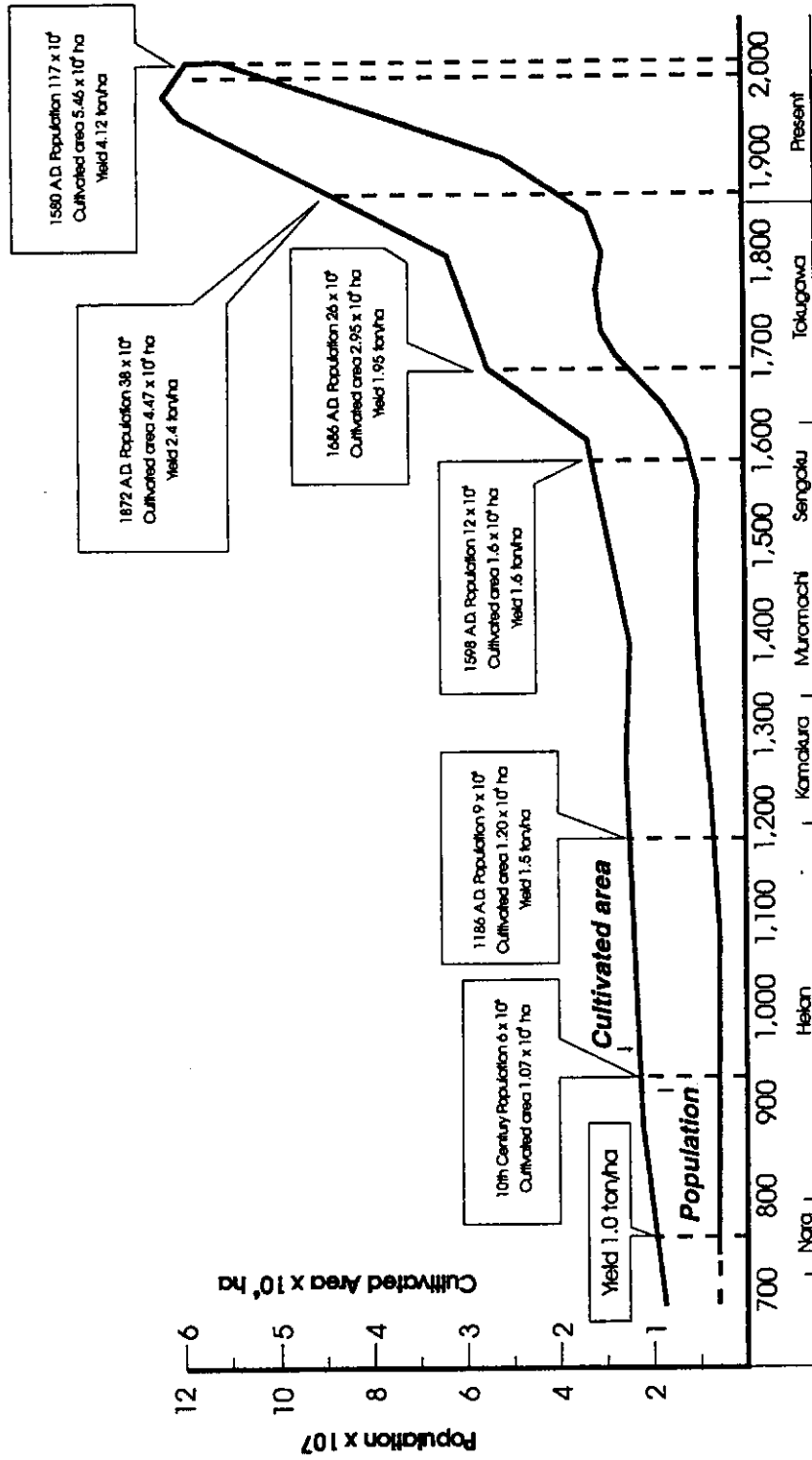


Figure 2. Population growth, cultivated area (ha) and rice production (ton/ha) in Japan, 700 A.D. to present.



Source: Japan National Committee on Irrigation and Drainage in, Mizutani (1992:46).

Table 1. Approval and subsidy system of Land Improvement Projects.

Project	The project body	General criteria of approval	Percentage of the charge (%)			The condition of loans/repayment of beneficiary's allocation		
			National Government	Local Prefecture	Farmers	Interest rate (%)	Repayment period	Limit of loans
Irrigation and drainage	Government	Service area: more than 3,000 ha	60 (58)	20 (21)	20 (21)	5.0	17 <2> yrs.	Less than 3 million yen or 80 percent of charges if more than 3 million yen
	Prefecture	Service area: more than 3,000 ha	45 50	27.5 25	27.5*25	6.5	25 <10>	
	Farmers	Service area: more than 3,000 ha	45	-	55	5.5	25 <10>	
Farmland development	Government	Service area: more than 3,000 ha	45	12.5 (13)	12.5 (13)	5.0	15 <3>	- ditto -
	Prefecture	Service area: more than 3,000 ha	75 (74)	17.5	17.5	6.5	25 <10>	
	Farmers	Service area: more than 3,000 ha	65	-	45	5.5	25 <10>	
Project without subsidy	General		-	-	100	4.5	25 <10>	- ditto -
	Reduction of interest	Irrigation/drainage. Land consolidation	-	-	100	3.5	25 <10>	

Table 2. Number of Land Improvement Districts in Japan, by size category, 1970 and 1989.

Year	Number of districts, by size (in hectares)							Total No. of Districts
	Under 100 ha	100 to 500 ha	500 to 1,000 ha	1,000 to 2,000 ha	2,000 to 5,000 ha	5,000 to 10,000 ha	Above 10,000 ha	
1970	6,729 57.6%	3,415 29.3%	860 7.4%	374 3.2%	212 1.8%	54 0.5%	20 0.2%	11,664 100%
1989	3922 47.7%	2,893 35.2%	726 8.8%	360 4.4%	253 3.1%	53 0.6%	17 0.2%	8,224 100%

Source: Survey on Land Improvement District, Ministry of Agriculture, Forestry and Fisheries, adopted from Mizutani (1992:48).