

IRRIGATION AND DRAINAGE IN JAPAN PICTORIAL

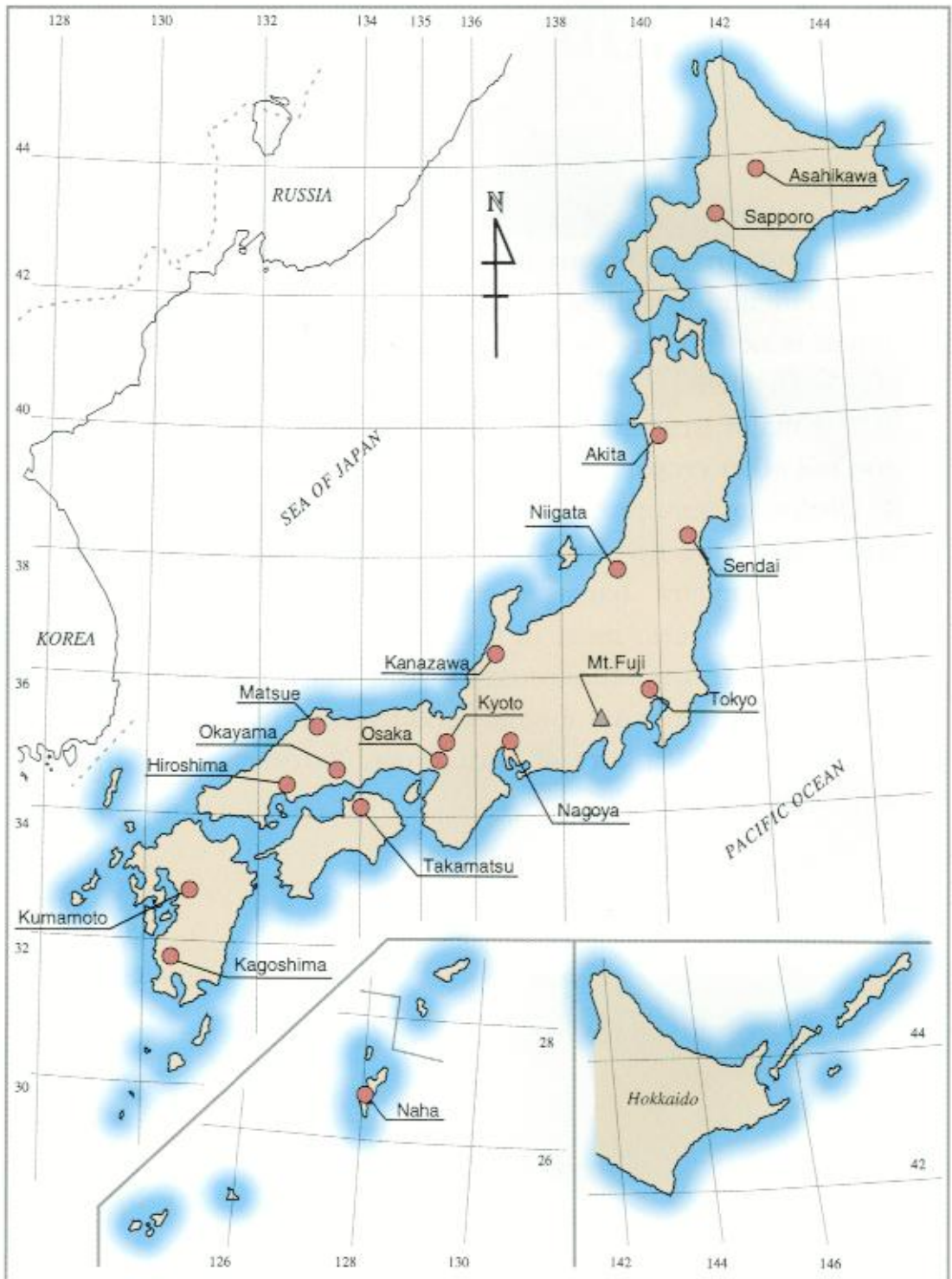
3rd
Edition

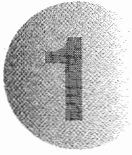


JAPANESE
SOCIETY OF
IRRIGATION,
DRAINAGE
AND
RECLAMATION
ENGINEERING



Map of Japan

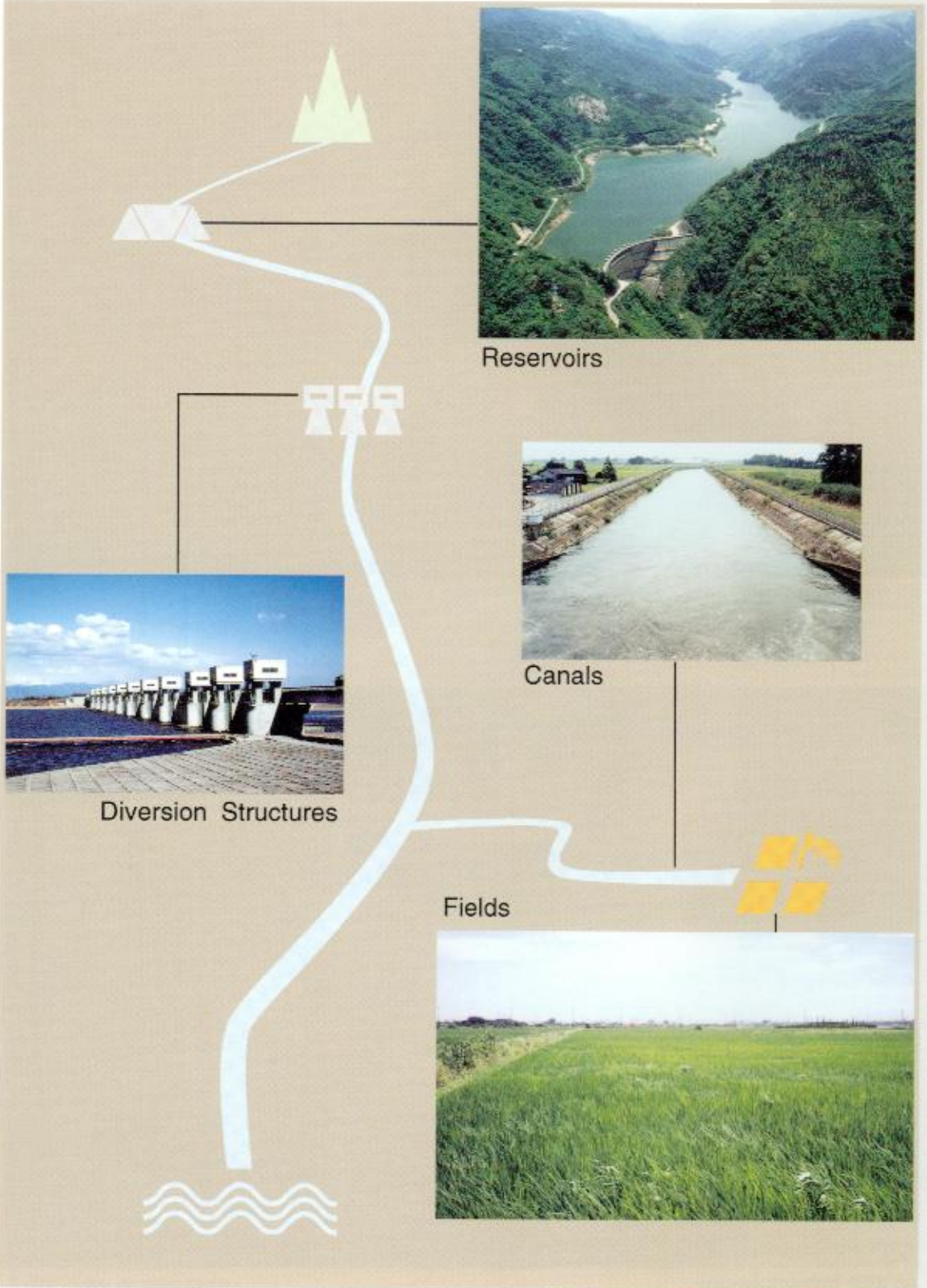




Irrigation

The characteristics of irrigation in Japan are as follows;

- 1) Irrigation in Japan is not "complete irrigation" but "supplemental irrigation". That is, the main irrigation season in Japan is not the dry season, but rather the rainy season from May to October.
- 2) The major irrigation crop has been, and still is , paddy rice, and not other crops.
- 3) Diversion requirements for paddy irrigation are enormous, and substantial investment is required for irrigation facilities such as reservoirs, barrages, and canals.
- 4) In recent years, most of the irrigation facilities have been scaled-up and mechatronized, and planning, design and construction works are mainly conducted and/or supervised by officials of the Ministry of Agriculture, Forestry and Fisheries with high rate subsidy.



Reservoirs



Canals



Diversion Structures



Fields



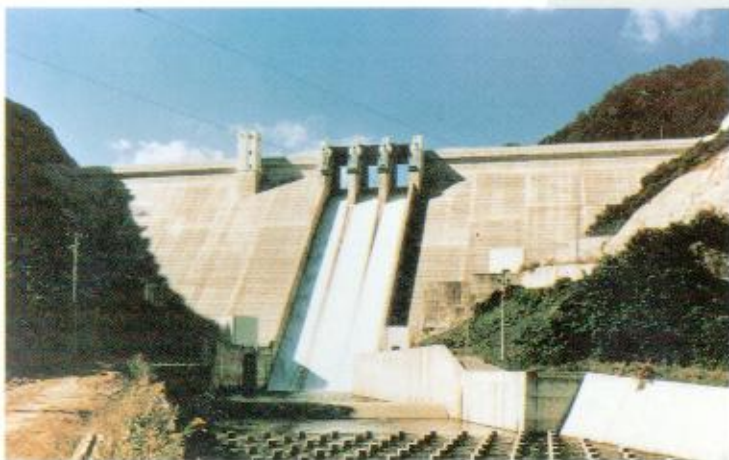


An arch dam

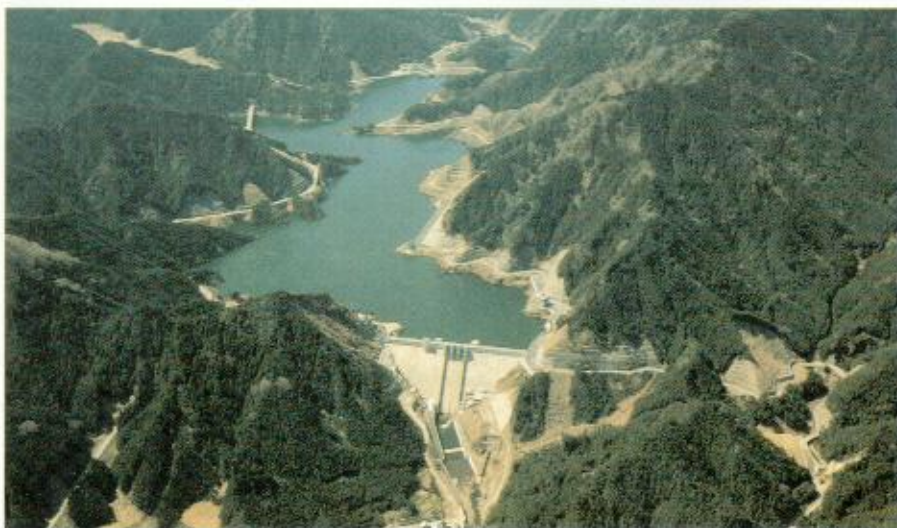
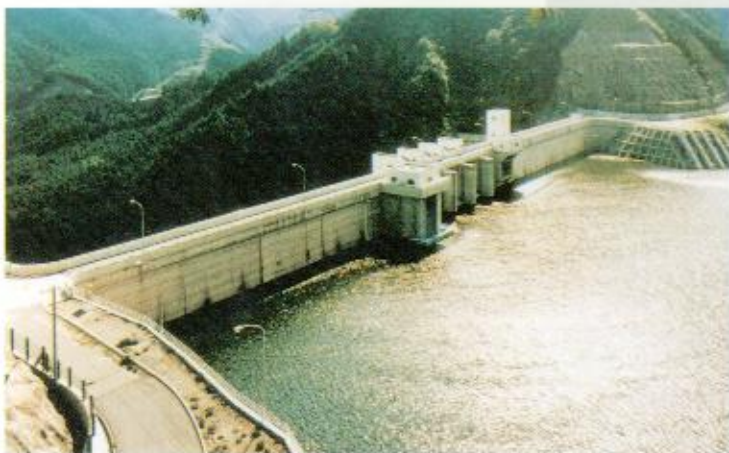


An arch dam(close-up)

A concrete gravity dam
(close-up)



A concrete gravity dam
(close-up)



A concrete gravity dam



A rock fill dam



A rock fill dam (close-up)



An earth dam



An earth dam (close-up)



A barrage



A diversion dam



A barrage



A barrage(close-up)



Tone Barrage, Saitama Prefecture

—The Largest barrage in Japan to date



Tone Barrage(close-up)



Tone Barrage



Its settling basin



Left : Canal spillway with gates Far right : Check gates



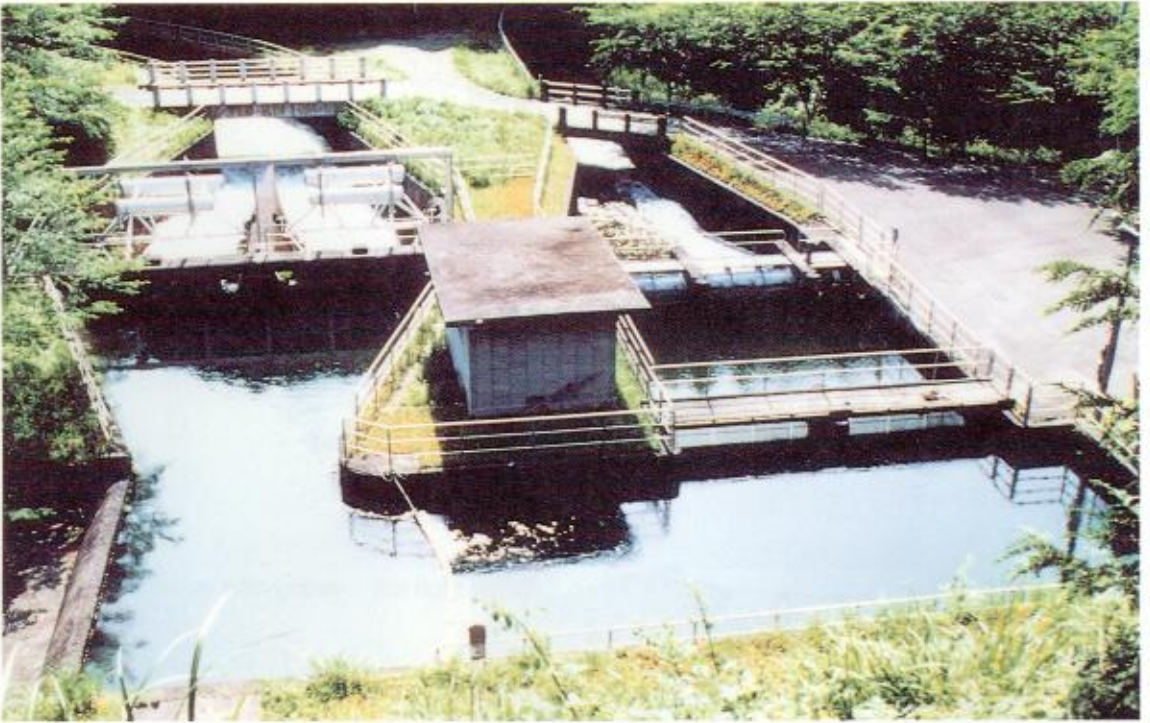
A Canal
Right : Division box
Top center : Check gates



A Canal
(close-up)

A canal and its equipments





Canal facilities for control



Canal facilities for control (close-up)

Division or distribution facilities
(close-up)



Division or distribution facilities
(close-up)



Division or distribution facilities

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Irrigation for non-paddy crops

In Japan, the irrigation rate of paddy fields has been, and is almost one hundred percent, but in contrast, the rate of non-paddy agricultural land was zero before the Second World War and is still only about ten percent.

Irrigation methods popular in many countries overseas, such as furrow irrigation, border irrigation, contour ditch irrigation and basin irrigation are seldom utilized, and instead, equipments such as that for sprinkling, trickling, and mist-spraying are commonly used. Pivot and lateral irrigation equipments popular in the USA, are not used in Japan.

Sprinklers set in mandarin orange groves are additionally to apply pesticide diluted with water.

The major irrigated crops are vegetables, flowers and fruits, which are sometimes grown in green houses.



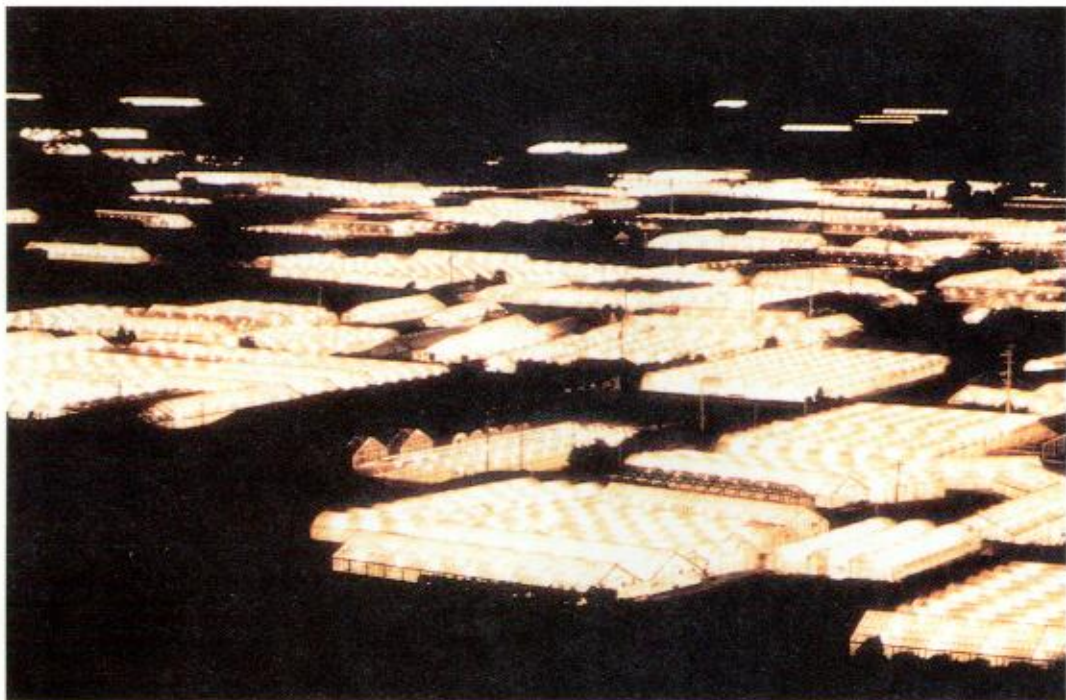
Greenhouse Irrigation equipments



Greenhouse irrigation equipment
(close-up)



Greenhouse Irrigation equipment
(close-up)



Greenhouse lighting



Spray equipment



Reel-type water sprayer



prinkler



High-pressure water sprayer

Drainage

Because Japan is located in the Far East in the Asian monsoon area, it experiences heavy rainfall caused by low-pressure fronts from June to July, and by typhoons from August to October. So low lying land and delta areas are often subjected to flooding and inundation in these months.

In Japan today the flood control of large river basins, and drainage in urban areas is managed by the Ministry of Construction, but flood drainage in rural areas, including agricultural land, is controlled by the Ministry of Agriculture, Forestry and Fisheries.

In Japan, there is much low lying land that extends to lower river basins. The Nishi-Kambara Plain in Niigata Prefecture is an example. A picture showing the somewhat primitive conditions of the former times is shown on page 21.

The other category of drainage in Japanese agriculture is subsurface drainage in paddy fields. "Subsurface drainage in paddy fields, which are often inundated" maybe sounds a little strange. However, even in paddy fields that are planted with wet rice, it is preferable in terms of labor efficiency and land productivity. Therefore, often during the conduction of a land consolidation project, drainpipes and their covering materials such as gravel and rice husks are laid under the paddy field soil surface simultaneously.



Prior to installation of surface drainage facilities



Pump station and drainage canals



Top center : Shinkawa pump station at the river mouth



Shinkawa pump station (close-up)



An inland drainage pump station



An inland drainage pump station(close-up)



A pump station (river side)

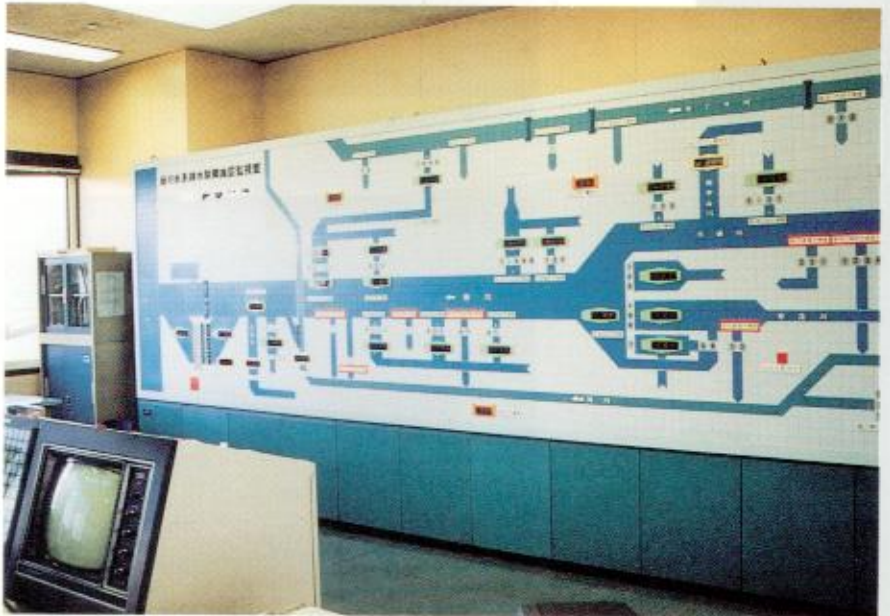


A pump station (inland side)

Inside a pump station



Pumps



Control room panel

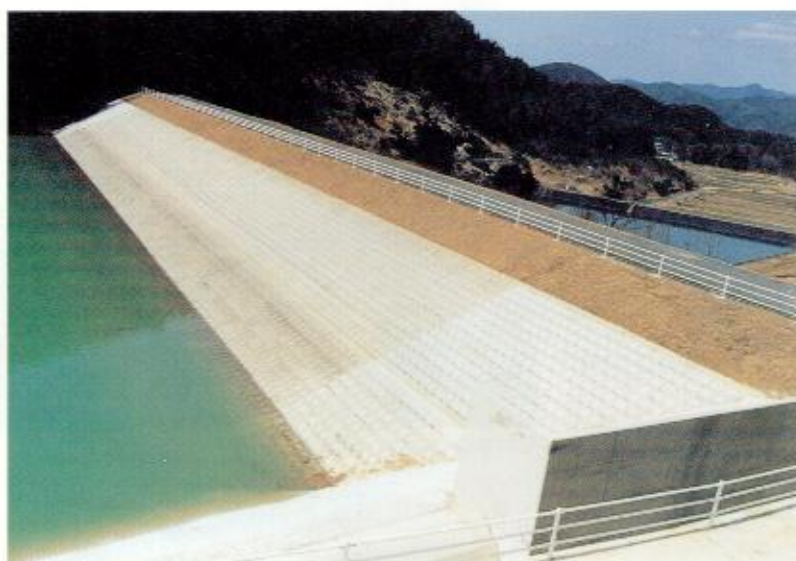
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Disaster Prevention and Repair

Embankment
repair



Before



After

Coastal repair



Before



After

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Land Reclamation

Our ancestors worked hard to reclaim the virgin land to develop paddy fields as much as possible. In recent years, reclamation of land for paddy was stopped due to surplus production of rice. However, reclamation of non-paddy agricultural land such as grassland, groves or orchards, fields still continues.



After completion

Reclamation process



Initial stages



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Land Consolidation

In order to improve the labor efficiency and increase land productivity of paddy fields, scattered, small nonsquare plots surrounded by levees, and not directly linked with farm roads or irrigation and drainage ditches, were consolidated into a new wider plot linked with farm roads and ditches. Sometimes subsurface drains were installed simultaneously in the project.

After the project is completed, each land owner gets a replacement in lieu of his former narrower scattered plots.

Following the Land Reform conducted after the Second World War, many land owners, who were also farmers, often had difficulty negotiating their differences.



1a Before

2a
Before



2b
After



1b After

Consolidation projects under construction





Consolidation projects under construction





A meeting of LID officials



An address by government and LID officials to participating farmers



Individual instruction by trained technicians



business discussion
between participating
farmers

Subsurface drainage works





Farmers on a farm road alongside a farm drain



Outlet of subsurface drain pipe



Irrigation faucet

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Land Improvement Districts (Water Users' Association)

After the Second World War, all the former farmers' irrigation associations and land consolidation associations changed their institutional structure and titles to the Land Improvement Districts in accordance with the law.

The major functions of this water users' organization are;

- 1) To propose projects to construct and/or repair or reconstruct irrigation and drainage facilities such as reservoirs, tanks, ponds, barrages, diversion dams, pump stations, canals and so on;
- 2) To conduct operation and maintenance works of major irrigation and drainage facilities in the effective areas without government subsidies. LID collects water charges in the form of association fees from member farmers on acreage basis for its O&M.



LID Headquarters



LID Headquarters (inside)



An LID general meeting



Registration desk



An LID officials meeting



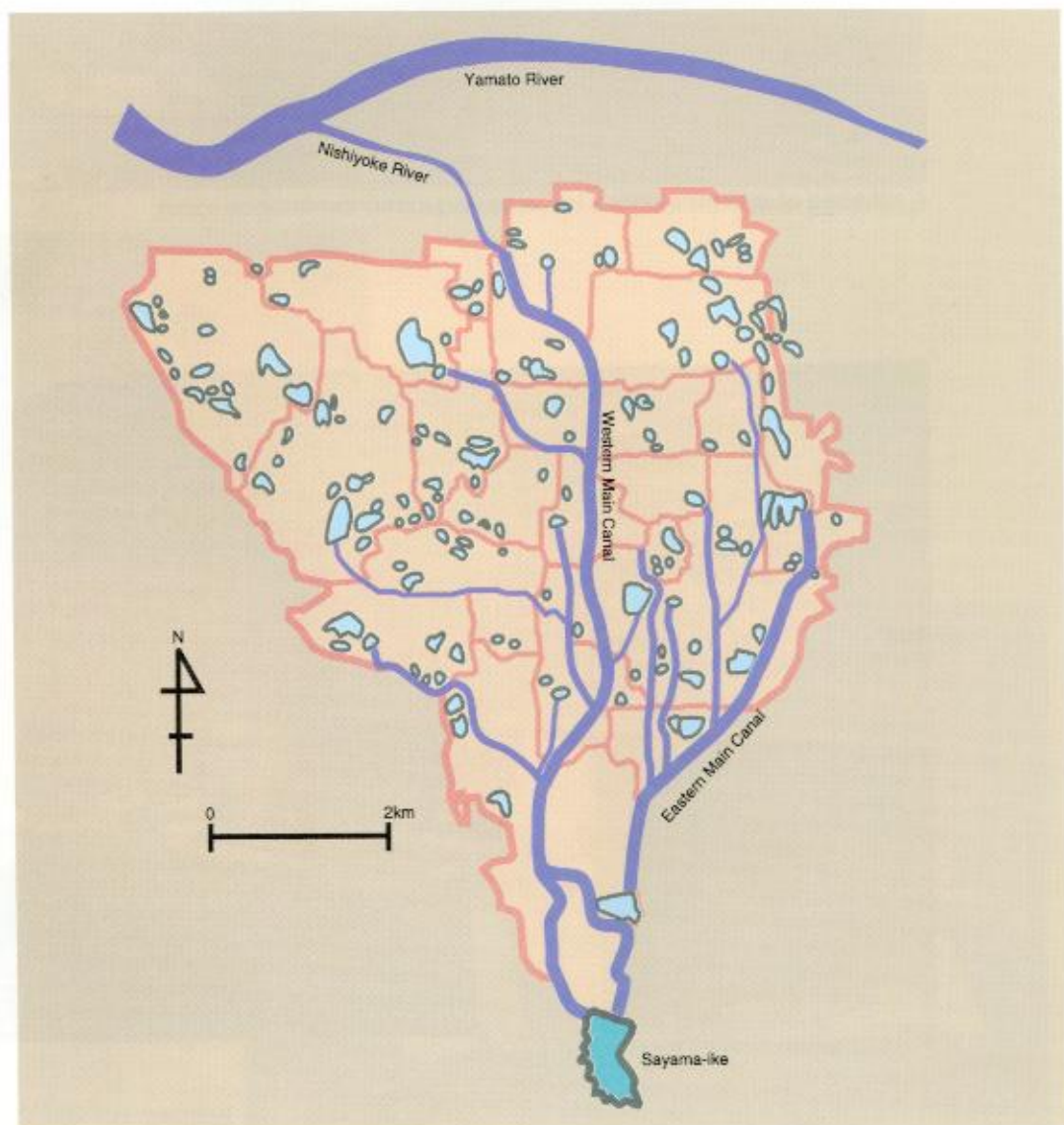
A meeting of overseas visitors in the headquarters conference room



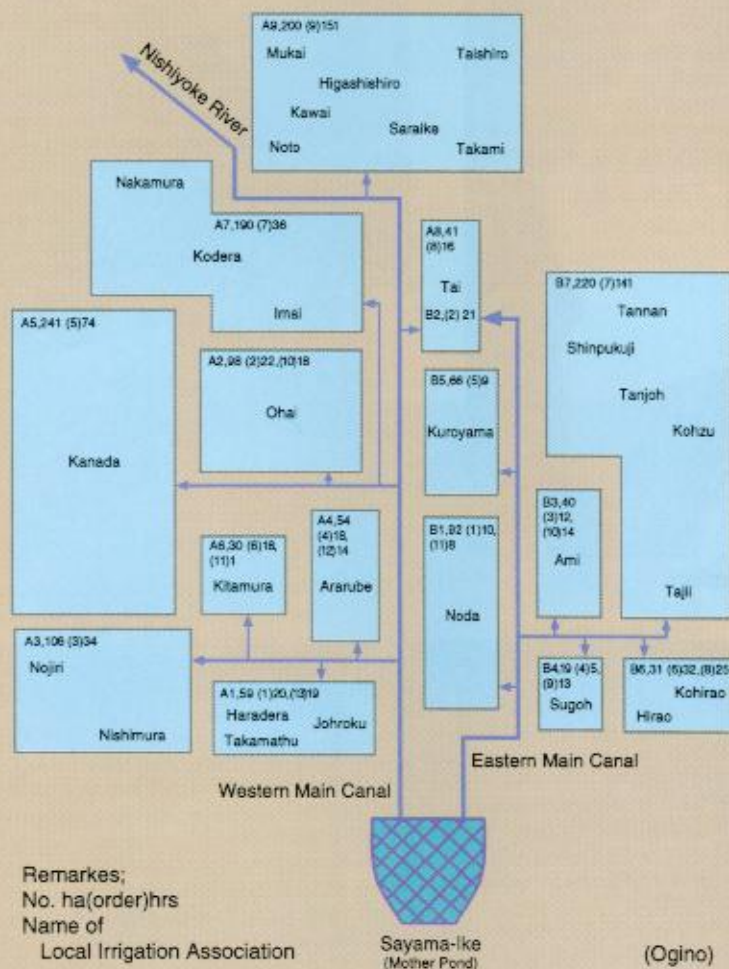
Headquarters control room

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On-farm water management



Japanese farmers and their organizations have been proficient in the O&M of irrigation systems. One of the most skillful and complicated system for irrigation by rotation blocks, is the Sayama-Ike irrigation scheme in Osaka Prefecture, which has many "daughter ponds" linked with a "mother pond (reservoir)", and features time scheduling of irrigation water distribution.



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Reclamation and Settlement

Ogata-mura in Akita Prefecture, is a typical case of sea-bottom reclamation and settlement.



Before reclamation



After



Embankment



Barrier dike



Irrigation canal



Drainage canal



Boating activities



A pump station



Transplanting of paddy rice seedlings



Harvesting



Sanctuary



Downtown



Akita Prefecture Agricultural College



Solar Car World Cup competition

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Landscape Architecture



Water Supply and Drainage



Water supply



Water supply



A flush toilet

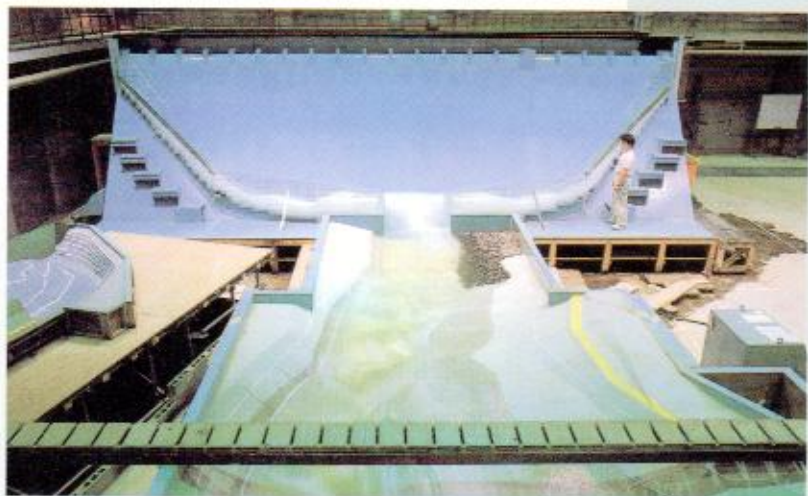


A sewage treatment plant

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National Research Institute of Agricultural Engineering





A spillway test model



Inside the wave generating tank



A sprinkler test