

**REPORTS FROM  
THE EIGHT COUNTRIES**

# MANAGEMENT OF IRRIGATION PROJECTS WITH FARMERS' PARTICIPATION IN JAPAN

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## I. INTRODUCTION

Not all irrigation projects are successful in their operation and maintenance. Many experts have pointed out that one of the major reasons for the failure may lie in the absence or underdevelopment of water user organizations or farmers' participation in water management. It is one of the worldwide topics in the field of irrigation (Vermilion 1997).

Construction or rehabilitation projects for irrigation facilities in Japan are conducted by public works sectors of central and local governments just like those in most of other countries. A special feature of the projects of Japan is that beneficiary farmers are deeply involved in the project process, and the completed facilities are totally transferred to the farmers from diversion dams in the source rivers to field ditches. The farmers are successfully managing them. They establish their irrigation associations, manage the systems, and collect fees from the member farmers, which cover all O&M costs.

This paper describes several aspects of the Japanese way of participation in comparison with the World Bank's idea on Participatory Irrigation Management (PIM), which is regarded as a standard idea on farmer participation.

## II. IRRIGATION BACKGROUND OF JAPAN

Japan is a long, narrow island country stretching from north to south. It has a total area of 37.8 million ha. Forest occupies 2/3 of its land (24.9 million ha). The agricultural land is 4.74 million ha (12.5% of the total area), of which rice

paddies occupy 2.59 million ha. The rest of the agricultural land is assigned to upland crops, orchard and pasture (as of 2003).

The total population of Japan was 126.8 million (49.8 million households) in 2003. The number of farming household is 2.98 millions (excluding subsistent ones) and the agricultural labor force is 2.59 million persons. More than half of the Japanese farmers are part-time farmers.

Japan has four seasons of spring, summer, autumn and winter. Due to low temperature during late autumn to early spring, rice can be grown only once in summer (from May to October), which has an average temperature of 22.2°C (in Tokyo). The temperatures during the rest of the year are lower than 15°C, which is the lower limit for growing rice plants. Therefore, Japanese farmers generally prefer to perform their puddling and transplanting during the best days. Otherwise, damage is more likely.

The average rainfall in Japan is about 1,800 mm per year, of which almost two thirds occurs during the irrigation season or monsoon season. However, due to the rainfall fluctuation during the irrigation season, the farmers suffer from dry spells that sometimes exceed one month and they rely mainly on river flow for paddy irrigation. Since rice was the most important and productive crop for the country in feudal times, the government at that time tried to develop paddy fields as much as possible. Eventually all the river flow during drought times became allocated to rice irrigation and water shortage leading to conflicts among farmers were inevitable. Thus Japanese farmers have a long history of struggle and compromise over water use.

Before World War II, 44% of the farmland was cultivated by tenant peasants and the rest (56%) by owner-farmers. In 1945-1946, the Japanese government instituted land reform; as a result, 91% of the land was in the hands of owner farmer in 1950. In 1949, the Land Improvement Law was enacted, under which both land consolidation associations and irrigation associations were reformed and renamed Land Improvement Districts (LIDs).

LID is established for an irrigation project and autonomously managed based on the Land Improvement Law. The members of LID are owner farmers and tenant farmers.

### **III. CONCEPTS OF PARTICIPATORY IRRIGATION MANAGEMENT (PIM)**

According to the World Bank, participatory irrigation management is “a process for improving the productivity and sustainability of irrigation systems,” and “Participatory Irrigation Management (PIM)” refers to the involvement of irrigation users in all aspects and all levels of irrigation management. “All aspects” includes the initial planning and design of new irrigation projects or improvements, as well as the construction, supervision, and financing, decision rules, operation, maintenance, monitoring and evaluation of the system.”

Although the outward objective of PIM is proper management of irrigation facilities, PIM requires participation in all levels of an irrigation project. This is because if the government constructs irrigation facilities and, after completion requests or orders farmers to manage them, it will be difficult for farmers to participate in the management. In addition, all levels refer to not only on-farm facilities but also major irrigation facilities, including large-scale weirs and main canals, so that farmers’ opinions on water management will be reflected throughout the project.

According to the World Bank’s description, farmers need to participate in all aspects and all levels. Although this description is important in that it shows the direction of PIM in an exceptionally comprehensive manner, some sort of concrete method for realizing it has still not been established even at the world level. Moreover,

because each actual project includes common basic aspects and the country or society’s own aspects, it is essential for each expert to consider and apply a method suitable for each district, based on various ways of thinking and the methods described in these guidelines.

With regard to definition of PIM, it is worth to list the aspects and canal levels of an irrigation and drainage project in terms of domains/stages and canal levels. An irrigation and drainage project can be divided into three domains of construction management and repair, each of which can be subdivided into several stages.

#### **Stages of construction domain**

##### 1) Initiation

(This is on whom first advocates the idea for the project to be executed. Especially for on-farm development, farmers may start the idea to solve present water problems or to introduce a new farming system by improving water conditions. On the other hand, a top-down method may be used to achieve a specific government policy. In both cases, of course, farmers and government staff need to jointly develop a basic idea for the project.)

##### 2) Planning

##### 3) Design

##### 4) Execution

#### **Stages of management domain**

1) Operation (further subdivided into decision, operation, monitoring and feedback)

2) Maintenance

3) Management of organization (further subdivided into organization and finance/accounting)

#### **Stages of repair domain**

1) Minor repair (things possible to repair by farmers’ labor and skill)

2) Major repair (disaster restoration that requires government support)

#### **Canal levels consist of the following:**

1) Farm ditch (which supplies water to each farm-plot)

2) Lateral canal (which connects farm ditches)

3) Main canal (which conveys water from the source and supplies it to lateral canals)

The combination of stages and canal levels will make Table 1.

Table 1 Irrigation project stages and canal levels

Project domain	Stage and area		Main canal	Lateral canal	On-farm system
Construction	Initiation				
	Planning				
	Design				
	Execution				
Management	Operation (Water management)	Decision			
		Operation			
		Monitoring			
		Feedback			
	Maintenance				
	Management	Organization			
Finance and accounting					
Repairs	Minor repair				
	Major repair and restoration from disaster				

#### IV. INVOLVEMENT OF FARMERS IN IRRIGATION DEVELOPMENT PROJECTS IN JAPAN

A rough sketch of the procedures in irrigation and drainage project formation in Japan is presented in Fig. 1. Based on the Land Improvement Law, there must be an application by farmers to start a new irrigation project or the government cannot begin the new project. Before making application to the government the LID must get written approval with seal from more than 2/3 of all beneficiary farmers or LID mem-

bers. To get the approval from the members, meetings are held in every *Mura* (traditional and informal village) to explain and discuss the new project.

Despite the formal criteria of 2/3, the government will not risk starting a new project unless more than 90% of the beneficiary farmers agree to the project plan; otherwise, many difficulties and inefficiencies will arise in the actual implementation. Therefore, the leaders of the farmers and the government engineers must design the project plan so that they can obtain approval from most of the beneficiaries. Once these conditions

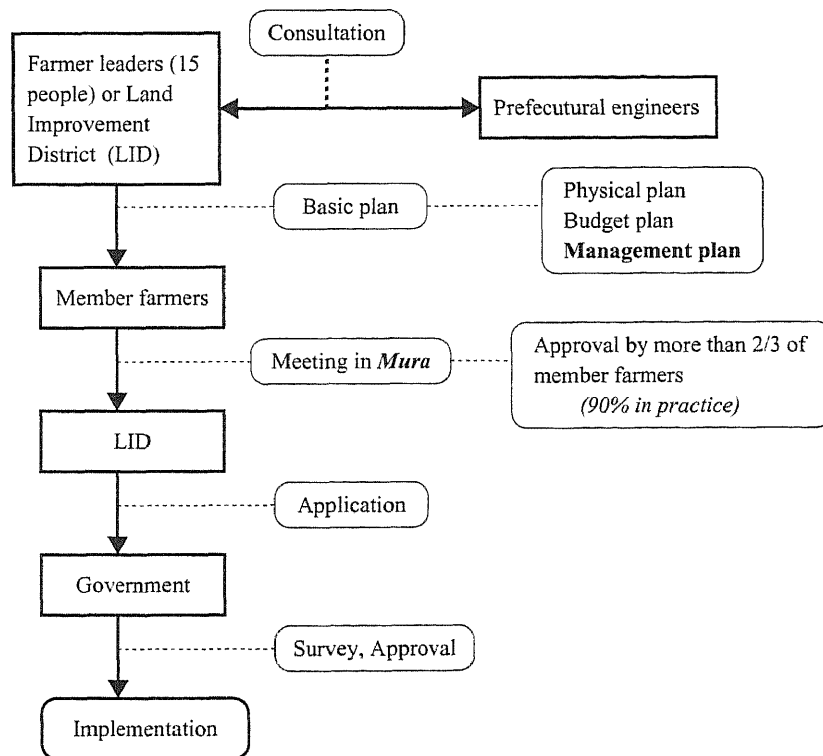


Fig.1 Procedure of Irrigation and Drainage Projects Formation in Japan.

are satisfied and the project starts, all beneficiary farmers must participate in the project and pay a portion of the project cost. The farmers also have to allow some percentage of their lands to be used for common facilities in case of land consolidation project. The government, of course, adopts and implements only such irrigation projects according to its policy.

In this way, farmers are deeply involved in irrigation projects undertaken by the governments. With this farmers' participation from the planning stage, the farmers have an opportunity to make the projects reflect their opinions through the procedure. Thus they get the ownership of the project.

## V. LID MANAGED SYSTEM OF IRRIGATION PROJECT

There are two types of irrigation management system in Japan. One is LID managed system and the other is joint manage system in Japan Water Agency (JWA) Projects. Most of irrigation projects constructed or rehabilitated by the governments are to be transferred to farmers' organization of LID after construction project is completed. Thus the LID manages all the irrigation facilities from diversion dam to on-farm systems in an autonomous manner. However, in case of large scale irrigation projects developed by JWA, constructed facilities are managed by JWA in their main parts, with LID management in the lateral canals and below. However, the number of such projects is limited. In this chapter LID managed irrigation system is described.

### 1. Typical layout of irrigation facilities

Irrigation systems in Japan typically consist of a diversion dam in the river, and main canals, lateral canals, tertiary canals, and field ditches. Drainage systems are also components. Most paddy fields in Japan have been consolidated in governmental land consolidation projects. The standard plot size of 0.3 ha (100 m × 30 m) was applied in these projects (Fig. 2); a broader paddy plot has been recently adopted as the standard size in order to raise the labor productivity by introducing bigger agricultural machines. All the consolidated plots in the projects are planned to have independent access both to the field ditches

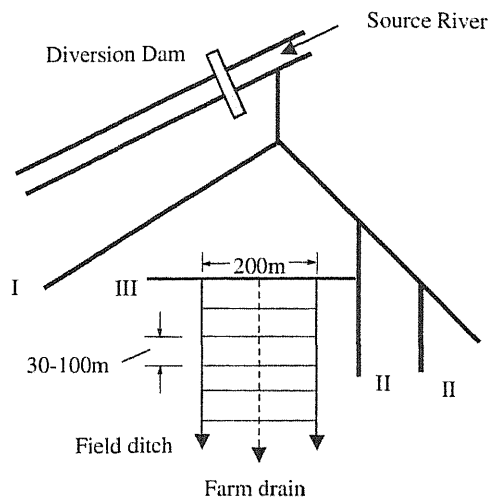


Fig.2 Standard Layout of Irrigation and Drainage System in Japan.

and field drains. Almost all irrigation canals at all levels are paved with concrete or made of concrete flumes.

### 2. Managing bodies

Irrigation facilities, including reservoirs for agricultural purposes constructed in irrigation projects, are mostly managed by the farmers or LID. Only the main facilities are managed by governments or a public corporation in a limited number of large-scale irrigation projects. A Land Improvement District (LID), an autonomous farmers' irrigation association, normally is responsible for operation and management of all irrigation and drainage facilities.

Although the LID is responsible for all the facilities, it operates only the main part of them, such as the reservoirs, diversion dams, and major facilities that deliver water to the main canals. The remaining parts of the system are operated and maintained by local traditional communities called *Muras*. If a lateral canal irrigates paddy fields in the territories of several *Muras*, the delegates from the relevant *Muras* establish a committee to operate and maintain their common canal (Fig. 3).

### 3. The Characteristics of a *Mura*

There are 47 prefectures (local governments) under the central government of Japan. Under a prefecture, there are cities, towns, and villages, which are the formal terminal units of the administrative system. A *Mura* is a traditional and

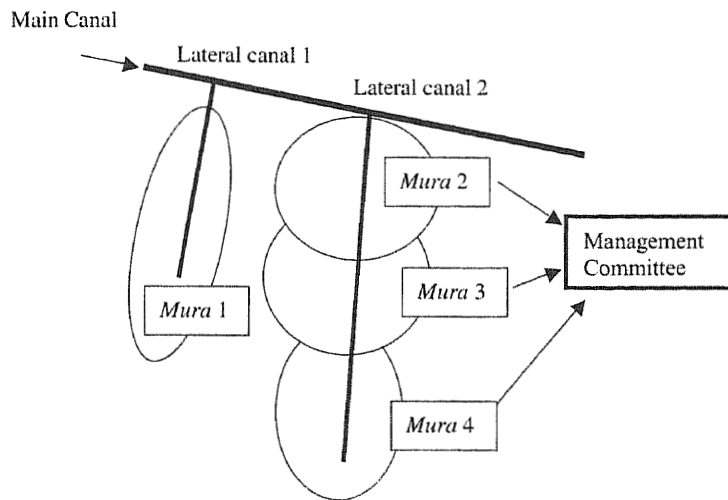


Fig. 3 Establishment of Management Committee for Common Lateral Canal.: *Mura* is a basic unit for irrigation management in Japan

informal sub-unit of the administrative villages (cities and towns). Thirty to fifty farming families and some non-farming families typically combine to form a rural community, a *Mura*.

The *Mura* has long functioned as a strong and firm unit of every social activity. It deals with every kind of cooperative work that is needed for life in the region, such as maintaining the canals, roads, and shrines in their territory, and arranging for traditional festivals and funeral ceremonies for the residents. Though it is not a formal administrative organization, it works like a branch of the village by helping the village in every respect, such as delivering printed matter and gathering information. An administrative village uses the

*Muras* and provides some allowance for these kinds of activities. LIDs do the same.

#### 4. Management of the Land Improvement District

The legislative organization of an LID is a meeting of representatives, who are elected by all member farmers with equal voting rights, one vote per member. According to the LID rules, the representatives elect the directors, and the board of directors chooses the president among them (Fig. 5).

Electoral districts are set based on regionally grouped *Muras* for the election of representatives. Therefore, elected representatives are delegates

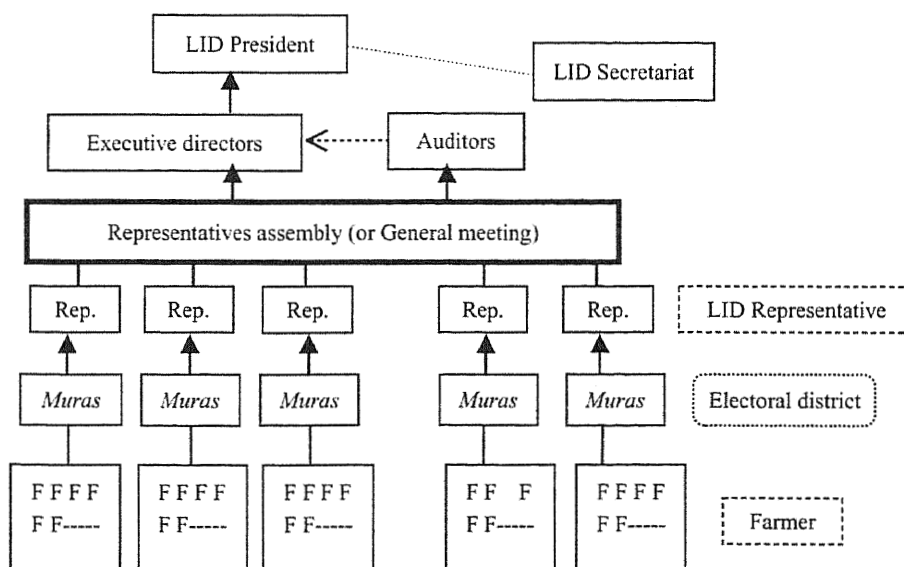


Fig. 5 Election System of a LID.

from the *Muras* and work for the benefit of the region. They not only attend the representative meetings, but also take care of irrigation facilities in their regions or negotiate with other representatives for water delivery.

Every important matter is discussed and decided in the representatives meeting, and all written material necessary for the discussion is presented at that time. Periodical leaflets describing the result of the decision and other important information are distributed to all members through the representatives and the *Mura* system. Thus, accountability and information disclosure are realized in LID management.

## VI. ROLE SHARING BETWEEN FARMERS AND GOVERNMENT-THE CASE OF TOYOGAWA PROJECT

The Toyogawa Project is a large scale irrigation project, which was developed by Water Resources Development Public Corporation (now called Japan Water Agency, JWA). The main facilities and lower levels of facilities are managed by JWA and LIDs, respectively. This chapter introduces how the farmers and government (public sector) share the roles in water management (Kono et al. 2007). The Toyogawa irrigation project is the irrigation sector of the Toyogawa Water Resources Developing Project in Japan.

### 1. Outline of the Toyogawa Project

The Toyogawa Water Resource Development Project, which was established in 1968, is one of the most successful modern water resources development projects in Japan. It is a multi-purpose project for the management of water for agricultural, industrial, and domestic use. In the agricultural sector, this project covers 18,000 ha of farmland (paddy: 6,500 ha, upland: 11,500 ha), extending over six cities and four towns in the central Japanese prefectures of Aichi and Shizuoka. This command area includes traditional paddy irrigation areas. This paper focuses on the new irrigation areas encompassing 16,000 ha (paddy: 5,000 ha, upland: 11,000 ha) in Aichi Prefecture. We call the study area “the Toyogawa area” hereafter.

The average temperature is 16.0°C and the average annual rainfall is about 2,100 mm/year. However, dry spells in the region sometimes extend to one month. Therefore, it is impossible for farmers to realize stable agricultural production without irrigation. The project has brought not only increased productivity but also remarkable crop diversification over the upland fields of the area. Irrigation has also promoted controlled and scheduled production, which agricultural markets in large cities prefer.

Figure 6 outlines the project’s water resources system. The major water source is the Toyo River (total catchment area: 724 km<sup>2</sup>), and

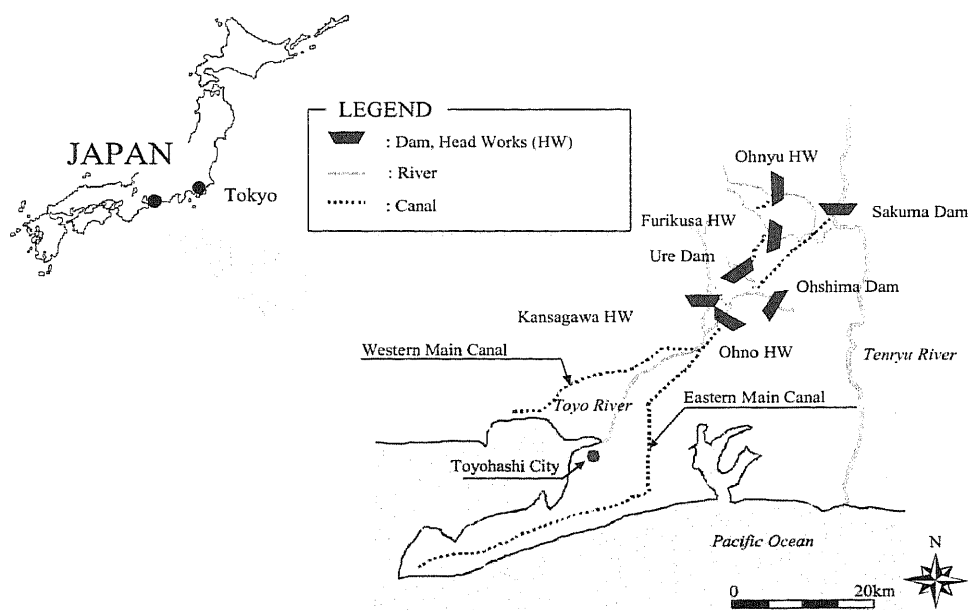


Fig. 6 Outline of the water resources system of the Toyogawa Irrigation Project

supplemental water comes from the adjacent Tenryu River basin (total catchment area: 5,090 km<sup>2</sup>). The irrigation system consists of the Ure reservoir (catchment area: 26 km<sup>2</sup>, live storage: 28 MCM) and the Ohshima reservoir (catchment area: 18 km<sup>2</sup>, live storage: 11 MCM) in the upstream of the Toyo River; the Ohno diversion dam (catchment area: 130 km<sup>2</sup>), seven regulating reservoirs (total live storage: 12 MCM), and a canal network, which includes 2 main canals, 163 lateral canals, 296 common-use farm ponds (FPs), and 2,700 km of distributaries. The irrigation water in the main and lateral canal system area is distributed by gravity, but it is applied mostly by sprinkling systems, which consist of FPs, pumps, and distribution pipelines.

**2. Organization for water management**

Five kinds of organizations are involved in the Toyogawa Irrigation Project (Kozuki 2000): (1) the Japan Water Agency (JWA), a public entity that managed the construction project; (2) Toyogawa LID, an autonomous irrigation association of farmers that is established for this project, having tree branch offices; (3) local LIDs, which are established based on administrative boundaries of cities or towns and which function as local water user associations; (4) Management Districts (MDs), which are established by beneficiary farmers of each FP, practically correspond-

ing to a traditional local community of *Mura*; (5) Management Groups (MGs), which are established by three to six farmers as rotational irrigation units in an MD.

Toyogawa LID and local LIDs employ a representative system following the articles of the Land Improvement Law. Representatives are elected from electoral districts by local farmers, each of whom has an equal vote. Every farmer in this project belongs to both types of LIDs (Figure 7).

**3. Demarcation in facility management**

These organizations demarcate their roles in water management according to the level of a facility, from main to on-farm. JWA manages the main parts of an irrigation facility: water resource systems (reservoirs, diversion dams, regulating reservoirs) and main canals. It is responsible for delivering water to lateral canals.

The Toyogawa LID manages lateral canals and sends water to FPs. Toyogawa LID staff patrol FPs to check on stored water daily, and they readjust allocation of water to lateral canals as needed.

Local LIDs, MDs, and MGs manage FPs and on-farm facilities in a group. MG leaders in a MD adjust water demand each other. The MD representative designated by local LID has a capacity to operate valves to send water from

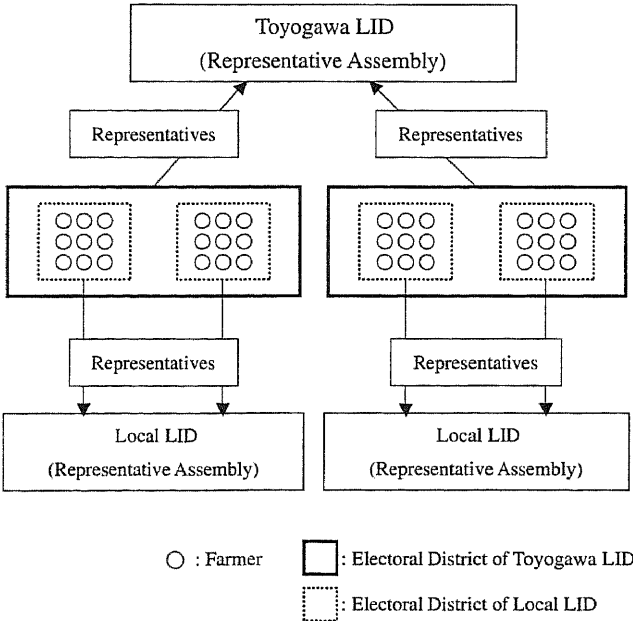


Fig. 7 The relationships between farmers to Toyogawa LID and Local LIDs



FPs. Only MD representatives have this authority; other farmers are not allowed to adjust water distribution. Local LIDs compile requests from MDs and request water from the Toyogawa LID according to necessity.

#### **4. Annual water distribution plan**

The representatives of local LIDs gather in the Toyogawa LID branch office every year to discuss and adjust the annual water demand. Toyogawa LID compiles these demands and submits them to JWA. JWA and Toyogawa LID then discuss the annual water allocation plan in consideration of applied demand and SDR. Upon approval by the president of the Toyogawa LID as well as by other water sectors, the annual water allocation plan is finalized. Thus, JWA doesn't decide the plan in a top-down manner.

Toyogawa LID employs a representative system and the directors are elected in a representative assembly, which selects the president. Therefore, the president's approval in the final stage of the process can be regarded as approval by all farmers in the hierarchical representative system.

#### **5. Measures against water shortage**

The Toyogawa project area has been experiencing water shortages rather often: 28 times in the past 38 years. JWA has established the Water Saving Committee (WSC) to discuss and decide measures against water shortage. The main discussion in the committee is to what extent water saving ratios should be applied to the different water sectors and when their application should be started or changed (intensified or loosened).

The WSC consists of 14 people. Two of them are the staff of JWA, and others are representatives of related organizations: Seven people are from four related LIDs, and the remaining five are from two prefectural governments representing the water supply sector, the industrial water sector, and some other farmers in Shizuoka Prefecture. Thus the representatives cover all beneficiaries in the project. WSC is chaired by one of the staff members of JWA. The secretariat of JWA compiles records of river discharge, water storage in the reservoirs, expected future water demand, meteorological forecasting, etc., and presents all the data necessary for discussion to the

committee. The secretariat also proposes measures against shortages to the WSC if required.

In case a water conservation operation is performed, especially when the ratio is very high, the local LIDs supplement the water supply by operating wells that have been developed for emergencies. The distribution of the wells is not uniform over the command area; some lateral systems include many wells, while others contain few or no wells. Therefore, a local LID will adjust the water allocation to lateral canals from the Toyogawa irrigation system so that all members of the local LID receive an equitable amount of water. This shows that local LIDs have developed a sense of unity among them. The lower-level farmers' organizations, MD and MG, have the same quality.

#### **6. Discussion**

Special attention should go to the fact that decision-making power in irrigation management is practically given to the farmers at all levels. Water management plans are decided in meetings attended by all delegates from different interest groups, and JWA merely guides and supports the discussion by providing scientific and technical information. On the other hand, water allocation operations are performed by JWA staff to strictly implement what has been decided in the meeting. As a result, JWA can realize equitable water sharing, stability in water use, and high irrigation efficiency. It suggests that the government realizes its goals in water management with minimal effort.

The main points for the successful water management of the Toyogawa Irrigation Project are (1) participation of farmers in the decision process at all levels, (2) farmer organizations for the project that give every farmer the opportunity to express his opinion, (3) role sharing between farmers and government based not only on canal level but on four functions.

### **VII. CONCLUSIONS**

1) Japanese farmers are totally responsible for operating and maintaining their irrigation systems, especially in traditional systems. They establish an LID for this purpose, based on the Land Improvement Law. They manage LID in an autonomous way, based on a representative

election system.

- 2) The government is not allowed to start an irrigation project without application by farmers, in which most of them need to agree to the plan. This application system make farmers participate in the project from the initiation to water management stages.
- 3) Under this system government engineers try to plan the project so that even the downstream farmers are willing to join the project.
- 4) In case of JWA project, role sharing between JWA and water users is introduced for water management; main facilities for JWA and lateral and on-farm facilities for LIDs. However, decision making power is practically owned by water users, while JWA provides information and guidance for the discussion and decision.
- 5) The government prepares the Land Improvement Law assuring the capacity of LID, and has a policy to promote cooperative activities of farmers through granting subsidies only to the projects for which the most of farmers can cooperate.
- 6) With this system, Japanese irrigation management can achieve PIM “in all aspects and all levels”, as the World Bank suggests.
- 7) Giving decision making power to beneficiary farmers is essential to make them participate in water management and maintain irrigation facilities in a sustainable manner.
- 8) Government and farmers should have a joint water management with proper role sharing in the four functions of decision, operation, monitoring and feedback.
- 9) The governments need to know they can thus achieve the target of irrigation management in an efficient way.
- 10) Education of both government staff and farmers are necessary to develop a common understanding of water resources management

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## JAPAN: DISCUSSION

**Question:** You have excellent infrastructures and managing system for irrigation and drainage through LID and JWA. Are there no more new projects for irrigation and drainage under the LID and JWA? What is the future of the irrigation engineers in terms of attractiveness of the job?

**Answer:** Now we have very few reclamation projects for which new LID must be established. New irrigation developments are few but rehabilitation projects are necessary and actually being done. When they are done functions are improved to meet the new situation of less labor, urbanization and so on.

**Question:** Can you explain how farmers mobilize resources to maintain the irrigation systems?

**Answer:** An LID allocates some distance of canals among the Muras, and Mura farmer members gather to clean the canals. Some allowances

are paid because all the canals are under the responsibility of the LID. However the amount of money being paid is just minimal, which sometimes is spent on beverage or for drinking spree after the cleaning activities are completed.