

# Success Factors of Participatory Irrigation Management in Japan: Case of the Kako Land Improvement District in Toban-Yosui Land Improvement District (1)

Ieko Kakuta

*Faculty of International Relations, Asia University, Tokyo, Japan*

## Abstract

Since the early 1990s, many irrigation schemes in developing countries have applied participatory irrigation management (PIM), which requires the involvement of beneficiary farmer groups, i.e. the Water Users Association (WUA), for the operation, maintenance, and management of the system. However, the performance of WUA and PIM has generally been poor. Meanwhile, the WUA in Japan, called the Land Improvement District (LID), can be considered a successful case worldwide. This case study examines the success factors of the Kako LID in the Toban-Yosui LID in Japan, using six evaluation indicators, derived from theories of common-pool resources management, proposed by Freeman. The assessment shows that Kako LID has irrigation management systems that are most suitable to the theories of Freeman, especially, the distributional share system. In Kako LID, although the irrigation service fee is fixed per hectare, given that there is no water shortage downstream, the district has achieved equal water distribution. As such, a member's share of cost is proportionate to his/her share of water in Kako LID. Moreover, in Kako LID, 12 hamlets in the village of Kako have served as units and fulfilled important functions,

such as maintaining reservoirs and drainage canals, since the introduction of the irrigation scheme in the Edo period, about 350 years ago. The local community called “Jichikai” (a residents’ association) has been supporting the management of Kako LID for generations. However, recently, it has become increasingly difficult to find successors to “Jichikai” among the younger generation. There is a risk that the management foundation of Kako LID may become weak in the future.

## I. Introduction

Many irrigation schemes in developing countries could not achieve expected targets in the operation and maintenance (OM) stage. Due to the deteriorating conditions of irrigation facilities, the idea of participatory irrigation management (PIM), which requires the involvement of farmers in the operation, maintenance, and management of the irrigation system was widely applied since the early 1990s (Ishii and Sato 2003; Sato and Sato 2006; Kulkarni and Tyagi 2012). In PIM, the beneficiary farmers are required to form a group called the Water Users Association (WUA) to manage the irrigation scheme. In conjunction with PIM, World Bank has been promoting irrigation management transfer (IMT) (Hatcho and Tsutsui 1998). The most common form of IMT involves the shifting of irrigation management responsibility from a centralized government irrigation agency to WUA (Svendsen et al. 1997). However, the performance of PIM, WUA, and IMT has been generally poor. It is said that the creation of WUA is not easy, and that the established WUAs cannot function well, or there is a gradual decline in the Irrigation Service Fee (ISF) collection rate (Ishii and Sato 2003; Kakuta 2015). There have been widespread reports of the illegal gates operation and destruction, and insufficient communal work

for canal maintenance that lead to an unequal water distribution, a decline in the irrigation efficiency, and the deterioration of irrigation facilities (Sato et al. 2007).

Meanwhile, the WUA in Japan called the Land Improvement District (LID) is considered a successful case worldwide. Why is LID successful? This study examines the factors behind the successful management of LID, based on a case study of the Kako Land Improvement District (hereafter referred to as Kako LID) in Toban-Yosui LID in Japan, using six evaluation indicators derived from theories of common-pool resources (CPR) management, proposed by Freeman (1989, 1992).

The rest of this paper is organized as follows. First, the analytical framework and methodology of the study are presented. Second, the irrigation system and the WUA are described. Third, the performance of the irrigation system is evaluated. Finally, the reasons for the successful management of the system are considered.

## II. Analytical Framework and Methodology

### I) Theories of CPR Management

An appropriate analytical framework is necessary to evaluate the irrigation system management. Since the irrigation water and the system that delivers the water to beneficiary farmers are considered to be CPRs, which are commonly managed by the local community, the author introduces Ostrom's (1990) design principles of long-enduring CPRs and Freeman's (1989, 1992) distributional share system model to assess performance. In light of limited space, the author first applies Freeman's model in this paper, and Ostrom's model in the next paper.

According to Ostrom (1990), although there are differences among CPR settings, long-enduring and self-governing CPR institutions (e.g., irrigation systems, community forests, common pastures) share eight design principles (see Table 1). Ostrom was awarded a Nobel Prize in economics in 2009 for her research on CPR management. If a CPR institution does not share these eight design principles, it cannot avoid free riders who break rules and appropriate resources without fulfilling their obligations as members of the institution. This results in the deterioration and dysfunction of the CPR institution, finally leading to the depletion and destruction of the managed resources. In an irrigation system, this causes a deterioration of irrigation facilities and water shortage at the tail end, and consequently, the irrigation project fails. Avoiding free riders is the key to managing CPRs in a sustainable manner (Ostrom 1990)<sup>1</sup>.

Table 1. Ostrom’s design principles illustrated by long-enduring common-pool resources (CPR) institutions

1	Clearly defined boundaries: Individuals or households who have rights to withdraw resource units from the CPR must be clearly defined, as must the boundaries of the CPR itself.
2	Congruence between appropriation and provision rules and local conditions: Appropriation rules restricting time, place, technology, and/or quantity of resource units are related to local conditions and to provision rules requiring labor, material, and/or money.
3	Collective-choice arrangements: Most individuals affected by the operational rules can participate in modifying the operational rules.
4	Monitoring: Monitors, who actively audit CPR conditions and appropriator behavior, are accountable to the appropriators or are the appropriators.

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<sup>1</sup> For a detailed explanation of the eight design principles of long-enduring CPR institutions, see Ostrom (1990: 88-102).

5	Graduated sanctions: Appropriators who violate operational rules are likely to be assessed graduated sanctions (depending on the seriousness and context of the offense) by other appropriators, by officials accountable to these appropriators, or by both.
6	Conflict-resolution mechanisms: Appropriators and their officials have rapid access to low-cost local arenas to resolve conflicts among appropriators or between appropriators and officials.
7	Minimal recognition of rights to organize: The rights of appropriators to devise their own institutions are not challenged by external governmental authorities.
8	(For CPRs that are parts of larger systems) Nested enterprises: Appropriation, provision, monitoring, enforcement, conflict resolution, and governance activities are organized in multiple layers of nested enterprises.

Source: Ostrom (1990:90)

Meanwhile, Freeman's distributional share system model has been formulated to apply to irrigation systems and the WUAs. However, its conceptual model is equivalent to Ostrom's design principles. Freeman (1989, 1992) presents six essential characteristics of an effective WUA (see Table 2).

Table 2. Freeman's six essential characteristics of an effective WUA

1	Leaders of the local organization should not be cosmopolitan outsiders but irrigators representing the various reaches of the local canal system.
2	Leadership and staff of the local organization are responsible to local members.
3	Water delivery is dependent on the fulfillment of organizational obligations (i.e., distributional share system).
4	The water share system should remove head and tail distinctions in service queues (i.e., distributional share system).
5	Water resource control of members is high.
6	Propensity of members to support the local organization is high.

Source: Freeman (1989:25), amended by the author based on Lepper (2007:50) and Freeman (2009)

Freeman (1989) states that a sense of fairness must be shared among WUA members in order to manage an irrigation system sustainably in the long run. Hence, the six characteristics mentioned in Table 2, especially a distributional share system (the third and fourth characteristics) should be introduced into the WUA management. A distributional share system has three aspects: (1) share of water, (2) share of cost, and (3) share of vote (Freeman 1992). According to Freeman, there are three conditions to make the WUA successful. First, each member's share of water should be equivalent to his/her share of cost; that is, the amount of water received by each member is roughly proportionate to the share of system costs paid by each member (Freeman 1992). A WUA should have a rule that if a member receives more benefits (e.g., water in a timely manner) than other members, he/she must pay more management costs (e.g., via an irrigation service fee, labor, materials, etc.). If a member receives less water than others, his/her management costs should be less (Freeman 2009). Second, a WUA should remove head and tail distinctions in the service queue, which ensures that it provides the same volume of water per unit area in the command area of the irrigation system. Third, conflicts in a WUA are resolved based on each member's share of vote: If a member's share of cost is larger, his/her share of vote in the WUA will also be larger (Freeman 1992)<sup>2</sup>.

Case studies have been conducted on successful irrigation systems that have distributional share systems, and Freeman's (1989, 1992) essential characteristics of effective WUAs (Freeman 1992; Maass and Anderson 1978; Martin and Yoder 1988, Siy 1982, Kakuta 2017).

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<sup>2</sup> For a detailed explanation of Freeman's six essential characteristics of an effective WUA, see Kakuta (2017).

## 2) Research Method

The author uses field data gathered over five days in February 2017 from surveys of various stakeholders involved in Kako LID in the Toban-Yosui LID<sup>3</sup>. The survey was conducted using the Rapid Rural Appraisal, especially semi-structured interviews, based on anthropological research methods. The interviews included questions about the respondents' activities in the WUA, farm and social settings, as well as their social relations. The survey respondents consisted of seven officials of Kako LID, a beneficiary farmer from Kako LID, a staff member of the Kako LID office, and an official of the Toban-Yosui LID.

The field data were qualitative rather than quantitative, since they were basically collected through semi-structured interviews. Hence, the performance of Kako LID is evaluated by the interpretation of those qualitative field data.

## III. Description of Kako LID

### 1) Description of the Toban-Yosui LID

The Toban-Yosui LID is located in the Hyogo Prefecture of Japan, and irrigated 7,403.6 hectares in 2012, covering the cities of Kobe, Akashi, Kakogawa, Miki, and the town of Inami. The number of beneficiary farmers were 12,534 in 2012. In this region, the annual rainfall totals about 1,300 mm, with the deficit attributed to the Seto Inland Sea maritime climate. Hence, the farmers continue to face chronic water shortage, although they have constructed more than 7,000 reservoirs for their irrigation water

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<sup>3</sup> The data and information presented in this article that do not indicate the original source are collected from the author's field survey.

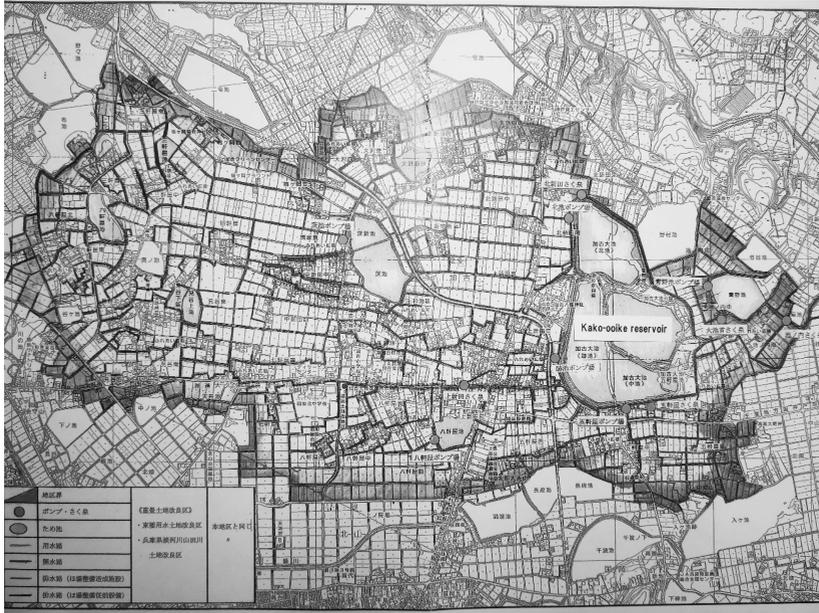
sources in this area.

The Japanese government decided to construct the Toban-Yosui National Agricultural Irrigation Project to address the water shortage, to provide irrigation water for existing rice fields, and to develop new fields for vegetable farming. The construction work started in 1970, and the project was completed in 1993. To secure enough water sources and to solve the chronic water shortage, the government constructed three new dams, namely, the Kawashiro Dam (1.3 million m<sup>3</sup>), the Ohkawase Dam (8.2 million m<sup>3</sup>), and the Dondo Dam (17.8 million m<sup>3</sup>), as well as new canals which connect the new dams with the existing irrigation schemes in the area. Through these facilities, the Toban-Yosui LID provides irrigation water to about 500 existing reservoirs in this area (Toban-Yosui Land Improvement District 2013). It is considered to be one of the best irrigation systems in Japan, which could attain a 99.1% collection rate of ISF (“Fukakin” in Japanese) in 2013 (Toban-Yosui Land Improvement District 2014).

## 2) Description of Kako LID

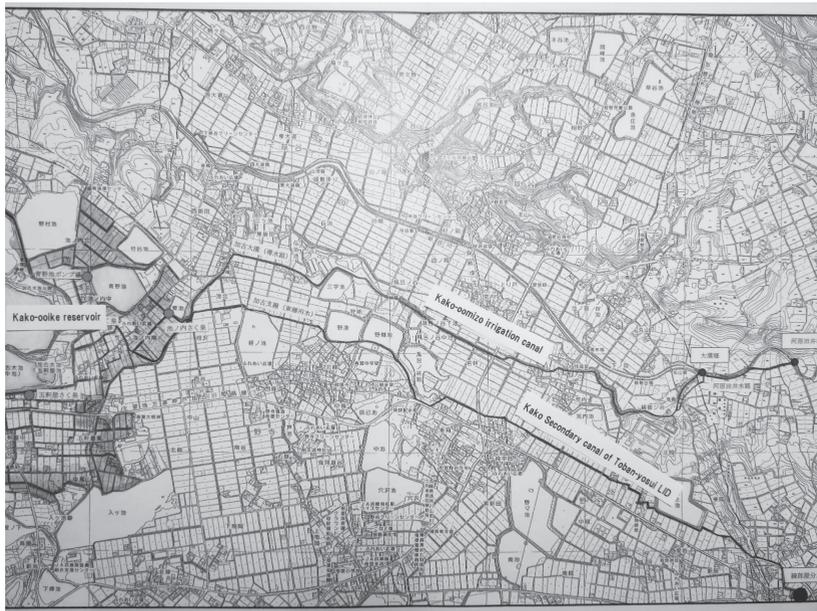
Kako LID is one of the irrigation schemes that receives water from the Toban-Yosui LID. It is considered to be a successful LID, which always pays 100% of ISF to the Toban-Yosui LID (see Figure 1 and 2).

Figure 1: Kako-ooike reservoir and irrigation area of Kako LID



Source: Kako Land Improvement District, 2017

Figure 2: Kako-ooike reservoir and Kako Secondary canal of Toban-Yosui LID



Source: Kako Land Improvement District, 2017

It is located in the village of Kako, the town of Inami, Kako district, Hyogo Prefecture (Kako Land Improvement District 2016). The topography of the area is called the Inamino plateau (Matsumoto 2016). The annual rainfall in the area is deficient at around 1,200 mm. In addition, there is no river which can be used as a water source for irrigation purposes. Therefore, the farmers in this area have been suffering from severe water shortage for a long time (Kako Land Improvement District 2016).

The irrigation facilities of Kako LID consists of the Kako-ooike reservoir which is the biggest reservoir in Hyogo Prefecture; the other new reservoirs are Ibara-ike, Sankenya-ike, Yonkenya-ike, Rokkenya-

ike, Sichikenya-ike, and Hachikenya-ike (Matsumoto 2016). There are also irrigation canals (90% of them are underground pipelines) and drainage canals. The Toban-Yosui LID provides irrigation water to Kako-ooike reservoir. The irrigated area is about 300 hectares and the average area per household is 0.36 hectare. The number of beneficiaries were 831 in 2016 (Kako Land Improvement District 2016).

Kako LID consists of 12 hamlets in the village called “Chiku” in Japanese (see Table 3 and Figure 3). The residents of each hamlet belong to the local community called “Jichikai” (a residents’ association). In Jichikai, there are neighborhood associations called “Rinpo.” Each Jichikai serves as a subordinate organization of the Inami Town Office, organizing communal work such as cleaning of local roads, reservoirs, and drainage canals, disseminating information from the Town Office, conducting regular meetings of residents, hosting traditional festivals (“Matsuri”), etc. (See Figure 4). Most of the Jichikais in the village of Kako are strong and active enough to participate in many of these local activities.

Table 3. 12 Hamlets in Kako LID

No	Name of the hamlet	Notes
1	Gokenya	
2	Ikenouchi	
3	Kitashinden	
4	Osawa	
5	Kamishinden	The oldest hamlet at the new rice field development in 1661. The three descendant families of the three Tobyakusho (Head Farmers) are quite influential in the hamlet.
6	Chiwaike	The second oldest hamlet. There are many local celebrities.

7	Nakashinden	The third oldest hamlet. Residents include many local celebrities.
8	Sanyonkenya	
9	Rokkenya	
10	Kentani	
11	Sichikenya	
12	Hachikenya	

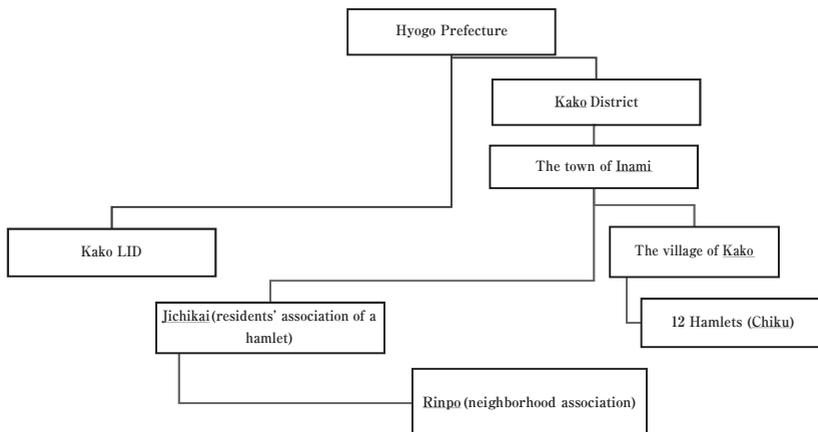
Source: Author's survey, 2017

Figure 3: 12 Hamlets in Kako LID



Source: Kako Land Improvement District, 2017

Figure 4: Administrative structure related to Kako LID



Source: Author's survey, 2017

Kako LID has a very long history. It started irrigation activities about 350 years ago in the Edo period, the feudal age of Japan. In the Edo period, the population increase stimulated the development of new paddy fields. Mr. Sawabe Kako, the headman of the village of Nakasaijo in Himeji-han, a feudal domain in Hyogo Prefecture, thought of developing the Inamino plateau. Since the plateau had no major river to supply water to the paddy fields, it remained undeveloped until then. In 1658, Mr. Kako, with the support of Mr. Kiheiji Numata, an assistant headman of the village of Kamisaijo, and Mr. Jihei Motooka, the village headman of Shimo, submitted a petition to Himeji-han, through Mr. Yojitayu Numata, the village headman of Kamisaijo, to develop the Inamino plateau. Initially, the Himeji-han officials did not accept their petition and instead reprimanded them, as the area was akin to a desert. But the farmers tried to explain the possibility of cultivation to the officials. Finally, in 1661, their petition was accepted,

and they received permission to develop the area. During that time, Mr. Sawabe Kako sought permission to rename the new village as “Kako-shin Village” using his family name “Kako.” However, Himeji-han did not accept this request, saying a village cannot not be named after a family. Consequently, Mr. Sawabe Kako changed his name to Mr. Saibe Sawa, and he was allowed to name the new village “Kako-shin Village.” Since then and until now, this village has been called “Kako.” In 1662, the three farmers, Mr. Saibe Sawa, Mr. Kiheiji Numata, and Mr. Jihei Motooka, migrated to Kako-shin as head farmers (Matsumoto 2016).

In 1662, Himeji-han supported the construction of five new reservoirs (Go-ooike), namely Minami-oike, Kita-ike, Ato-ike, Naka-ike, and Gokenya-ike, which are the predecessors of the present day Kako-ooike reservoir, and the 4.5 kilometer-long irrigation canals. This year, the remaining 23 families migrated to the new village (Matsumoto 2016). The first hamlet built in the village of Kako-shin was Kamishinden. In this hamlet, the three head farmers, Mr. Sawa, Mr. Numata, and Mr. Motooka, as well as the village headman Mr. Numata, built their houses and prepared rice fields. In 1663, the Nakashinden hamlet was built, followed by the hamlets of Kitashinden, Sankenya, Gokenya, Sichikenya, Hachikenya, and Kentani (Hyogoken Kako Tochikairyo-ku Shi Henshu Inkai 1995). The number of immigrants increased to up to 163 families, with the population rising to 800 in 1669. One hundred and ninety-one hectares of land had been newly developed. Since the irrigation demand had increased, in 1669, the six new reservoirs mentioned earlier (Ibara-ike, Sankenya-ike, Yonkenya-ike, Rokkenya-ike, Sichikenya-ike, Hachikenya-ike), which were the offshoots of the main reservoir Go-ooike, and received water from the main reservoirs through irrigation canals, were constructed and irrigation canals extended.

However, since the development of the new paddy fields continued, there was a shortage of irrigation water (Matsumoto 2016).

In 1680, the farmers in the village of Kako-shin succeeded in negotiating with the eight villages that used water from the Kusatani river to construct the new diversion weir Oomizo-iseki to take water from the river along three kilometers of the new irrigation canal Kako-oomizo in order to bring water to Go-ooike in Kako-shin (Matsumoto 2016).

Due to the recurring water shortage for irrigation, the farmers contracted with the upper village to take water from the diversion weir Kawaharada-iseki located at the upper portion of Kusatani river and to allow the water to flow to the Kako-ooike reservoir through the irrigation canal Kako-oomizo. Because of this new arrangement, the water shortage in Kako-shin was addressed to a great extent (Matsumoto 2016).

After the Meiji Restoration in Japan, in 1891 (Meiji 24), Go-ooike in Kako received water from the newly constructed Ougo irrigation canal (Ougo-gawa Sosui) through the new Kako secondary canal (Kako-shisen) (Matsumoto 2016). In 1919 (Taisho 8), the new Yamada irrigation canal (Yamada-gawa Sosui) was constructed to supply water through the Kako secondary canal to Go-ooike (Hyogoken Kako Tochikairyo-ku Shi Henshu Inkai 1995). Because of these new canals, there was a sufficient volume of irrigation water at Go-ooike (Matsumoto 2016).

However, since the five reservoirs comprising Go-ooike had deteriorated, in 1949 (Showa 24), the reservoirs were integrated into one large reservoir called Kako-ooike (Matsumoto 2016). The irrigation system in Inamino plateau, including the Kako-ooike reservoir, was established by the Ougo-gawa & Yamada-gawa Agricultural Irrigation Improvement Project between 1949 (Showa 24) and 1962 (Showa 37). Further, the Toban-Yosui

National Agricultural Irrigation Project had been constructed between 1970 (Showa 50) and 1993 (Heisei 5). The Kako-ooike reservoir was integrated into this new Toban-Yosui LID, and since then, the reservoir has received water from the newly constructed Dondo Dam (Hyogoken Kako Tochikairyō-ku Shi Henshu linkai 1995). Currently, the Kako-ooike reservoir does not take water from the irrigation canal Kako-oomizo anymore.

In 1998 (Heisei 10), 90% of the area of Kako LID was irrigated through underground pipelines from the Kako-ooike reservoir. Finally, Kako LID had a stable water supply, following the resolution of the problem of water shortage that the farmers had been facing for a long time (Kako Land Improvement District 2016).

The irrigated area of Kako-ooike reservoir had been managed by the local community since 1662. The first legal WUA, the Hyogo Prefecture Kako District Kako Village Land Consolidation Association, was established in 1931 (Showa 6) before World War II. After World War II, under the new Land Improvement Act of 1949 (Showa 24), it was amended to Kako District Kako Village LID in 1952 (Showa 27), with the approval of the Governor of Hyogo Prefecture. Subsequently, in 1955 (Showa 30), the name was changed to Hyogo Prefecture Kako LID (Kako Land Improvement District 2016).

#### IV. Evaluation of the organizational performance of Kako LID

Hereafter, this study examines the organizational performance of Kako LID using the indicators derived from the models of Freeman. Among Ostrom's eight design principles (see Table 1), the second (congruence between appropriation and provisional rules are local conditions) is considered to be equivalent to Freeman's third essential characteristics,

that water delivery is dependent on the fulfillment of organizational obligations (i.e., the distributional share system) (see Table 2). While the author will use 13 evaluation indicators derived from Freeman's six essential characteristics of effective WUAs and Ostrom's seven-design principles (see Table 4) to assess the performance of Kako LID in the next study, this study uses six evaluation indicators (No 1 to 6) derived from Freeman's model, in light of limited space.

Table 4. Indicators for evaluation of the organizational performance of WUA

No	Model	Indicator
1	Freeman	Source of leadership
2	Freeman	Responsibility of the leader and staff
3	Freeman	Share system of water delivery and obligation (distributional share system)
4	Freeman	Head and tail distinction (distributional share system)
5	Freeman	Water resource control ability
6	Freeman	Members' support to WUA
7	Ostrom	Clearly defined boundaries
8	Ostrom	Collective choice arrangement
9	Ostrom	Monitoring
10	Ostrom	Graduated sanctions
11	Ostrom	Conflict resolution mechanisms
12	Ostrom	Minimal recognition of rights to organize
13	Ostrom	Nested enterprise

Source: Freeman (1989:25) and Ostrom (1990:90), arranged by the author

#### 1) Evaluation of the source of leadership of Kako LID

Freeman points out that leaders should be irrigators representing the various reaches of the local organization. Freeman's model stipulates that a

“local leader” is one who can serve and even unite beneficiary farmers and other stakeholders (Freeman 1992).

Mr. A (assumed name), aged 72, has been the president, the leader of Kako LID since August 2016. The term of the Kako LID directors is four years. Mr. A and the other directors were selected during the elections in Kako LID in August 2016, as members of the 17<sup>th</sup> Board of Directors (BOD). Mr. A had served as a director since 2008, hence, it is his third term as a director. In the 16<sup>th</sup> BOD, he had served as vice president.

Mr. A is the son-in-law of a well-established family in Nakashinden, the third oldest hamlet in Kako LID (see Table 3). The family has been living in the same area since the beginning of the new land development in the village of Kako-shin for about 350 years since the Edo Period. He is a large farmer and still owns one hectare of paddy fields and 0.1 hectare of vegetable field, much higher than the average land ownership of 0.36 hectare in Kako LID. The family also ran a “Terakoya” (a private elementary school during the Edo period), and later around 1800, the family head served as a medical practitioner for the lord of Himeji-han. In the neighboring house, his relatives have served as medical practitioners for generations.

Mr. A had been a branch manager of a sake brewing company, of which his father-in-law had formally been the president. He retired at the age of 60. He has served many positions in the local community of Nakashinden Jichikai (a residents’ association) since 2007 such as lifelong learning representative, deputy chairman of Jichikai, and chairman of Jichikai for two years, immediately after his retirement from the brewing company. He became the director of Kako LID in 2008. Furthermore, he serves as an official of the Shoganji Buddhist Temple, and as a coordinator of the Non-

Profit Organization (NPO) of 12 Jichikai chairmen's association in Kako.

Since Kako LID belongs to Toban-Yosui LID, he also serves as its director. He is also the director of the Inami Town LID Federation, and vice president of the Kako Agricultural Land and Water Environment Conservation Council.

As the president of Kako LID, Mr. A is a very busy man. Despite being in a part-time position, he comes to the LID office Monday through Friday. Although he claimed that Wednesday is a holiday, he cannot take a day off. His predecessor president had also served from 9 am to 5 pm Monday through Friday.

Mr. A is a very competent person with great organizational and financial management skills, and is adept at document preparation, given that he had served as the manager of a company before his retirement. He has a good reputation that he has a good character and talks to people gently. It is believed that he can give suitable advice to the LID staff on how to prepare documents.

However, the salary of the president is meager, just 1.58 million yen per year. It could be said that the jobs of the president and the other directors are likely to be voluntary, and dependent on the good intentions of officials. They take on the job because there is a well-founded bond with the people in the Jichikai, and hence they have a strong sense of responsibility.

Like Mr. A, the president of Kako LID is usually a large landowner farmer who is past his retirement age, and comes from a well-established family since the time of the new land development in the village of Kako-shin during the Edo Period (see the list of successive presidents of Kako LID since the Kako District Kako Village LID was established in 1952 (Showa 27) in Table 5).

Table 5. List of successive presidents of Kako LID since the Kako District Kako Village LID was established in 1952 (Showa 27)

No	Term	Time in office	Number of years	Hamlet	Notes
1	1	1952~1956	4	Sanyonkenya	Village headman, Kako Village mayor
2	2,3	1956~1963	7	Kamishinden	Descendant of the J family, one of the three head farmers of Kako-shin Village
3	4,5	1963~1972	9	Kamisinden	Succeeded after the predecessor died. Descendant of the J family, one of the three head farmers of Kako-shin Village
4	6,7	1972~1980	8	Kentani	Big landowner farmer
5	8,9	1980~1988	8	Hachikenya	Succeeded after the predecessor died. Ironmaster
6	10,11	1988~1996	8	Chiwaike	n.a.
7	12,13	1996~2004	8	Kamishinden	Descendant of the K family, one of the three head farmers of Kako-shin Village. Staff of Inami Town Office
8	14	2004~2008	4	Kentani	Staff of the tax office
9	15,16	2008~2016	8	Kitashiden	Succeeded after the predecessor resigned. Staff of the Japanese National Railways
10	17	2016~	1	Nakashinden	Succeeded after the predecessor resigned. Branch manager of sake brewing company

Source: Author's survey, 2017

It appears that in the village of Kako, there has been a custom that a member of the well-established family who is a descendant of the three head farmers of Kako-shin and other influential families with large rice fields should become the president of the irrigation system. The president of Kako LID has traditionally held a good reputation in the local community of the village as a leader of the irrigation system, where the farmers had often experienced water shortage. The presidents had continuously tried to develop a new water resource for the Kako-ooike reservoir until it

was connected to the Toban-Yosui LID in 1993. Although the job of the presidents is almost voluntary, it seems they have served the local people devotedly, because for them it is more important to create social assets and earn the respect of the local people than earning money.

Based on Mr. A's family background, skills, character, and devotion to his job, he is considered to be a good local leader in Kako LID. Therefore, indicator 1 of Table 4 is evaluated as "yes." However, if the bond holding the Jichikai together becomes weaker in the future, it would become difficult to recruit a competent leader with a high morale.

## 2) Evaluation of staff responsibility of Kako LID

Freeman notes that the WUA leadership and the staff are responsible to local members, not to the central government. The leaders and the staff should not be appointed by the irrigation agency, but instead are selected in a general election held in WUA to encourage them to serve their local members. Moreover, they should be paid by local members, not by the government (Freeman 1992).

As mentioned above, when the Kako District Kako Village LID was established in 1952, there were 50 representatives, 16 directors, and four auditors. In 2000, the number of officers was modified to 35 representatives, 12 directors (including the president and the vice president), and three auditors.

The representatives are elected at the general elections in Kako LID which are held in July for a four-year term. The directors and auditors are elected at the representative assembly in August. The president and vice president are elected from among the directors. Their term is also for four years.

Among the directors of Kako LID, the president, the vice president, the accountant, and the chief of the general affairs committee are the four key officials. They hold meetings frequently. Especially, the president Mr. A and the vice president Mr. B usually meet three times a week, and are extremely busy.

The main functions of the directors are to attend the director assembly four times a year. They are the executive committee members who implement the activities of LID. Secondly, they are responsible for ensuring the cleaning of the pipelines in their respective hamlets, and closing the valves of the pipeline to avoid wastage of irrigation water. Thirdly, they distribute the bills for the ISF to members of their respective Jichikai. In the past, the directors had collected the cash toward ISF payments from their members. Now, the ISF is directly paid to Kako LID through the Japan Agricultural Cooperative (JA) bank account. Fourthly, if there are some members who have not paid the ISF, the directors pressure the members for the payment. Especially, in Kako LID, there are some members who have their own fields but do not live within the village of Kako (12 hamlets) and are called “Chikugai” (outside the hamlets) members.

The directors are usually concerned about the ISF payments to be made by those Chikugai members, as part of efforts to increase ISF revenue.

Meanwhile, the monitoring of the cleaning of the reservoirs and the drainage canals and mowing at drainage canals in each hamlet are the tasks of the Jichikai of each hamlet. Thus, there is no report on the performance of these tasks at the director assembly.

The duties of the representatives are mainly to attend the representative assembly once a year in March, and twice a year during the election year in August and March. The representative assembly functions as a

substitute of the general assembly of the whole LID members which should be the decision-making body of Kako LID. BOD members (the directors and the auditors) of Kako LID perform their duties following the decisions of this representative assembly.

However, their salaries are quite meager. According to the bylaw of Kako LID, the salary of the president is 1.58 million yen per year, and that of the vice president 120,000 yen per annum. Meanwhile, the salary of the other directors and auditors is only 60,000 yen per year. They also receive additional daily allowance for their duties (2,400 yen for two hours, 4,000 yen for four hours, 8,000 yen for eight hours), and a special allowance of 15,000 yen for five months of the irrigation period. The salary of the representatives is 11,000 yen per year and 4,000 yen per meeting.

Besides these LID activities, some directors of Kako LID have an additional duty. There is an organization named Kako Agricultural Land and Water Environment Conservation Council, for which the chairman was formerly the Kako LID president, but now it is the Kako LID vice president Mr. B. One of the deputy chairmen was formerly the Kako LID vice president, but now is the Kako LID president Mr. A. Another deputy chairman is the chairman of Kitashinden Jichikai. The accountant is the Kako LID chief of the general affairs committee. The auditors are the Kako LID auditor and the chairman of Ikenouchi Jichikai. The executive office consists of the executive director Mr. E who is the Kako LID auditor, an accountant, and other staff. In addition to this head council, each Jichikai also has the branch council management committee, which consists of a chairman, vice chairman, and an accountant. At each Jichikai, a chairman of Rinpo is responsible for the cleaning of reservoirs and drainage canals, and mowing at drainage canals.

The task of this council is to organize the collective activities for the agricultural land and water environment conservation, i.e., operation, maintenance, and repair of irrigation facilities of LID. This council belongs to the town of Inami. However, in reality, the organization of this council is inseparable from Kako LID. Actually, these maintenance tasks of irrigation facilities are the busiest jobs for the directors of LID. This is the reason why the post of the chairman of the council was altered from LID president to LID vice president.

The duties of this council include mowing, cleaning, and repairing of the drainage canals and reservoirs two to four times per year at each Jichikai. In addition, the council handles the program for the reservoir repair work, in order to extend the life span of the reservoirs. The executive office is very busy as they have to apply for the subsidy, to place the order to a construction company, to monitor the construction work, etc. The executive director Mr. E, who is concurrently the Kako LID auditor, is a retired engineer of a private company, and has enough capacity to handle these construction works. The council chairman Mr.B and other officers are quite occupied with the preparation of new program plans, the preparation and approval of the construction work plans, the supervision of project applications, construction works, and project reports, etc.

Why do those directors work hard even though their salaries are meager?

In Kako LID, there is a customary rule that the 12 directors are elected from each of the 12 Jichikais. Each of the three auditors are elected from the three blocks, each of which consists of four Jichikais. (The first block comprises the hamlets of Gokenya, Ikenouchi, Kitashinden, and Kamishinden; the second block Oosawa, Chiwaike, Nakashinden,

and Sanyonkenya; and the third Rokkenya, Kentani, Sichikenya, and Hachikenya.) Within each block, the position of the auditor is rotated (see Table 6).

Table 6: 3 Auditors elected from the 3 blocks

Block	Hamlet
1	Gokenya, Ikenouchi, Kitashinden, Kamishinden
2	Oosawa, Chiwaike, Nakashinden, Sanyonkenya
3	Rokkenya, Kentani, Sichikenya, Hachikenya

Source: Kako Land Improvement District, 2017

However, before the general elections, the candidates to those officers (representatives, directors, and auditors) are already decided in each Jichikai. The former director looks for a successor who is in his sixties and obtains his informal consent. Then, the director recommends the person to the chairman of Jichikai, who formally asks the candidate to be the next director. The position of director of Kako LID is one of the most important posts of Jichikai. An influential person who already has experienced the position in Jichikai is selected as the LID director. Usually, a person who had served as a LID representative becomes a director, with some exceptions. The chairman of Jichikai usually does not become a director concurrently, because both positions are busy. However, in a small Jichikai, the chairman is simultaneously appointed as the director, because no one else wants to serve as a director.

In Jichikai, there are several official positions such as that of the chairman, deputy chairman, accountant, agricultural production department chief, farming department chief, environment committee member, public relations representative, lifelong learning representative,

etc. In principle, since the LID and Jichikai are different organizations, the LID representatives and the director are not the official positions of Jichikai. However, those positions are also considered as one of the Jichikai positions, so that the chairman has the responsibility of selecting LID officers. Following requests from the LID president, the chairman of Jichikai looks for a suitable candidate in his Jichikai. It is said that once a person accepts a position in Jichikai, he continuously serves many other positions because only a few residents want to serve a Jichikai position. Jichikai officers rotate the positions, including LID official post, amongst themselves.

The LID director is usually a part-time rice farmer. It is said that a full-time farmer is too busy to serve as LID director. The directors have retired from service, and are aged between 63 and 75. It is not possible for a person who is currently employed to accept this position given his busy schedule. Most of the directors are local celebrities and come from reputed families since the new land development at the village of Kako. Most of them are persons with a good reputation in their local community, although there are some exceptions.

In some Jichikai, farming associations are requested to allow their members to become LID officers by the chairman of Jichikai. For example, the Kentani farming association chose all LID officers of Kentani Jichikai, i.e., a director and five representatives, while the Nakashinden association chose two representatives.

The LID directors mostly perform their duties very well and actively. However, there are a few cases where a director failed to handle the non-payment of ISF of his own Jichikai members, or a representative coming from Chikugai does not attend the representative assemblies. They

work hard because LID duties are closely connected with the works of Jichikai, especially the Kako Agricultural Land and Water Environment Conservation Council.

Although at present, the LID officers perform their duties well, there are some problems. First, there is a certain uncertainty regarding the successors of LID officers. Lately, there has been a drop in the number of people who want to become Jichikai officers, especially in the next 10 years, because the bond of the local community has become weaker, hence local people avoid the voluntary jobs of Jichikai. The salaries of LID officers is very meager as mentioned above, and the same holds true for the LID staff. It is difficult for a person who has a job at present to become a LID officer, since the officer on duty is quite busy. Therefore, a person who has retired from service is always considered for the post. However, many companies are reemploying their retired employees, and the final retirement age has been extended from 65 to 70, making it more difficult to secure LID officers. At present, Kako LID depends on the goodwill of the officers, who consider their LID duties as “contributions to their own local community.”

Secondly, there are discussions within Kako LID whether they should choose the director and representatives not only from the 12 Jichikai, but also from Chikugai. The number of Chikugai members has gradually increased to 203 (24.4%) of the total 831 members in 2017. From 1952 to 2016, all the representatives had been selected from the 12 Jichikai. In the customary rules of Kako LID, each Jichikai had one to five allotments of representative positions. However, since 2017, there has been one Chikugai representative. Before the LID election in 2016, one member from outside the 12 hamlets claimed that he would run for elections. Responding to

this claim, the new president Mr. A agreed to change the number of representatives allotted to his Jichikai (Nakashinden) from four to three, and offered the seat to the member from outside.

Besides these LID officers, there are two LID staff that receive salaries from Kako LID. One is a water tender, formerly called a reservoir keeper (“Ikemori”). The present water tender Mr. O is 75 years old and has been serving since 2014. He was formerly a director from 2000 to 2012, and has a thorough knowledge of water management. The other is an office clerk Ms. F, who has been serving since 2008. She deals with accounts, the billing of ISF, preparation of the documents of conversion, inheritance, exchange of farmland, dunning the ISF payment, etc. She is quite busy with many tasks in hand (see Table 7).

Table 7. The 17<sup>th</sup> directors and auditors (elected in August 2016, four-year term) and staff of Kako LID

NO	Position	Assumed name	Age	Hamlet	Farmland (ha)	Occupation	Position in Jichikai	Notes
1	Director		69	Gokenya				The 3 <sup>rd</sup> term
2	Director		64	Ikenouchi				The 2 <sup>nd</sup> term
3	Director		64	Kitashinden				The 1 <sup>st</sup> term
4	Director		63	Oosawa				The 1 <sup>st</sup> term
5	Director		78	Kamishinden				The 1 <sup>st</sup> term
6	Director		69	Chiwaike			Jichikai chairman	The 2 <sup>nd</sup> term
7	President	Mr. A	72	Nakashinden	1.0	Branch manager of sake brewing company, retired at 60	Married to the Nakashinden well-established family from Okayama. Lifelong learning representative, deputy Jichikai chairman, chairman from 2007 to 2008. Person in charge of Shoganji Temple. Manager of NPO of Jichikai ex-chairmen	The 3 <sup>rd</sup> term since 2008. Vice President at 16 <sup>th</sup> BOD.
8	Director		66	Sanyonkenya				The 2 <sup>nd</sup> term

9	Vice President	Mr. B	68	Rokkenya	0.55(0.33 planted)	Sales department chief of valve manufacturer. retired at 63	Jichikai chairman at 44 to 45. Present president of farmers club	The 2 <sup>nd</sup> term since 2012. Auditor at Gandoi LID.
10	Director	Mr. C	68	Kentani	1.0(0.6 planted)	Staff of transportation company. retired at 63	Official of farming association since 1993. Farming department chief from 2006 to 2010. Lifelong learning representative for four years. Traffic safety instructor for four years	The 1 <sup>st</sup> term. 1 director and 5 representatives were chosen by Kentani farming association. Member of Gandoi LID.
11	Director		70	Sichikenya				The 1 <sup>st</sup> term. General Auditor from 2008 to 2012.
12	Director		72	Hachikenya				The 2 <sup>nd</sup> term
13	General Auditor	Mr. D	65	Kamishinden	0.73	Sales staff of machinery. transferred to maintenance staff of high school, retired at 60, part-time maintenance staff of school	Member of L head family, which is one of the well-established families engaged in the new land development in Kako Village. Agricultural production department chief for six years. Farming department chief for four years. Accountant for six years. Presently holds no position.	The 1 <sup>st</sup> term. Representative of 14 <sup>th</sup> , 15 <sup>th</sup> , 16 <sup>th</sup> BOD from 2004 to 2016.
14	Auditor	Mr. E	67	Nakashinden	0.6	Engineer of printer manufacturer. Reemployed at 60. Retired at 65	JA representative for the 1 <sup>st</sup> term. Accountant and deputy chairman of Jichikai. Accountant from the age of 50 for eight years. Vice president of the hamlet drainage association from age 60 to 67. Manager of Jofukuji Temple since 2016. Group leader of the elderly people association. Member of the Nishikawa religious association.	The 1 <sup>st</sup> term. Representative of 15 <sup>th</sup> BOD. Accountant of Kako Agricultural Land and Water Environment Conservation Council since 2007. Executive director of the Council since 2014.
15	Acting General Auditor		62	Rokkenya				The 1 <sup>st</sup> term

16	Water tender	Mr. O	75	Sanyonkenya		Staff of Kako LID		Served since 2014. Director of 13 <sup>th</sup> , 14 <sup>th</sup> , 15 <sup>th</sup> BOD from 2000 to 2012.
17	Office clerk	Ms. F	54	Gokenya		Staff of insurance company for two years, transferred to temporary worker of Kakogawa City, transferred to staff of Kako LID in 2008	Returned to mother's home in Kako with her family. Family of mother's younger brother is the head of the family	Served since 2008.

Source: Author's survey, 2017

### 3) Evaluation of distributional share system of Kako LID

Freeman (1992) points out that the distributional share system is the core of any effective WUA. This means that water delivery is dependent on the fulfillment of organizational obligations. Moreover, the water share system should remove the head and tail distinction in the service queue. The member's share of cost for system management is proportionate to his/her share of water and share of vote. In Kako LID, the distributional share system has been introduced into LID management.

#### a. Share of cost at the Kako LID 1: ISF payment

In Kako LID, the members' organizational obligations are the ISF payments and participation in communal labor.

In Kako LID, ISF is currently set at 30,000 yen per hectare, which is paid to Kako LID, and 25,000 yen per hectare for special ISF, which is paid to Toban-Yosui LID; hence in total, 55,000 yen per hectare per year. In the past, a member had also paid 10,000 yen per hectare to the water tender ("Mizuire").

In 2016, 75.2% of the members paid ISF by the JA account transfer payment in September, while 24.8% of them paid directly to the Kako LID office or into the LID account at JA. In the past, each director had made door-to-door visits to collect ISF from the members in his Jichikai; hence, it was a tough job for the director.

In 2013, the collection rate of ISF was 99.8%. The total collection was 16.54 million yen. There were two cases of non-payments which amounted to 30,000 yen. It can be said that Kako LID can attain almost 100% of the ISF collection rate with a few free riders. One of the non-payers Mr. M had paid before the land consolidation. However, since he was not satisfied with the results of the consolidation, with complaints about problems such as poor drainage, he had stopped paying ISF since 2013. Another member in the Hachikenya hamlet had not paid or partially paid since 2010, because he had leased his land and had stopped farming.

The illegal checking of irrigation water is very rare in Kako LID. However, an exception exists in Rokkenya hamlet. A Kako LID member who has his farm at the hindmost part of Kako LID, also belonging to Gandoi LID, took drainage water from Kako LID and brought it to his neighboring farmland in Gandoi LID. Initially, he only brought the water to a single paddy field. But gradually, he carried it in a tank to the other paddy fields in the inland, drawing water from his valve at Kako LID, and transporting the tank to Gandoi LID in a small truck. The director noticed the case and planned to warn him if the situation persisted.

Although most of the members pay ISF accurately, there are some problems of changing the amount of ISF when the farmland size is altered due to inheritance or the conversion of farmlands. The Kako LID office has to reset the member's ISF again, which is a complicated procedure.

Currently, when the director provides an explanation, the members pay ISF. However, it appears that the cases of non-payment would increase in the future because the son or daughter who inherits parental farmland is usually surprised when he/she first finds out about the ISF payment, or because many members have become old and delayed in payments.

Besides the ISF payment, each member in Kako LID had to pay a one-time fee of 2.3 million yen per hectare toward pipeline installation costs, and 3 million yen in Kentani hamlet, owing to the late construction period. However, there was no objection to the pipeline installation cost, because the Kako LID members had visited other LIDs which had already introduced the pipeline, and had hold strong requests for the installation of the pipelines in Kako LID.

b. Share of cost at Kako LID 2: communal labor

Kako LID members are also responsible for participating in communal labor work such as cutting grass and cleaning drainage canals. This communal labor is organized by each Jichikai, so that not only the Kako LID members, but also non-farmer residents should participate in the communal labor. Actually, this system is based on the guidelines of the Japanese Ministry of Agriculture, Forestry, and Fisheries (MAFF), which makes non-farmer residents participate in the cleaning of LID drainage canals, because they also use the drainage canals to drain their domestic waste water. In addition, because the population of farmers has decreased in each rural community, it has become extremely difficult for the farmers to maintain the LID irrigation system on their own.

In Kako LID, each Jichikai allocates the cleaning tasks to each Rinpo (neighborhood association) which is below the Jichikai. So, the cleaning task

is done under the leadership of the Rinpo chairman. The residents repair the reservoirs, the drainage canals of Kako LID and sewerage, mow grass along rural roads, and perform cleaning tasks. This has been the rule of the community since the Edo period. The whole community (farmers and non-farmers) participates in the cleaning tasks in April and June, before and after the opening of the gate of the Kako-ooike reservoir on May 8th.

As mentioned above, since each Rinpo is responsible for the maintenance of the drainage canals, there is no report to the BOD of Kako LID on the number of participants.

Each Jichikai receives subsidies for the cleaning of the reservoirs and the drainage canals from the Kako Agricultural Land and Water Environment Conservation Council, as mentioned above. Since 2007, the council has been paying a daily allowance ranging from 800 yen to 2,000 yen per day to each person. (The amount varies in each Jichikai).

Some Jichikai impose fines (“Debusokukin”) ranging between 3,000 yen and 10,000 yen per day for the absence of the cleaning. It is said that in the past, all members of the hamlet attended the cleaning, even though there was no allowance because they were scared of “Murahachibu”, which means that the offender is ostracized within the village by other villagers. These days, several households cannot attend the cleaning because of their jobs or due to old age. For example, in Rokkenya, 95% of households attend the cleaning duties, while one or two households pay the absentee fines. In Kitashinden, among 133 households, 111 (83.5 percent) attended the tasks, while in Nakashinden, 70 to 80 percent of the grass was cut by the Nakashinden farming association in 2017.

Presently, there are several problems regarding communal labor in Kako LID. There are some residents who do not want to attend the cleaning, so

they just pay the fine and give it a miss. Young residents are often absent and only people in their seventies attend the cleaning sessions. Although the members are told to bring their own grass cutters, some residents do not possess them. Earlier, cleaning was not a difficult task because the drainage canals were small. Now, some tasks like cutting grass along the slope of the drainage canals have become very difficult and dangerous because the farms have become larger after land consolidation, resulting in the drainage canals becoming wider and deeper.

In sum, in Kako LID, there are very few cases of ISF non-payment and illegal checking. Also, at present, most of the LID members attend communal labor, and the absentees have been paying fines. Hence, there are very few free riders who break the rules of LID and appropriate resources unfairly without fulfilling their obligations as LID members.

#### c. Share of vote at Kako LID

When we just focus on the number of directors and representatives within Chikunai (within the 12 hamlets), the distribution is mostly equitable. From each Jichikai, one director is elected, and one to five representatives are elected based on the area of the farmland and the number of LID members (see Table 8). Therefore, as Freeman mentions, the share of cost is mostly equivalent to the share of votes. Hence, a sense of fairness is mostly attained among members within the Chikunai.

However, there is some inequality among Chikunai members. Kamishinden has more representatives than is appropriate for their proportion of the irrigated area, and therefore their share of vote is higher than the other Jichikai. It is believed that this has been the custom from the past, since Kamishinden is the oldest hamlet in Kako Village and

the three head farmers had settled there. However, when we see the proportion of the number of members, their share of vote is appropriate (see Table 8).

Table 8. Kako LID share of the 16<sup>th</sup> Directors and Representatives per irrigated area and per number of LID members within Chikunai

NO	Hamlet	Number of Directors	Number of Representatives	Share of Representatives %	Irrigated area (m <sup>2</sup> )	Area ratio %	Number of LID members	Member ratio %
1	Gokenya	1	4	<b>11.4</b>	280121	11.2	74	<b>11.8</b>
2	Ikenouchi	1	2	<b>5.7</b>	180880	7.2	26	<b>4.1</b>
3	Kitashinden	1	4	<b>11.7</b>	324470	12.9	71	<b>11.3</b>
4	Oosawa	1	1	<b>2.9</b>	70076	2.8	18	<b>2.9</b>
5	Kamishinden	1	4	<u><b>11.4</b></u>	213243	<u>8.5</u>	69	<u><b>11.0</b></u>
6	Chiwaika	1	2	<b>5.7</b>	167871	6.7	36	<b>5.7</b>
7	Nakashinden	1	4	<b>11.4</b>	290180	11.6	75	<b>11.9</b>
8	Sanyonkenya	1	3	<b>8.6</b>	229221	9.1	56	<b>8.9</b>
9	Rokkenya	1	2	<b>5.7</b>	109423	4.4	29	<b>4.6</b>
10	Kentani	1	5	<b>14.3</b>	316932	12.6	87	<b>13.9</b>
11	Sichikenya	1	1	<b>2.9</b>	100111	4.0	24	<b>3.8</b>
12	Hachikenya	1	3	<b>8.6</b>	228176	9.1	63	<b>10.0</b>
	Total	12	35	<b>100</b>	2510704	100	628	<b>100</b>

Note : Irrigated area and the number of LID members in 2016.

The 16<sup>th</sup>: From August 2012 to August 2016 (four-year term)

Source: Author's survey, 2017

Although there is mostly equitable distribution of directors and representatives within Chikunai, there exists an inequality between Chikunai and Chikugai (outside twelve hamlets). Hence, the share of cost is not equivalent to the share of vote between those members. From the 1<sup>st</sup> to the 16<sup>th</sup> BOD of Kako LID, all the directors and representatives had

come from Chikunai. In the 17<sup>th</sup> BOD, for the first time, there was one representative who came from Chikugai (see Table 9 and 10). However, those Chikugai members still do not attend the Jichikai activities such as grass cutting or drainage canal cleaning. Since the Chikugai members do not fulfill their obligations as LID members (they pay ISF but do not participate in communal work), it is difficult to evaluate whether the share of Chikugai representatives is equitable or not. However, since the number of Chikugai members who have their farmland in Kako LID but live outside the 12 hamlets has been growing, the president and vice president have already recognized this matter as the problem of Kako LID management.

Table 9. Kako LID share of the 16<sup>th</sup> Directors and Representatives per irrigated area and per number of LID members between Chikunai and Chikugai

NO	hamlet	Number of directors	Number of representatives	Number ratio %	Irrigated area (m <sup>2</sup> )	Area ratio %	Number of LID members	Number ratio %
1	Chikunai	12	35	<b>100</b>	2510704	83.7	628	<b>75.6</b>
2	Chikugai	0	0	<b>0</b>	488473	16.3	203	<b>24.4</b>
	Total	12	35	<b>100</b>	2999177	100	831	<b>100</b>

Notes : Irrigated area and number of members in 2016.

The 16<sup>th</sup>. From August 2012 to August 2016 (four-year term).

Source: Author's survey, 2017

Table 10. Kako LID share of the 17<sup>th</sup> Directors and Representatives per irrigated area and per number of LID members between Chikunai and Chikugai

NO	hamlet	Number of directors	Number of representatives	Number ratio %	Irrigated area (m <sup>2</sup> )	Area ratio %	Number of LID members	Number ratio %
1	Chikunia	12	34	<b>97.1</b>	2510704	83.7	628	<b>75.6</b>
2	Chikugai	0	1	<b>2.9</b>	488473	16.3	203	<b>24.4</b>
	Total	12	35	<b>100</b>	2999177	100	831	<b>100</b>

Notes : Irrigated area and the number of members in 2016.

The 16<sup>th</sup>: From August 2012 to August 2016 (four-year term).

Source: Author's survey, 2017

#### d. Share of water allocation in Kako LID

Formerly, since the Edo period up to the land consolidation work, there was severe water shortage in the Kako irrigation system. The water was delivered from Kako-ooike reservoir to "Koike" reservoir (a subordinate reservoir which receives water from the parent reservoir, i.e. Kako-ooike reservoir) through the main canal. From Koike reservoir, the water was delivered through a small canal to each farmland. At that time, the size of the farmland was small at around 0.1 hectare. The canals were used as both irrigation and drainage canals. Water was distributed round the clock.

There were water tenders who cared for the Kako-ooike reservoir called Ikemori, and one Mizuire per hamlet who was responsible for water management within each hamlet. Besides them, there was a "Toban" who was in charge of monitoring the canals at nighttime once in 20 days in Kentani hamlet. There were nine Koike (subordinate reservoirs) in Kako LID. The duties of the Mizuire included opening and closing the gate of the reservoirs, and the monitoring of the irrigation water from Kako-ooike

reservoir through the main canal, Koike reservoir, and the tail end.

There was a rotation schedule to take irrigation water within the hamlet. Usually, there was the tacit agreement among the hamlet members that the larger farm took water first. Each farmer opened the inlet of his paddy field by himself, and had his irrigation period ranging from one day to four or five days, hence he had to be absent from his job. It took about one month to complete the rice transplantation in the hamlet, where each farmer waited for his turn. Therefore, the farmers had to plant the same rice variety such as Nihonbare or Kinnanfu and arrange the cropping calendar in a similar way. When they planted vegetables, they chose those vegetables that did not need much water, or they used drinking water.

In the past, there was water shortage downstream, which resulted in severe water conflicts and illegal checking. There was a customary rule that the upstream was privileged, thus the farmers in the downstream had to wait for their turn. If the downstream farmer went upstream and opened the gate, a quarrel arose. For example, the Nakashiden farmers shared irrigation canals with upstream farmers in Kitashinden and Oosawa (see Figure 3). They had to watch the canal because the upstream farmers took water illegally at the turn of Nakashiden. Some farmer opened his inlet a little bit illegally and secretly diverted the water into his paddy field. The other farmer opened the gate at night, but it was closed by somebody in the morning. It was a huge task for the farmers because they had to deal with water management right from early morning. In Rokkenya (see Figure 3), since they are located at the tail-end of the Kako irrigation system, the farmers went up to Ibara-ike reservoir in Chiwaike hamlet to watch the canals. At their irrigation turn, they found that some farmers in Nakashinden and Sanyonkenya (see Figure 3) has pilfered water at night,

so, they closed the inlets. Especially at the time of drought, the farmers fought for water, and irrigated their paddy fields with buckets of water.

At that time, there was water shortage in the downstream area, and differences in water allocation between the head and tail portions existed.

The situation changed dramatically after land consolidation between 1989 and 1998. Ninety percent of irrigation canals had been converted to pipelines. Also, Kako LID had begun to receive water from Toban-Yosui LID. Presently, Toban-Yosui LID delivers water to Kako-ooike reservoir, and through the new pipelines, the water is delivered to each farmland. However, some portions of Hachikenya are still irrigated by open canals, because the farmlands are close to the residential area and it is difficult to perform construction work.

From 1981 to 1998, the Inami LID had been established to conduct land consolidation work in the Kako LID area. The farmers had to exchange their farms with other lands within Kako LID. There were three years of temporary land consolidation to deal with some discontent expressed by the farmers. However, the farmers finally put their seals on the documents, because they say they were afraid of Murahachibu (social ostracism in the community). Before consolidation, the farmland was 0.1 hectare, and after land consolidation, each farmland became 0.6 or 0.3 hectare. The drainage canals remained as open canals. Earlier, the roads and irrigation canals were curved, but after the construction work, the roads become straight along the pipelines and also wider. And now, all paddy fields face the road.

Nowadays, since each paddy field has a valve of the pipeline at the entry to the farm, if a farmer opens the valve, he can easily receive irrigation water. Also, the farmer can adjust the volume of water on his own. Therefore, neither does the farmers have any trouble in water

management, nor is there any water conflict. Since there is no more water shortage, Kako LID attains equal water distribution at the head and tail portions.

Soon after the land consolidation works, some farmers complained about their drainage systems for about two to three years. They addressed the drainage issue by creating a ditch, following which most of the problems were resolved.

Currently, there is another problem because some farmers leave the water running so there is a water wastage.

The daily operation and maintenance of the irrigation facilities had also changed significantly before and after land consolidation.

Before land consolidation, the canals were made of earth, and the farmers cleaned the canal once a year through “Mizubushin” (communal canal cleaning). To improve the drainage, they repaired the canals by driving posts into them. Since the ridges were thin and easily collapsible, regular maintenance jobs were essential.

Now, Mr. O, who is the staff of Kako LID, checks for any breakdown of valves or water leakage from the pipeline. He also deals with the opening and closing of the valves, does maintenance work for open canals, and checks whether any farmer has forgotten to close the valves.

The breakdown of valves or the poor flow of water rarely happens in the summer. The farmers request Mr. O to solve the problems.

It has become possible to have a stable and equal water distribution in Kako LID after the land consolidation.

In sum, in Kako LID, regarding the sharing of costs, there are two kinds of obligation for LID members: payment of ISF and participation in communal work. As for the ISF payments, all the members, with a few

exceptions, pay ISF, while for participation in communal work most of the members fulfill their obligations.

Regarding the share of vote, within the Chikunai, the number of the representatives are proportionate to the irrigated area and the number of LID members. Therefore, the share of vote is equivalent to the share of cost.

However, there is a shortage of share of vote for the members in Chikugai.

Regarding the share of water, the ISF is a fixed rate per area. If there are farmers who experience water shortage downstream, this fixed ISF would be an unfair system for those farmers. However, after the pipelines were installed in Kako LID, there is no more water shortage even in the downstream, and LID has successfully achieved equitable water distribution both in the head and tail portions. Kako LID ensures the provision of the same volume of water per unit area in the command area of the irrigation system. Therefore, in Kako LID, a member pays ISF equivalent to the volume of the irrigation water he/she receives. Hence, the share of water is proportionate to the share of costs.

Therefore, in Kako LID, a member's share of water is proportionate to the share of his/her cost, and also the share of vote within the Chikunai members, thereby ensuring a distributional sharing system. However, there is the shortage of the share of vote for the Chikugai members, hence the distributional share system in Kako LID is considered imperfect.

#### 4) Evaluation of water resources control ability of Kako LID

Freeman (2009) states that among the six essential characteristics, if the first four are fulfilled, then the remaining two (water resources control

ability and the propensity of members to support the local organization) will be realized. He points out that if the WUA has good water resource control, it can deliver sufficient irrigation water in a timely manner to all members. To have a higher water control ability, ideally, the WUA owns and controls the entire irrigation system from the water source (e.g. reservoir) to the downstream end.

a. Water resource control ability at water source

As mentioned above, Kako LID had continued to construct new reservoirs as their water source and new paddy fields since the Edo period. The farmers had made efforts to secure enough water for their water source Kako-ooike reservoir since they had suffered from chronic water shortage. In the past, they brought water from the Kusatani river by constructing the Kako-oomizo canal to the Kako-ooike reservoir. In 1891, the Kako-ooike reservoir could receive water from a newly constructed Ougo irrigation canal. In 1919, Yamada irrigation canal also provided water to the Kako-ooike reservoir. In 1962, through the Ougo-gawa & Yamada-gawa Agricultural Irrigation Improvement Project, Kako-ooike reservoir could receive more water. However, the volume of water at Kako-ooike was still not adequate. Finally, in 1993, after the Toban-Yosui National Agricultural Irrigation Project was completed, and Kako-ooike reservoir could receive water from the Dondo Dam, ensuring that there is enough water in the Kako-ooike reservoir.

Currently, Kako LID receives sufficient water from the Toban-Yosui irrigation system. From the middle of February to May, the Kako-ooike reservoir is filled with 1.3 million tons of water. Mr. O checks the water gauge of the reservoir on a daily basis. If the volume of water decreases,

he contacts the office of Toban-Yosui LID to provide more water for the Kako-ooike reservoir.

In 1994, there was severe drought. Within the Kako LID, farmers shared water amongst themselves to cope with the situation. They could harvest rice even during the drought. In some cases, two farmers shared water for a 0.5 hectare paddy field. They checked the drainage canal and pumped the drainage water to irrigate the rice field. Since the water quality was not good, the yield decreased.

b. Water resources control ability from the Kako-ooike reservoir to the farmlands

As mentioned above, in 1998, 90% of the irrigation area of Kako LID had received water from the new pipelines. Therefore, Kako LID could solve the water shortage problem at the downstream areas and achieve equal water distribution across LID.

The water management at the farmland level has vastly improved following the laying of the pipelines. After the pipelines were installed, it has enabled the farmers to plant the crops any time they like. Thus, there are various rice varieties being cultivated from Nihonbare, Kinnanfu to Hinohikari, Kinuhikari, and Koshihikari whose planting seasons are different. The farmers can now grow any rice variety they want.

Vegetable cultivation has also become very convenient. The farmers can grow any time they want, and they can also connect hoses from their valves to irrigate vegetable farms. The part-time farmers can engage in farming even during the weekends, hence farming has become easier.

Each farmer is now responsible for adjusting water allocation by himself/herself. At Nakashinden, the farming association monitors the opening and

closing of the valves in the hamlet. Sometimes, full-time farmers ask the Nakashinden representative Mr. H who comes from the farming association to provide more water. Mr. H in turn asks Mr. O to address the problem.

Full-time farmers who cultivate greenhouse vegetables need water all year through. However, the irrigation water from the Kako-ooike reservoir is available only from May through September. Also, the quality of the reservoir water is not good. Therefore, they use well water and grow spinach, strawberry, etc.

Meanwhile, Kako LID is responsible for water management from the Kako-ooike reservoir to each farmland. The dates on which the gates of the Kako-ooike reservoir will be opened will be intimated to each farmer. The opening date is decided at the directors' meeting in February, and it is announced at the annual representative meeting held at the end of March. After this, all the directors and representatives are informed about the date through documents as well as verbally. At the end of March, the date is published in the information bulletin of the Inami Town. At the same time, the date is announced at the officers meeting of the Jichikai and the information reaches each household through the circular bulletin within each Rinpo.

The dates of the opening of the gate has been advanced following requests from the farmers. Earlier, the date was in the middle of June, but now it is in the beginning of May, because the rice varieties have become diverse.

Regarding the operation and maintenance of the irrigation pipelines, Mr. O daily operates and checks the pipelines. On Saturdays, the president inspects and closes the valves if the water is left running to avoid wastage of water. The directors clean and check the pipelines and valves in their

hamlet a week before the opening of the gate of the Kako-ooike reservoir. For example, they flush the rubbish by discharging water into the pipelines.

The pipelines have been installed since 1989, and 30 years have already passed since the setting up of these pipes in Gokenya and Ikenouchi hamlets. Their condition has deteriorated, hence the leakage of water occurred at least in six instances in 2014, three in 2015, and there was one case reported in 2016. The repair costs ranged from 300,000 yen to 800,000 yen per year. Now, Kako LID put a tag on the pipeline to call attention to the leakage of water. Kako LID earmarks 3 million yen in their annual budget for the operation and maintenance of their irrigation facilities, and spends around 1-2 million yen of this money per year. However, the amount is expected to increase in the future. Since some pipelines are buried below the road, they are easy to break because of vibration. Some pipelines are buried close to the drinking water and the drain pipes.

Regarding the repairs to the Kako-ooike reservoir, the Kako LID removed the sediment in the conduit of the reservoir in 2017. In 2017 and 2018, Kako LID received 100% of the subsidy amount, totaling 30 million yen for the reservoir repair work, which is used for the repair of the reservoir, gate, and spillway. This reservoir's preservation project aims to conduct the maintenance work gradually with minimal costs, rather than bear the expenses in the event of the reconstruction of the entire reservoir, which is expected to cost 300 million yen over three years.

Regarding the maintenance of the subordinate reservoirs, each Jichikai is responsible for the cleaning of the reservoir and removing rubbish from the gate. The maintenance works are conducted by each Rinpo under the leadership of the Rinpo chairman. For example, in Kentani hamlet,

the farmers clean the drainage canals below the Kako-ooike reservoir, the Kentani-kamiike subordinate reservoir, and the Kentani-shimoshinike subordinate reservoir which was used for irrigation before but is now used for disaster prevention after the pipelines were installed. In 2017, the reinforcement work was planned in the Kentani-kamiike and Kentani-shimoshinike subordinate reservoirs, considering that there is a risk of the reservoirs bursting due to typhoons.

As mentioned above, each Jichikai promotes the grass cutting and cleaning of the subordinate reservoirs and the drainage canals.

In sum, Kako LID has a great ability to control water resources. Regarding the water source (Kako-ooike reservoir), LID can secure enough water. Mr. O conducts daily checks and addresses the requests to provide water to Toban-Yosui LID based on the water level of the reservoir. Regarding water allocation from the Kako-ooike reservoir to the farmlands at the tail portion, the water shortage has been solved by the installation of the pipelines. As for the maintenance and the repair of irrigation facilities, Mr. O, the directors, and each Jichikai take charge of the jobs. Also, they have implemented the necessary repair works for the reservoirs and pipelines. Hence, Kako LID can properly manage, right from the water source (Kako-ooike reservoir) to the tail portions of LID.

##### 5) Evaluation of members' support to Kako LID

Kako LID has been greatly supported by the LID members.

The collection rate of ISF is 99.8% with only two exceptions, while illegal checking is very rare with one exception. The grass-cutting and cleaning of the drainage canals are managed by each Jichikai with fairly high participation rates of 70 to 90 percent. Each Jichikai chooses the director

and representatives within the hamlet. Those leaders are very cooperative and active in LID activities. In the past, the water management and maintenance of irrigation facilities were conducted by each Jichikai, and the cooperative attitude toward irrigation activities in each Jichikai still continues. However, there exists some exception such as a non-cooperative director or representative from Chikugai.

## V. Conclusion

Based on the six evaluation indicators derived from the Freeman model, the organizational performance of Kako LID is as follows (Table 11).

Table 11. Evaluation of the organizational performance of Kako LID

NO	Indicator	Evaluation
1	Source of leadership	Yes
2	Responsibility of leader and staff	Yes
3	Share system of water delivery and obligation	Rather weak
4	Head and tail distinction	Yes
5	Water resources control ability	Yes
6	Members' support to WUA	Yes
	Overall performance	Successful

Even though indicator 3 (share system of water delivery and obligation) has been evaluated as “rather weak” because the share of vote of Chikugai members is smaller than their share of cost, the other indicators showed good performances at Kako LID. Hence, the author evaluates the organizational performance of Kako LID to be successful, on the lines of a WUA. Kako LID's performance corresponds to Freeman's model of a

successful WUA, although some issues still need to be resolved.

One of the most important factors for the successful performance of Kako LID is the existence of the distributional share system in which each member's share of water is equivalent to his/her share of costs (ISF payment and participation of communal works). Freeman (1992) states that the amount of water received by each member should be roughly proportionate to the share of system costs paid by each member. Meanwhile, in many developing countries, the ISF is set at a fixed rate per area. This is an unfair system for farmers who experience water shortage downstream. In Kako LID, the ISF is also charged by the size of farmland per hectare. However, Kako LID could avoid this problem because they resolved the water shortage even in the downstream area with the installation of the pipelines. Hence, the head and tail distinctions in the service queue have been eliminated, and equal water distribution has been realized. If members have farmlands of the same size, they receive the same amount of water, including in the head and tail portions. Therefore, this suggests that the farmer pays ISF proportionate to the volume of water that he/she receives. Freeman (2009) states that if a member receives more water, he/she must pay more ISF. Therefore, in Kako LID, if a member's farmland is bigger, he/she must pay more ISF.

Another factor is that Kako LID could have a high water resource control ability after Kako LID was connected to Toban-Yosui LID, so as to provide enough water to the Kako-ooike reservoir, and moreover they installed the pipelines in LID. After these improvements, Kako LID currently has irrigation facilities which can provide enough volume of water in a timely manner to all LID members.

Moreover, Kako LID has dedicated leaders as president, vice president,

and directors. These LID leaders are also leaders of the local community. Each Jichikai is responsible for choosing the leaders (director and representatives) of Kako LID. These leaders devote themselves actively to their duties of the management of Kako LID with only a small amount of allowance, almost akin to volunteering work, because they consider the LID tasks as the one of the duties in their own local community.

Further, Kako LID has a diligent water tender, and a competent and hardworking staff who prepares the documents for ISF collections, etc., and promotes the collection of ISF from each member.

The LID members are also very cooperative toward LID activities. It is reflected in the high collection rate of ISF and the participation rate of communal labor.

Above all, each Jichikai has a strong will that they would like to treat the Kako LID, which has a long history, as their precious assets. Since a long time, the local community has had a good tradition of managing the Kako irrigation system in a stable way. And these days, the community people have inherited this tradition.

Meanwhile, there are also problems in the management of Kako LID, given that the LID has functioned for a long time on the condition that the Jichikai supports the LID management as the subordinate organization of Kako LID. In the past, Kako LID had depended on volunteer labor and the high morale of the local community. However, nowadays, many residents in Jichikai are part-time farmers with jobs, and it is difficult for them to participate in LID activities. Since the salary of the LID staff is quite low, it is impossible to hire full-time employees, prompting LID to rely on volunteers in their sixties and seventies, who have retired from their former jobs. If the local community which has supported the Kako

LID becomes weaker, Kako LID may lose its foundation. It is necessary to address this problem properly. Otherwise, there is a danger that the present high quality of LID management might deteriorate in the future.

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