

## Local Trade of Water Rights in Pre-modern Japanese Irrigation System

**Mikiko Sugiura**

Graduate School of Agricultural and Life Sciences, the University of Tokyo  
Room,616, Bldg.7A, 1-1-1 Yayoi, Bunkyo-ku, Tokyo, 113-8567 JAPAN  
asugiura@mail.ecc.u-tokyo.ac.jp

### **Abstract**

This paper analyzes the factors underpinning the local trade of water rights through an examination of the case in *Kami-yokoyama* village in *Sado Island*. Although out of six factors the difference in water demands caused by the hydrological conditions cannot be underestimated, the case study highlights the importance of the water rotation system that serves as a background of water rights trade. Water rotation system is characterized by its community-based resources management. Since “rights” means not only rights of “quantity” but also “order”, the trade of water rights did functioned in two ways: (1) water dividing and (2) a kind of conflict-resolution mechanisms. The trade itself was abolished by the Land Improvement Project. Yet the water rotation system and water dividing mechanism essentially remain in place. The pipelined project that will be completed by 2009 might bring the big change to an idea of sharing water. This may lead to another phase, which will have relatively relevant implications and lessons for an arid or semi-arid area.

### **Introduction**

The purpose of this paper is to identify the factors that contribute to the local trade of water rights in the pre-modern Japanese irrigation system. In the case of Japan, water rights are usually attached to land ownership after the modern legal system was introduced since the 1900s. However, evidence shows that the de facto trade of water rights occurred in some areas of Japan, and continued until the readjustment of arable land or land improvement projects. This study focuses on one of such areas, *Kami-yokoyama* village in *Sado Island* (see Figure 1), and examined the case of local trade of water rights. First, the paper gives a brief overview of the case. Second, it analyzes the key factors which made the trade possible, and highlights specific aspects of the water-use system as community-based resources management. The study relies on a variety of sources to analyze the factors including field research. However, since the water rights trade was operationalized more than 30 years ago, some information has come from interview with elders of the village and documents owned by them. Finally, the paper describes the present water use, and discusses the implication of local trade of water rights as pre-modern economic system.

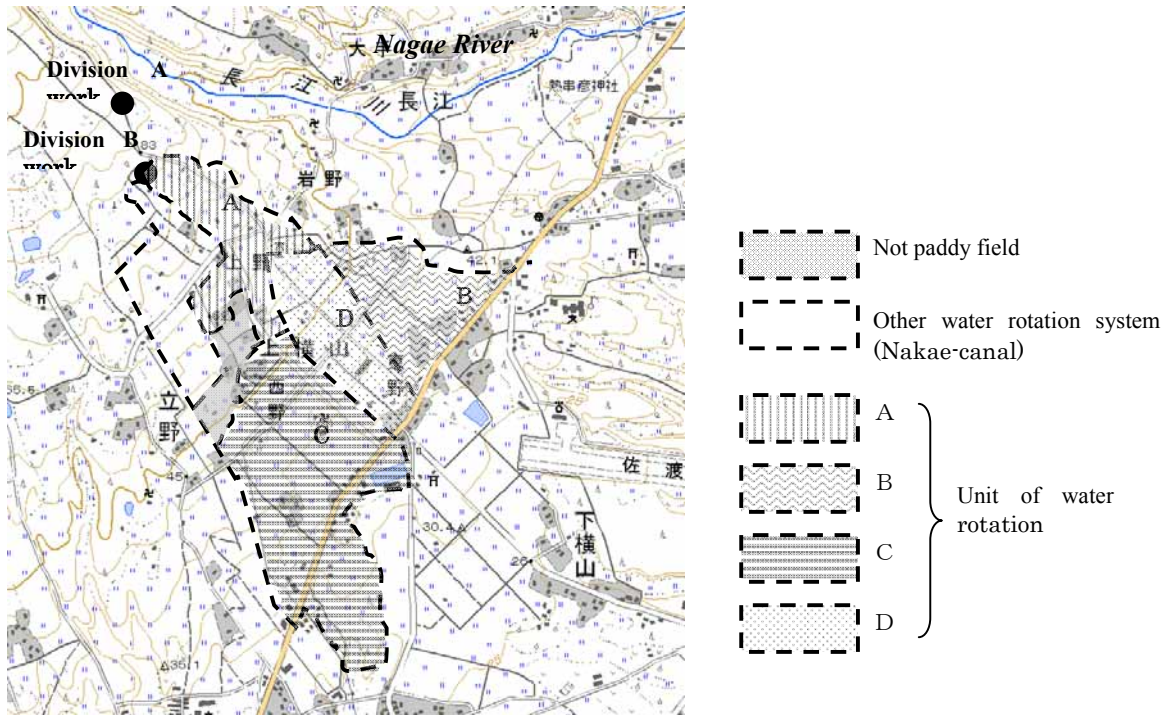


Figure 1. Map of Kam-yokoyama village in Sado Island, and each unit of water rotation. Source: map with a scale of 1 to 25,000 published by Geographical Survey Institute

### Case Overview

Water rights were traded in *Shimo-yokoyama* (downstream) and *Kami-yokoyama* (upstream) until 1931 and 1969 respectively along the *Nagae River* in *Sado*. The number of permits (or water appropriations) was 25 in *Shimo-yokoyama* (Kitamura, 1973) and 50 in *Kami-yokoyama* (Sugiura, 2005), whose irrigation area was twice as large irrigation areas. Water rights were first introduced to the areas by the construction of an irrigation canal from *Nagae River* around 1600. The policymakers of the time established the concept of water rights in the dry season, distributing the newly available water equally to each household. The unique feature of this system is that it allowed one farmer to hold more than two water right permits acquired by trade and it also allowed trades between outsiders (merchants) and farmers. It resulted in the distribution of water rights proportionally to income gaps and water scarcity in the end.



Photo 1. Costume of getting a twig from *Satoyama*, and setting it at a diversion work as a signal of water rotation

It is interesting that water “right” means not only the right of “quantity” (i.e.how much they could take) but also the right of “order” (i.e.when they could take water into their own paddy field). This is due to the distinctive water-use system common in Monsoon Asia known as water rotation. In this case, the paddy field was divided into four units according to water rotation (See Figure 1). The contract of water-rights trade mostly showed which unit, what number in the unit, who the former owner, and how much the quantity was. The *Kami-yokoyama*’s

water rotation begins from the first of June including *Shimo- Yokoyama* located disadvantageously downstream. The first 12 hours is for *Shimo- Yokoyama*, and the second six hours for unit A, the third six hours for unit B, the fourth six hours for unit C, and the final six hours for unit D. It takes 36 hours for one rotation, and continues during rice farming. There were 50 water rights allotted into four units, such as seven in unit A. Water rotation system strongly needs community-based resource management such as monitoring and maintenance. For example, it is a custom in *Shimo-Yokoyama* that farmers take a twig from common-used forest (*Satoyama* in Japanese), and put it at the point of water diversion as a sign of their order (see Photo 1). This shows us that local trade of water rights was a form of pre-modern economic system, which was supported by community-based resource management.

### **Key factors of trade**

What made these trades possible? There are six important factors: 1) the difference in water demands due to the hydrological conditions of the areas, 2) “moderate scarcity”, 3) the homogeneous status of farmers at the beginning, 4) the coexistence of freedom and obligation within the system, 5) the moderate community-ship of the villages in terms of water use, and 6) the lack of large landowners and the spirit of self-dependence.

Above all, the difference in water demands (above factor 1) caused by the hydrological conditions cannot be underestimated. Since *Kami-yokoyama* is located in an alluvial fan, the upland (dry area) and the lowland (intake area) differ in water requirements for agriculture. This geographical condition not only brought about the concentration of water rights in the upland around 1900 but also promoted the trade of water rights. By contrast, *Shimo-yokoyama* (the lower canal region) is located in a flatland, resulting in less difference in water requirement. The area, however, had a tighter water rotation system because it relied highly upon the surplus water of *Kami-yokoyama*. In this sense, *Kami-yokoyama* had a different water scarcity problem and a different hydrological condition.

### **Water rights trade as a conflict-resolution mechanism**

Water rotation systems are generally managed by the community or water users associations. They are dealt as long-enduring CPR institutions (Ostrom, 1990). Her eight design principles show essential elements and conditions that help to account for the success of these (See Table 1). *Kami-yokoyama*'s case clearly contains No. one, two, four, seven of eight. The point No. six requires attention. The local trade of water rights did function as a coordination system by transferring water rights from less use to more use. More than 400 years many water conflicts occurred not only between upstream and downstream, but also between farmers in *Kami-yokoyama*. While they had many opportunities for consensus building for “quantity” and “order” such as meetings of representatives at village level, water rights trade did work complementarily to settle the controversy at farmer level. Both of them were based on farmers' “voluntary” decision. One explanation for the pre-modern economic system may be that the water rotation system as CPRs can co-exist or include the pre-modern economic principle. Another explanation may be that water rotation system is not compatible with the pre-modern economic principle, and community as a safety net must have offer to help for vulnerability.

Table 1. Design principles illustrated by long-enduring CPR institutions

1	Clearly defined boundaries
2	Congruence between appropriation and provision rules and local conditions
3	Collective-choice arrangements
4	Monitoring
5	Graduated sanctions
6	Conflict-resolution mechanisms
7	Minimal recognition of rights to organize
8	Nested enterprises

### Present water use and implications

There are three phases for irrigation-water use in *Kami-yokoyama*; the first is when the local trade of water rights was in process, the second is after the trade was abolished by the readjustment of land improvement projects implemented by the state authorities, and the third is after the pipelined irrigation project that will be completed by 2009. Even in the second phase, water rotation systems themselves remain in place to work efficiently as a water distributing mechanism. In the current system, *Shimo-yokoyama* (downstream) is allotted 12 hours while *Kami-yokoyama* (upstream) 24 hours. The important point to note is that they have shared common irrigation canals, and have divided the irrigation water by the hour since around 1600. However, as the pipelined project will be completed by 2009, they can intake water whenever in need of water with the ratio of *Kami-yokoyama* to *Shimo-yokoyama* of 0.5. The big change resulting from pipelined water will mean that their water use is moving to the next phase. It shows that there is the possibility for the present rotation system as community-base resources management to be affected by this change.

In general, there are two principles for how to distribute irrigation water in the Japanese irrigation system; one is a principle of acquired rights (*Koden-yusen*), and the other is a principle of upstream advantage (*Jyoryu-senshu*).



Photo 2. Diversion work A



Photo 3. Diversion work B

and the other is a principle of upstream advantage (*Jyoryu-senshu*). In this case, additional three additional measures (division works; time control over water rotation; local trade of water rights) do or did work to distribute irrigation water. First, the division works (A: Photo 2 built around 1600, and B: Photo3 built in 2007 and located downstream of A) divide the water according to the result of consensus building. A canal map (See Figure 2) shows that acquired rights exist and the rigid ratio control by each division work is important. Second, the time control by people's monitoring also plays a significant role in dividing water as a form of community-based resources management. As referred to above, using a twig of common used woods *Satoyama* as a time signal serves as an example. Third, it is interesting to note that local trade of water rights in accordance to the water available, and functioned as a water-dividing mechanism. It admits of two interpretations as mentioned, one as a part of CPRs and the other as no more than dividing mechanism without safety net. Water rotation system did serve as an important background of the local

trade, and thus seems reasonable to suppose that the local trade of water rights is compatible with Commons. In addition, it shows the possible relationship between an economic system and community-based resources management.

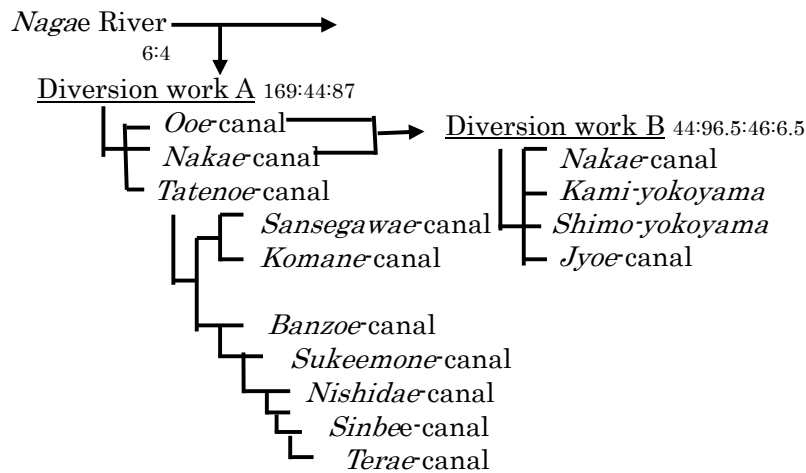


Figure 2. Canal map

## Conclusion

In *Kami-yokoyama*, located upstream of *Nagae-River*, the trade of water rights occurred under some conditions. Although the difference in water demands due to the hydrological conditions of the areas was important over all, this case study suggests the difference of water use between arid or semi-arid areas and non-arid areas can hardly be ignored. Since water “rights” means not only “quantity” but also “order”, water rotation system as community-managed resources management serves as an important background. One of examples is that the trade of water rights did function as both dividing water and as kind of conflict-resolution mechanisms. This suggests that the pre-modern economic principle was compatible with CPRs. The trade itself was abolished by Land Improvement Project. Nevertheless, the water rotation system and water dividing mechanism essentially remain in place. However, since the pipelined project will be completed by 2009, the big change in the concept of sharing water may lead them to another phase that will have implications for arid or semi-arid areas.

## References

- Kitamura T. (1973). 11 chapter In: *Historical analysis of Japanese irrigation water practice (case edition)*, Iwanami Shoten, Tokyo, pp.359-431.
- Sugiura M. (2005). An examination of the factors concerning water right trading in Japanese History: A case study of the former Kamiyokoyama Village, Sado City, *Niigata Prefecture*. *Journal of Water and Environmental Issues*, vo.18, 1-14/
- Ostrom E. (1990). *Governing the Commons*, Cambridge University Press, NY, pp.58-142