Institutional Analysis of the Obara Pond, Niiike Buraku, Japan

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1 Part I: Static Analysis - Collective Action

This case was part of the original CPR database developed in the 1980s by Edella Schlager and Shui Yan Tang at Indiana University. The case study was described in 1959.

The case study focuses on the provision of irrigation water from a small pond in the absence of external regulation of enforcement. At the beginning of the period discussed by the authors, the typical Commons dilemma of such a situation (i.e., free riding, overexploitation) seems to be solved due to the characteristics of the community in which the SES under consideration is embedded.

1.1 The Commons Dilemma

The potential source of a Commons dilemma in this system is the coordination of individual efforts without the presence of a centralized authority. The resource is the small Obara pond used by Niiike buraku residents and farmers for irrigation.. Collectively managing a pond enables the exploitation of the economies of scales that these infrastructures entail.

The agents in the area seem to have successfully solved the typical Commons dilemma that might arise under these conditions and jeopardize the provision of common pool resources, namely free-riding (e.g., using irrigation infrastructure while avoiding maintenance costs) or over-exploitation of the resource. This success is due to two main characteristics of the system:

1. The agronomic technology of the area (primarily rice paddies) entails almost a fixed land / water ratio, so that benefits from irrigation are clearly defined, and thus costs or individual efforts can be clearly assessed.

2. The tight connections among the members of the community engenders a high level of trust and of co-monitoring potential for resource use and irrigation maintenance involvement[see 1.3 Attributes of the Community].

1.2 Biophysical Context (IAD)

1.2.1 Natural Infrastructure

The resource is irrigation water, which is provided by the Obara pond. Climate is characterized by relatively high rainfall variability, so that the management of the hydrology has to address potential risks from both flooding and droughts .

1.2.2 Human-Made Infrastructure

The Obara pond is a relatively small reservoir. No information is provided on the origin of the pond itself (how and when it was built). No information is provided on the technological characteristics of the pond. The pond seems to be filled in by collecting drainage water from the surrounding hills. The pond provides water for 24 households, for a total of 10 acres.

The agriculture is mainly characterized by paddy fields, which covers 85% of Niiike. The paddy technology is highly intensive both in terms of input (labor) and output (double harvest per year). These two characteristics are strictly linked and mutually reinforce each other: high yields sustain a large population that in turn is needed to maintain the paddy technology.

1.3 Attributes of the Community (IAD)

The sub-community of households that manage the Obara pond is fully included within a community named a "buraku". The buraku is characterized by the following: a) daily, face-to-face interactions among members, b) low mobility of people, and c) few exchanges of land propriety rights. A high level of mutual trust and reliance emerges in these conditions and in turn the solution of the coordination problem, and resolves the related uncertainty in the long run .

Agricultural technology makes cooperation highly relevant. The construction and maintenance of paddies and the related Obara pond irrigation system are complex and labor intensive processes that require more labor than household units can provide. Additionally, all households rely on functioning irrigation systems, requiring effective buraku-wide cooperation.

1.4 Rules in Use (IAD)

- **Boundary rules.** A fixed number of households belonging to the buraku who require irrigated water have access to the resource (16 households). Land reform regulations developed during 1946-1947 restrict land ownership to community members. Legal rights to access irrigation water go "automatically... with the ownership of irrigation land" (Beardsley et al. 1959:141). Communities (burakus) rather than individual households manage irrigation water.

- **Payoff rules.** The pond is managed by the farmers and households who benefit from it. The individual efforts are proportional to the benefits

(Beardsley et al. 1959:143). Every 3-4 years, the buraku gathers to drain the entire Obara pond and to clean it of weeds. The event is community festivity, which gathers people from the whole area, beyond the beneficiaries of the pond. The fish harvest is shared among all the participants at the event.

- **Position rules.** Four household members assume the role of water guards, and rotation is based on 16-year cycles. While in charge, the guards receive a payment at a token rate, with funds that are collected from community members based on their acreage of irrigated land as well as from previously-collected regional water taxes (Beardsley et al. 1959:144).
- **Choice rules.** No information is provided.
- **Aggregation rules.** No information is provided.
- **Scope rules.** No information is provided.

1.5 Summary

Original authors deemed the coordination of individual efforts around the Obara pond irrigation system a successful instance of common pool resource (CPR) usage and management.

2 Part II: Dynamic Analysis - Robustness

2.1 Dynamic until 1959

In the original study, the only information regarding the dynamics of the systems are related to the evolution of the agriculture in the area up to the time of the case study description (1959). This is schematically presented in Figure 1.

The SES was originally characterized by 1) dry fields, 2) cotton as a cash crop and 3) the under-development of the paddy agriculture due to difficulties in drainage. Two major external shocks affected the SES:

- Link 8: the openness of the Japan economy to US cheaper cotton, which severely affected the profitability of cotton in the area
- Link 8: a call for public policy support for the development of irrigation infrastructures across Japan. Public policy financially supported the construction of the irrigation infrastructures and the rationalization of land/water patterns that enabled the flourishing of the paddy agriculture.

The two shocks drastically changed the nature of the SES, turning into the 1959 system characterized by:

- A. Resource: Water
- B. Resource Users: Farmers using irrigation

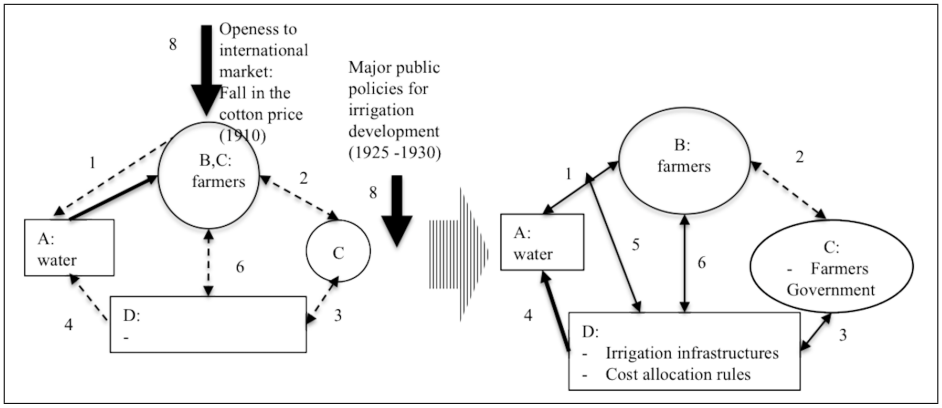

Figure 1: Coupled infrastructure representations of the Obara pond socioecological system, both before (left) and during (right) the 1959 analysis.

- C. Public infrastructure providers: Farmers using irrigation (identical to RUs during canal and pond maintenance, construction, and water guard allocation)
- D. Public Infrastructure: irrigation infrastructures, including primarily Obara pond, water guards (monitors), and distributive canals
- Link 1. Irrigation water enables paddy agriculture
- Link 2. Farmers are equal to the public infrastructure providers regarding canal and pond maintenance, construction, and water guard allocation
- Links 3. and 6. Farmers provide the maintenance of the pond, and they formulated a set of rules for the cost allocation
- Link 4. Public infrastructures (i.e., canals and water guards) reduce variability in water resource availability via complex canal and Obara pond management and maintenance
- Link 5. Public infrastructures (i.e., canals and water guards) ensure consistent, proportional use and maintenance of Obara pond water, mitigating variation in water availability to rice cultivators due to flood and drought risks.

2.2 Possible Dynamics After 1959

Subsequent dynamics are not recorded in the original study, but the use of results of studies carried out for similar SESs could be considered legitimate due to: 1) the widespread use of reservoirs (= ponds) as irrigation source in Japan, 2) a number of policies of extreme importance for the rural landscape

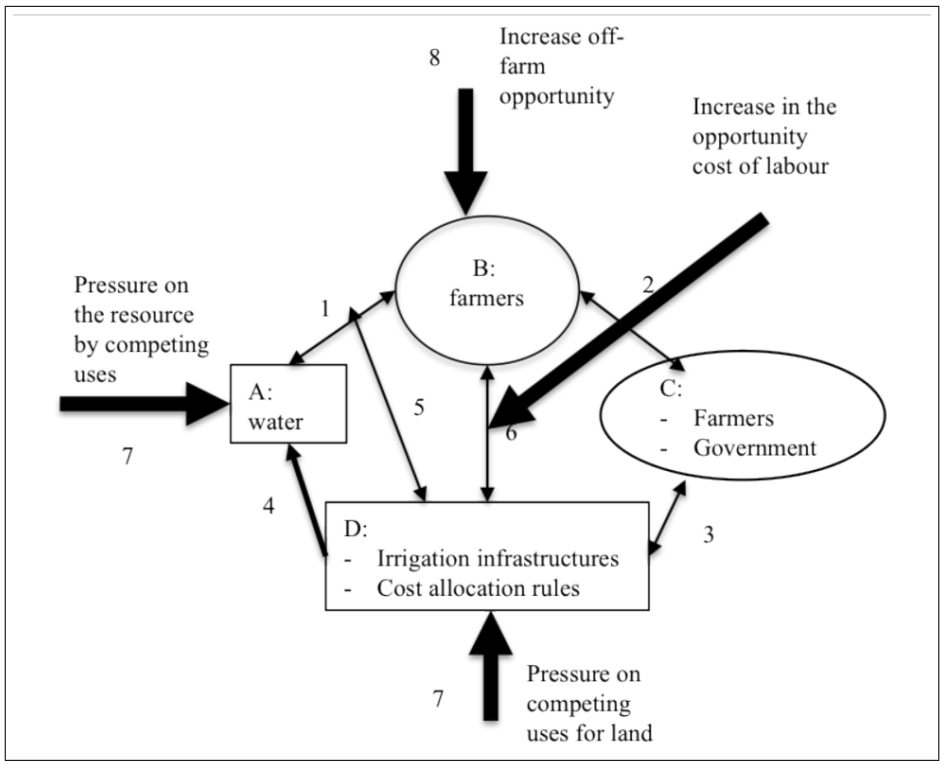

Figure 2: Possible shocks and exogenous drivers to have affected the Obara pond SES following 1959.

development have been applied extensively in the whole country, 3) the relative high homogeneity of agricultural practices, mainly paddy agriculture.

Data show that the relative importance of reservoirs compared to other water sources, and the absolute number of reservoirs have declined since the end of World War II (Mogi 2011). This trend could be caused by 1) the overall decline of the relative importance of agriculture, 2) specific characteristics of the reservoir technology, 3) a further rationalization of the link between water and land in the whole of Japan (for further information, see Mogi 2011 and Sugiura et al. 2013).

Based on the information available, Obara Pond and like SESs within Japan likely faced several notable external shocks (Figure 2).

Link 8: Increase off-farm opportunities

This could have two relevant effects for the potential solution of the common dilemma:

1. the reduction of the number of people employed in agriculture, that in turn reduces the average provision of efforts for the maintenance of the systems; moreover, the high opportunity cost of labor is likely to reduce

the private contribution of time to the provision of the CPR

2. rapid changes in the composition of the community, that in turn increase the uncertainty over the potential reciprocity of the individual contribution to the CPR.

Link 7: Pressure on competing uses for land
Reservoirs occupy land. With increasing urbanization, land becomes scarcer and other forms of water sources that occupy less space are preferred over reservoirs.

Link 7: Pressure on the resource by other destinations, e.g., industrial, civil.

3 References

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4 Contributors

- Shui Yan Tang, Indiana University

- Edella Schlager, Indiana University

- Matteo Zavalloni, Arizona State University

- Amy Rieth, Arizona State University