The Obara Pond (Japan)

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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 (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 coordination of individual efforts without the presence of a centralized authority for the management of a small pond for irrigation water is the source of the commons dilemma. In the area, the irrigation water is either coming from a canal, from private ponds, or from collectively managed ponds (the Obara pond is a collectively managed pond). 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., maintenance of the infrastructure is not provided) or overexploitation of the resource thanks to two main characteristics of the rural community in which they are embedded:

1) The agronomic technology of the area (mostly 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 [educated guess].
2) The tight connections among the members of the community engenders a high level of trust [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 take into account both flood and drought risks [quoted].

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 16 households, for a total of 10 acres.

The agriculture is mainly characterized by paddy fields, which covers 30% to 60% of the individual proprieties. The paddy technology is highly intensives 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 [quoted].

1.3 Attributes of the Community (IAD)

The sub-community of households that manage the Obara pond is fully included within a community named "buraku," and takes on all the characteristics of this larger entity. 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. It seems then that high level of mutual trust might emerge in this condition and in turn might help the solution of the coordination problem, and the related uncertainty in the long run [educated guess].

The agricultural technology makes cooperation highly relevant. The construction of paddies is a complex and labor intensive technique that is likely to require more labor than household units might provide. The irrigation system also requires a common effort. Cooperation thus seems to be a common element in the economy of the area.

Moreover, land is a relatively scarce resource in Japan, and that in turn reduces the rate of land property exchanges, so that the community members are, and are expected to be, relatively stable over the years [educated guess].

1.4 Rules in Use (IAD)

- **Boundary rules.** There seems to be a fixed number of households that have access to the resource (16 households) but it is not clear how it developed and whether the rule is flexible.
- **Payoff rules.** The pond is managed by those farmers who benefit from it. The individual efforts are proportional to the benefits. This seems to be relatively clearly defined, although informally, since the agronomic technology of the area (paddy) is characterised by an almost fixed land / water ratio [educated guess]. Every 3-4 years a major operation is required to drain the pond 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 among the members and are based on the size of the irrigated land.
- **Choice rules.** No information is provided.
- **Aggregation rules.** No information is provided.
- **Scope rules.** No information is provided.

1.5 Summary

The coordination of individual efforts for the management of a collective pond is the source of the commons dilemma. The pond provides irrigation water needed for the paddy agriculture of the area. The characteristics of the agricultural sector (clear benefit/cost ratio) and of the community (stable and repeated interactions among the members) in which the system is embedded provide a favorable environment for the solution of the commons dilemma.

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.

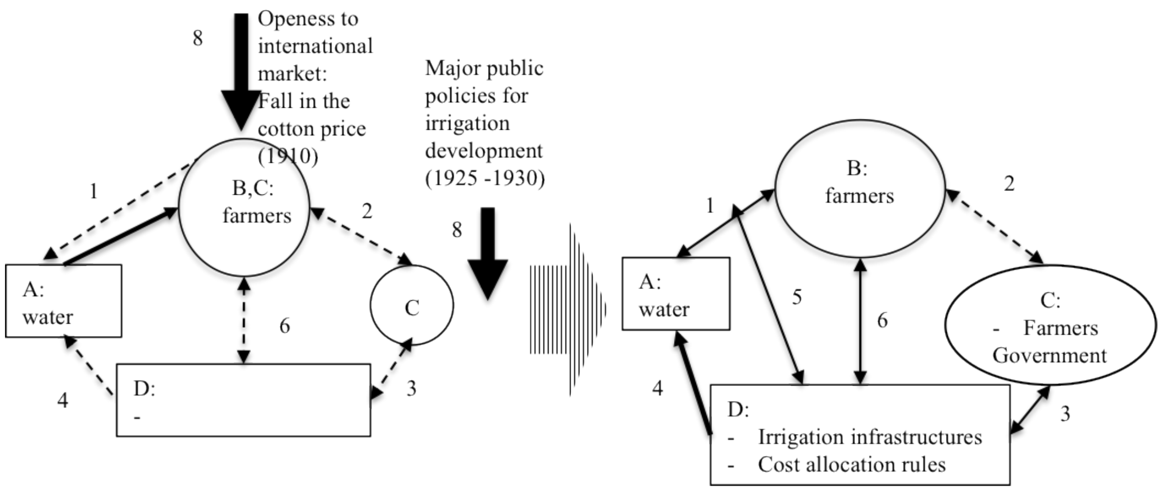

Figure 1 - Dynamics of the SES "Obara Pond"

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 in the whole Japan. The 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, that turn into a system characterized by:
A. Resource : Water.
B. Resource Users: Farmers using irrigation.
C. Public infrastructure providers: government, farmers.
D. Public Infrastructure: irrigation infrastructures.
1. Irrigation water enables the paddy agriculture.
2. Farmers are the public infrastructure providers.
3. and 6. Farmers provide the maintenance of the pond, and they formulated a set of rules for the cost allocation.
4. and 5. The pond ensures the access to a stable resource flow.

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 policy of extreme importance for the rural landscape 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 been declined since the end of the World War II (table 1 and graph 1). This trend could be caused by 1) the overall decline of the relative importance of agriculture (see table 2), 2) specific characteristics of the reservoir technology, 3) a further rationalization of the link between water and land in the whole Japan

Table 1 - Changes in the relative importance of irrigation water sources (Mogi 2011).

	Rivers	Groundwater	Reservoir
1946	68%	5%	18%
1996	87%	1.6%	11.1

Graph 1 - Number of reservoirs from 1950 to 2000 (Mogi 2011).

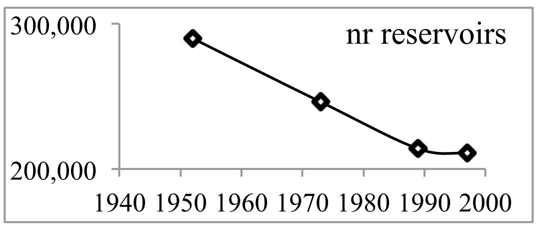

Table 2 - Changes in the relative importance of agriculture in Japan economy

	1959	1970	1990	2000	2005
Nr of farms (1000)	6174	5402	2970	2336	1963
rice profits / tot profits	51.90%	38.60%	28.60%	27.50%	22.80%
Off-farm income (%)	31.70%	63.50%	73%	82.10%	64%

Based on the information available (Mogi 2011, Sugiura and Tajima 2013) Obara Pond alike SESs might have faced several 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 reduce the average provision of efforts for the maintenance of the systems. Moreover, the high opportunity cost of labour 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 become scarcer and hence, ceteris paribus, other form of water sources are preferred over reservoirs.

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

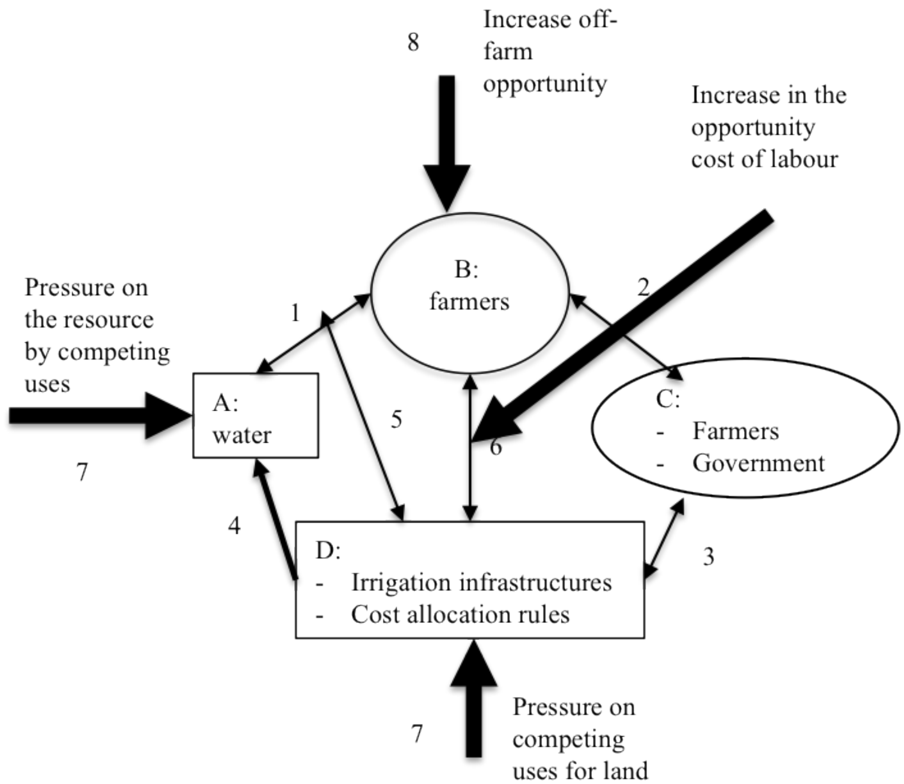

Figure 2 – possible shocks after 1959

Reference:

Beardsley, Richard K., John W. Hall, and Robert E. Ward (1959) "Japanese Irrigation Cooperatives." In VILLAGE JAPAN. Chicago: The University of Chicago, reprinted in (1980) IRRIGATION AND AGRICULTURAL DEVELOPMENT IN ASIA: PERSPECTIVES FROM THE SOCIAL SCIENCES, edited by Walter E. Coward Jr., 127-152. Ithaca, NY: Cornell University Press.

Mogi, A., 2011. The Evolution of Reservoir Irrigation Systems as Commons in the Dry Climate Region of Contemporary Japan, in: Sustaining Commons: Sustaining Our Future, the Thirteenth Biennial Conference of the International Association for the Study of the Commons.

Sugiura, M., Ishii, A., Tajima, M., 2013. Collisions of Traditional Commons with the Modernized Institution of Rice-Paddy Irrigation Systems in Japan, in: Commoners and the Changing Commons: Livelihoods, Environmental Security, and Shared Knowledge, the Fourteenth Biennial Conference of the International Association for the Study of the Commons.