Felderin Irrigation System (Torbel, Valais, Switzerland)

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1 Part I: Static Analysis - Collective action

The Felderin irrigation case was part of the original CPR database developed in the 1980s by Edella Schlager and Shui Yan Tang at Indiana University. The original CPR report was available at `https://seslibrary.asu.edu/seslibrary/case/79/cpr`.

The key resources (natural infrastructure) in the system are land (private) and perennial streams (shared). The key resource relevant to the commons dilemma faced by the community is irrigation water (common-pool). Törbel has three irrigation systems or bisses (German: Suone, English: man-made watercourse): the uppermost, Augstborderin, was administered by the association of users while the lower two, Springerin and Felderin which are smaller and older, were regulated without central authority or official mechanisms for adjudication. Data of this case study was collected from Netting's work in 1974. Subsequent to the previous document, one follow-up has been found on the canton of Valais. It talks about the use and management of bisses in the canton of Valais focusing on Bisse de Vex, another irrigation channel located in Veysonnaz, canton of Valais, Switzerland.

1.1 The Commons Dilemma

- The water appropriation problem was addressed through creating an intricate water sharing schedule that was based on the movement of sun and shadows on the surrounding landscape. This complex schedule caused inequality in water shares, dispute over the shadow markers, waste of water and time and occasional theft of water. Conflicts were settled privately, some flexibility was introduced to the system by allowing users to buy water from the Church, to trade water, and to use water during their allotted period for any meadow they own in the area served by the irrigation networks. (Netting, 1974).

- The potential under provision of public infrastructure was overcome. The public infrastructure was constructed, managed and used by the local association of farmers in Törbel.

1.2 Biophysical Context (IAD)

- **Natural infrastructure:**

  Törbel is a small, remote village situated in high, steep Alpine region, Switzerland. The regional arid climate severely limits agriculture and herd activities. Restricted by the annual precipitation of 500 mm, crop yield and grazing heavily rely on irrigation. Along with the Springerin irrigation system, the Felderin system is the simpler, smaller, and older irrigation network in Törbel, irrigating 19 hectares of land. Most

Törbel farmers have their land widely scattered at distant meadows within the village. One meadow often consists of plots from several farmers.

- **Hard human-made infrastructure:**

  The water source is locally controlled. The Felderin system takes one third of the water from the nearby perennial stream, Törbelbach. The system is built of stone-lined channel and soil ditches, with wooden sluice and stone plates to control the flow of water. It grows essentially without planning. Maintenance is provided by a half dozen men working communally one day in the spring. The system is then left to run itself over the entire year (Netting, 1974).

1.3 Attributes of the Community (IAD)

- **Social Infrastructure** Törbel village is a closed corporate community with a total population of 583. The remarkable continuity of many local family lines is related to rules of village citizenship and accompanying property rights (Netting, 1981).
  The Felderin system is nominally administered by a village council. It is regulated without central authority or official mechanisms for adjudication. The time and duration for irrigating a particular plot is gauged by the movement of the sun and shadows on the surrounding landscape (basically functions as a clock); the order is determined by drawing straws.

- **Human Infrastructure** Within the village, literacy is general and most adults can perform quite complex bookkeeping and bureaucratic chores. Each individual can supply information on when and where he is entitled to water. But there is no unified knowledge or administration regarding the entire schedule of water sharing. Women do a great deal of irrigating and may be better informed in irrigation schedule than men (Netting, 1974).

1.4 Rules in Use (IAD)

1. **Position Rules:** Positions are assigned voluntarily.

2. **Boundary Rules:** Resource users are citizens from Törbel village. Appropriation of water is associated with land ownership of local residents.

3. **Choice Rules:**

   - Farmers can use water during their allotted period for any plot they own in the area served by the irrigation network.
   - Neighbors may trade water, one taking two continuous shares in one cycle while the other does the same in the next or in return for help at plowing or harvest.
   - Farmers can purchase additional water from the church, which has all water rights on Sunday.
   - When conflict arises over the watering schedule, confused farmers may consult older farmers who are reputed to have a good head for these intricacies.

4. **Aggregation Rules:** Farmers draw straws to determine the order in which the meadows should be watered.

5. **Scope rules:**

    - The annual irrigation period is from April to September during weekdays.
    - Within a meadow area, which usually contains plots of several owners, the sequence of watering within a day rotates every 16 days.

6. **Information Rules:** There were not explicit information rules mentioned in the study.

7. **Payoff Rules:**

    - Farmers who break the schedule and steal water repeatedly may receive warnings or have their stone plate thrown away by the injured party, which results in sanctions as losses of water.

    - If ditches were poorly maintained or water was left slowly unsupervised, soaked the earth, and caused a mudslide, the individual or association responsible could be sued for damages.

1.5 Summary

The Felderin irrigation is an example of an unsuccessful solution to the commons dilemma. Netting explained that this acephalous system of ordered anarchy illustrates that small-scale irrigation systems can function on the basis of an intricate series of water sharing agreements, each meshing with the others but known to individuals only insofar as their use rights are exercised. The loose schedule led to unequal water share. However, users refused to plan reorganization of the water schedule, and considered the successful change possible only with the installation of a pipe and sprinkler system that would radically alter the amount and nature of work involved in watering (Netting, 1974).

2 Part II. Dynamic Analysis - Robustness

There are no exact follow up studies available on this case. However, updated research on transition of CPR management structure of Bisse de Vex, a similar irrigation channel in Veysonnaz village that is along with the Törbel village located in the canton of Valais, Switzerland. It is possible to predict that Törbel was likely to experience similar social-economic change and shift of water use regimes as Veysonnaz. In-text parenthesis indicate corresponding links in the system representation (Robustness diagram) on the SES library.

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2.1 Update on the Commons Dilemma

In Veysonnaz, the use of Bisse de Vex constitutes a mixture of public, private, and common property: the water in the river is public property, the bisses are either common or public property (if owned by a local authority), the water in the channel is also common or public property and the water rights and land irrigated by the bisse are privately owned. The bisse is supervised and controlled by a self-organization in a form of co-operative that is governed by the bisse commission. The commission is the decision-making body of the co-operative

that meets twice a year. It rules for 4 years and is responsible for administrative and financial management of co-operative. The commission also appoints a "water-steward" who is responsible for the distribution of water rights. The maintenance work of the bisse is carried out by members of the co-operative.

2.2 Shocks, Capacities, Vulnerabilities

...to and of the Resource (link 7 to R):
Competition from low land intensive farming because of high value added of water use in different sectors: After the Second World War, water was the driving force behind the social and economic shift away from a predominantly agricultural society to a society focused on industry and services. The major shocks came from technical and economic development. Mountain farming experienced strong pressures to stay competitive with intensive agricultural practices in the Central Plateau and abroad (Kissling-Näf, Volken, and Bisang, 2002). This had a significant effect on the demise of the traditional self-sufficient farming system.

...to and of the Public Infrastructure (link 7 to PI):

Changes in hard infrastructure: the development of the irrigation system in Valais in the 20th century led to increased replacement of traditional irrigation systems with underground irrigation systems and sprinkler systems. The functioning of the modern sprinkler systems does not depend on the strict monitoring and sanction for their use and they do not require maintenance work by the co-operative (Kissling-Näf, Volken, and Bisang, 2002). This indicates the diminish of voluntary cooperation among users, which was critical to the operation of traditional irrigation systems.

...to and of the Public Infrastructure Providers (link 8 to PIP):
The Pubic Infrastructure Providers were the Resource Users (see link 8 to RU).

Changes in attributes of the community: population growth and the rise of industry in the post-war era increasingly attracted people away from agriculture while others were lost through emigration, as land became scarce commodity for the growing population. Farmers began to work - initially part-time and later full-time - in industry and tourism. Whoever still finds the enthusiasm to engage in farming as a sideline does so as a hobby and this is referred to as "leisure farming". This simultaneously marked the end of large-scale livestock raising and concern with the fulfilment of basic family needs and the shift in emphasis from the extended to the nuclear family(Kissling-Näf, Volken, and Bisang, 2002).

2.3 Robustness Summary

Water in the region became scarce because of the population growth and the rise of industry in the post-war era. That generated an urge to shift to a more competitive agriculture economy on one side, and on the other side, people moved away from agriculture or emigrated (also because of the economic attractiveness of other sectors). Farmers felt the pressure to be more competitive and changed the hard public infrastructure. All these had a significant effect on the demise of the traditional self-sufficient farming system.

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