Chiangmai Irrigation System, Thailand

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1 Part I: Static Analysis - Collective action

The Chiangmai village irrigation system is located within the Ping River valley in northern Thailand. The key resource system is the Ping River system and the key common-pool resource unit relevant to the commons dilemma is water. The original case spans 1971-1972 and reports 875 village residents and 206 households, of which 171 households are engaged in some farming activity. Farmers primarily cultivate rice in the monsoon season and other crops like soybeans, peanuts, and garlic in the dry off-season. The village draws from three irrigation systems in the valley. Farmers adhere to rules dictating water use and irrigation canal maintenance. The original case was considered successful in managing the shared water resource. Some key vulnerabilities include strain on water resources and changes in the agricultural export market.

1.1 The Commons Dilemma

- The Chiangmai village irrigation system is impacted by competition for water from upstream villages. Potter (1976) describes instances of conflict when upstream users attempt to overuse water in the dry season by blocking downstream flow in secret. Intensification of dry season cropping activities and rapid urbanization in the region starting from the mid-20th century also places a strain on available water resources (Cohen and Pearson, 1998). Decreased water quantity impacts proper water flow in the canals.

1.2 Biophysical Context (IAD)

- **Natural Infrastructure:** Chiangmai village is located within the Ping River valley in the Saraphi district of northern Thailand. The village is located downstream of the river and is thus at a lower elevation than more upstream villages. The monsoon season begins in June and peaks around September, the wettest month. During this season, the river level is high and paddy farming dominates the village activity. March through May is the dry season when the river is at its lowest level. Small freshwater fish, eels, freshwater crabs, and shrimp can be found in the river and connected streams and irrigation canals. The resource unit for the Chiangmai village system is water, which is used to irrigate farmland.
- **Shared hard human-made infrastructure:** There are three main irrigation systems shared by the Chiangmai village and other villages along the river: irrigation system X, irrigation system Y, and the government Old Ping River

Irrigation Project. The systems branch into smaller canals that service different areas of the village. They are designed to flow naturally through the village with the land's grade, but still be flat enough to flood the paddy fields. Irrigation system Y is the original case author's (Potter 1976) primary focus. This system branches from the Ping River north of the village. Irrigation system X is a modified traditional system branching north of system Y. Weirs made of sand, bamboo, or concrete have been constructed along the irrigation systems to control water levels depending on the season. Water gates are also used to control water movement. The sand and bamboo weirs, constructed by villagers for the village-level canal system, are usually washed away by monsoon flooding. They are rebuilt each year after the winter dry harvest season. Permanent raised boundaries, created in the past by carving out the valley floor into different fields, delineate village sections usually owned by a few farmers that share a draining canal. The Old Ping River Irrigation Project was created by the Thai government's Royal Irrigation Department. They constructed a concrete weir and water gates to draw water from the Ping River into one of its older channels.

- **Private hard human-made infrastructure:** Internal field boundaries made of mud or by digging are temporary and reshaped throughout the year to accommodate the crop being cultivated at the time.

1.3 Attributes of the Community (IAD)

- **Social infrastructure:** At the time of the original case study in 1972, there were 875 Chiangmai village residents composing 206 households (Potter 1976). Agriculture is the primary economic activity within the village, with only 35 of 206 households who do not farm. Households either cultivate their own land, lease land for farming, or are hired to farm other villagers' land. Farmers grow paddy in the wet season and other cash crops like soybeans, peanuts, and garlic in the dry season.
- **Soft human infrastructure:** A household's geographic location primarily determines which irrigation system it draws from. Although canals are under the control of the Thai government, the government allows local governance systems to manage the traditional irrigation systems. At each irrigation subsystem level, there is some elected representative. Farmers elect a village headman, usually someone of wealth and good standing, to oversee water usage and canal maintenance. Headmen also communicate between villagers and higher officials, including major canal headmen, irrigation system headmen, and district government officers. For the government-built canal, government workers handle construction and maintenance. Only people who own or control some land build the weirs for irrigation.

1.4 Rules in Use (IAD)

- Position Rules.
    1. A farmer or farming household who owns or rents land for agriculture.

2. A farm labourer is hired by farming households for agricultural tasks.
3. Headman of the village irrigation system.
4. Thai government workmen.

- Boundary Rules.
    1. Use of the irrigation systems is limited to farming households who own or lease land. Farming land is passed down through the family.
    2. Any village member may hire themselves out as a farm labourer.
    3. Headmen are members of their respective community (village, commune, etc.) and are elected by community members and are often wealthier, well-respected individuals.
    4. Thai government workmen are hired by the Thai government.
- Choice Rules.
    1. Users of the irrigation system must contribute to cleaning the canals and rebuilding weirs, or face a fine.
    2. During the dry season, irrigation users must follow the headman's directions for water rationing or face punishment.
    3. Headmen may impose a fine on farmers who violate irrigation system rules, and report repeat offenders to the district government officer for punishment.
    4. Users of the irrigation system may vote to elect their village irrigation system headman.
    5. Each year the irrigation heads decide when and how the irrigation canals should be cleaned and the weirs should be rebuilt.
    6. If farmers do not dig the canal deep enough the first time, they must go back to re-dig following inspection.
    7. After reconstructing the weirs, farmers must make offerings to the spirits of the weir or the structure will not last.
    8. Thai government workmen maintain the government irrigation system and operate the water gates in all three systems.
- Aggregation Rules.
    1. Headmen of the village are chosen through a village election.
    2. The village-level headmen represent their village's concern to higher officials within the system. They also relay orders and decisions from higher officials to their village.
- Scope Rules.
    1. The scope of a village headman is limited to their respective administrative village.
    2. The Thai government is responsible for maintaining only the government irrigation system.
    3. It is understood that the Thai government does not interfere with the operations of local irrigation systems, aside from hiring workmen to operate the water gates.

4. The amount of labor farmers must contribute to canal maintenance is proportional to the size of their irrigated land.

- Information Rules.
    1. Village irrigation headmen record the names of farmers who do not fulfill their labor obligations or adhere to the irrigation system rules.
- Payoff Rules.
    1. Headmen do not have to pay taxes on a portion of their land and do not have to contribute labor.
    2. Farmers will face a fine if they do not adhere to the irrigation system rules, imposed by the village headmen. Repeated violations may result in punishment from the district government officer.

1.5 Summary

The success of the Chiangmai irrigation system can be attributed to the strict rules surrounding water use and irrigation system maintenance, and the surveillance and enforcement mechanisms of these rules. In the dry season, irrigation system users adhere to a time-based rationing system. Following the monsoon season, farmers are required to rebuild weirs, and clean and re-dig the irrigation canals. Elected village irrigation headmen enforce these rules by imposing fines on those who do not adhere. The village does experience conflict with upstream villages who sometimes use more water than allowed during the dry season, which creates scarcity and competition. Elected village and irrigation headmen attempt to resolve such disputes, but conflicts continue to occur.

2 Part II: Dynamic Analysis - Robustness

In the original case study, the social infrastructure organized around the Chiangmai village irrigation system appeared strong. Potter (1976) describes that although the Thai Royal Irrigation Department took control of irrigation systems in the valley at the end of the nineteenth century, the government generally deferred to the existing, traditional governance systems for local irrigation systems. However, Cohen and Pearson's (1998) analysis of irrigation systems in the Chiangmai province suggests the system was not robust to market, ecological, and political changes. Over the course of the nineteenth century, the Thai government began to tap more into the agriculture export market and increased investment in irrigation projects. Farmers were encouraged to diversify their agriculture production, particularly in the dry season (when rice was not cultivated). Intense cropping activity began to place strain on the region's water supply during seasons when resources were already limited. In addition, Cohen and Pearson (1998) explain that the practices of rebuilding bamboo and wooden weirs annually was unsustainable in the face of ongoing deforestation. This growth in farming created new labor shortages, where farmers were not able to devote as much labor to rebuilding and maintaining the weirs. Farmer labor was an important factor in maintaining the Chiangmai irrigation system. Given these stressors, irrigation users began to rely more on state entities to maintain and

organize the irrigation systems. Although Cohen and Pearson (1998) discuss trends at the province-level, we can infer that Chiangmai village experienced similar effects on their irrigation systems. This suggests that the original system was not robust.

3 Part III: Case Contributors

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