

# Nae Pae and Muang Mai Irrigation Systems, Ban Pae Luang, Thailand

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## 1 Part I: Static Analysis - Collective Action

*Fai Muang Mai* is one of three irrigation systems along the Mae Klang River in the Chiang Mai Province, Thailand. Muang Mai is the most upstream of the Mae Klang River irrigation systems and provides irrigation to 800 hectares of riceland and orchards through a weir and canal network. The system is managed and maintained by an irrigation organization known as *Mu Muang Mai*, composed of farmers within the command area. The original case includes a comparative analysis of two traditional irrigation systems in Northern Thailand, the Muang Mai and Nae Pae irrigation systems (Tan-kim-yong, 1983), but this analysis will focus solely on Fai Muang Mai.

### 1.1 The Commons Dilemma

- **Potential Appropriation Problem or Poor Coordination of Appropriation**

The problem is poor coordination of water appropriation and distribution between water user groups. The biophysical context of Fai Muang Mai includes a steep elevation gradient and terraced farming, creating water supply disparities between upstream and downstream users. There is also seasonal variation in management: water users must manage for water shortage in the dry season and flooding in the wet season. This canal structure can lead to conflicts between head and tail users during water shortages, as traditional water rights allow upstream farmers to appropriate as much water as necessary before passing the water on to the next user.

### 1.2 Biophysical Context (IAD)

- **Natural Infrastructure:**

Water flow in the Mae Klang River is variable seasonally and annually. The wet season (May-November) delivers 90% of annual flow and can produce excess run-off and flooding. The dry season can produce water shortages (the irrigation scheme has no storage feature). The irrigation canal network first flows from high-elevation terraced fields before flowing down into valley farms.

- **Hard Human-Made Infrastructure:**

- Fai Muang Mai is a traditional emphmuang fai (canal and weir) irrigation system: it diverts water from the river into a weir and canal network which allows continuous flow from high- to low-elevation paddy fields. The weir structure is traditionally made of logs and bamboo stakes, which captures water and diverts it into primary and secondary distribution networks (irrigation canals, weirs, ditches, and gates). During the dry season, the main controlling structure (a concrete regulator) at the primary weir is used to leave the gate open and allow maximum water flow to the main canal. During the rainy season, the gate is adjusted more frequently to regulate water flow.
- Private infrastructure includes the farms owned by individual farmers. The size of each holding is relatively equal but farmers may acquire more land holdings. These farms may not be contiguous, so farmers may be members of various groups associated with irrigation system maintenance.

### 1.3 Attributes of the Community (IAD)

- **Social Infrastructure:**

The Muang Mai provides water for rice fields and orchards across 5000 rai ( 800 ha). Members from ten adjoining villages collectively manage the system through a canal-based organization known as *Mu Muang Mai*. Membership in Mu Muang Mai is limited to farmers (both land-owners and tenant cultivators) whose farms are within the physical boundary of irrigation flow.

The main weir is also important in annual rituals. Near the central weir is a small pavilion or *sala pak muang* and a spirit house or *hoh phi fai*, where Muang Mai activities (including meetings and fee collection) are conducted. The *phi fai* ritual is centered around the spirit which protects the irrigation weir and canals. These spirits belong to former irrigation leaders. This ritual has been performed annually since the irrigation system was created.

- **Human Infrastructure:** There is no information on human infrastructure in the original case study.

### 1.4 Rules in Use (IAD)

#### 1. Position Rules:

- *Mu Muang Mai*: The irrigation organization composed of farmers (both land owners and tenant cultivators) of the irrigated area who share water from the same weir (spans 10 villages). Mu Muang Mai manages all water and settles conflict resolution. The internal organization of the Muang Mai is as follows:
  - Irrigation leaders: responsible for identifying and planning for maintenance and management schemes.
    - \* *Mu huana*: top irrigation leader. Selected by vote by members at a meeting. Typically re-elected until retirement.
    - \* *Puchuey*: Four assistant leaders. Appointed by the huana.

- *Laam*: Messengers who facilitate flow of information between irrigation leaders and water users (appointed by the huana). There are 5 laam positions, each serving a particular zone, and are held permanently (until retirement or resignation).
- *Mu luk muang*: water users. Water users are further categorized according to a) type of cultivation (rice or fruit growers), b) season of cultivation (wet or dry), c) access to land (land-owners or tenant cultivators), and d) field location.
- *Mu khon tao*: Group of retired leaders who voluntarily serve as a senior advisory group to the huana
- *Khana kamakarn*: Special project committee who coordinates with district government during projects.
- External organizations: involved in irrigation activities during emergencies, requests for financial assistance, or during special projects.
  - *Nai amphoe*: Head of the District Office
  - *Nai Chang*: Head Engineer of RID Project

## 2. Boundary Rules

- Mu Muang Mai: membership is extended on the basis of ownership or cultivation of irrigated fields. The right to obtain water traditionally comes with the right to cultivate the land. Membership ends when they stop cultivating. Includes farmers from 10 adjoining villages.
- Only land-owning members of the Mu Muang Mai can nominate someone or promise themselves as candidates. The right to vote on these candidates is limited to owners of rice land. Each member has one vote, regardless of land holding. Members can also vote a huana out of the position during their term of service.

## 3. Choice Rules

- Mu Muang Mai: all members must contribute labor and other resources to ensure proper irrigation function. This includes irrigation tasks such as: water allocation, maintenance (repairing weirs, cleaning canal, etc.), conflict resolution, and wet/dry season rituals. All members have the ability to participate in voting for a leader, reporting violations of water use, planning work projects, contributing resources and labor to maintenance, and paying irrigation fees.
- Mu huana and puchuey: must identify and plan irrigation activities, make decisions, supervise work. They are responsible for coordinating with district government and RID agents.
- Laam must communicate messages from the irrigation leaders to the water users.

## 4. Aggregation Rules:

- All Mu Muang Mai members must participate in two general meetings (at the beginning of each growing season in December and May).
- Mu Muang Mai leaders may meet with leaders of other irrigation systems in times of drought.

- All members must appear when the organization calls for an emergency work force.
5. **Scope Rules:** There is no information on scope rules in the original case study.
  6. **Information Rules** Laam are responsible for creating information flow between huana and water users. When the pouchey have finalized the work schedule, they send a message to the laam who informs all members (by visiting house to house or shouting messages to the public).
  7. **Payoff Rules** Huan and pouchuey earn two types of rewards:
    - *Nam yok*: leaders free to use water without contributing additional labor or materials
    - *Kha nam loh* leaders receive direct payments from water users. Water fee collected from water users after harvest each season. Water fee proportional to amount of land cultivated in wet and dry season.

## 1.5 Summary

The success of the Muang Mai Irrigation System can be attributed to its organizational arrangements and cooperative behavior among its members. Muang Mai has a complex administrative arrangement which assigns members to small, task-oriented groups around leadership and maintenance (cite). Boundaries for membership are heterogeneous (ie: various membership categories exist based on farming practices) but well-defined. The organization is well-adapted to its biophysical setting and its external sociopolitical context. It has also successfully adapted to changes in central administration,

## 2 Part II. Dynamic Analysis - Robustness

Fai Muang Mai was built in 1880 in response to changes in central government and pressures on agricultural communities. From 1880-1983 (when the source document for this case was compiled), the Muang Mai irrigation system was reported to be a “well-maintained system and an administration entity under effective leadership which receives continuing commitment from its members” (Tan- , 1983). More research is needed to report on temporal dynamics (resource and social conditions, etc.) of this particular common-pool resource. The contributors thus far have been unable to locate any specific updates for this case study.

## 3 Part III. Case Contributors

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