

## **Structural Approach in the Participatory Muang Fai Irrigation Management**

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This paper analyzes the approach and principles that self-reliant farmers in a small- and a large-scale Muang Fai system in northern Thailand used in managing their irrigation systems. With keenness in water resources development, the farmers located their weirs where they could get abundant river flow and built their irrigation systems with an adequate capacity to supply water to all members on a continuous and simultaneous basis. These starting hydraulic conditions bailed them out of recurrent water conflicts that farmers with limited natural endowment and irrigation infrastructure faced. Hence, their attitude toward irrigation management was not geared towards conflict management. Rather, they were more oriented toward the structural approach in bringing about orderly irrigation management. Their participatory management process was composed mainly of a platform for exchanging information on physical conditions, water requirements and farming schedules, a forum for deciding a joint irrigation management plan, and a public commitment to honor the plan. The farmers who had agricultural productivity as their incentives and voluntarily identified themselves as Muang Fai members participated in the cross section of collective activities or functions, directly in the small-scale system, and through village sub-groups in the large-scale system. With close proximity, the small Muang Fai group used irrigation intake widths, which were relatively more precise, as the basis for water and cost distribution and kept straighter working rosters and financial accounts. With economy of scale, the large Muang Fai group used the more sloppy irrigation acreage as the basis for water and cost distribution and faced more risks of dysfunctions in their management process. However, the Muang Fai structural approach achieved an equilibrium because, in devising a harmonious irrigation management at the farm, village, and system levels, the horizontal as well as vertical social interactions between the members, their village irrigation delegates and their Muang Fai managers adhered to the principles that all members shall be equally treated, and all management activities shall be transparent and accountable to the members.

**Key words:** participatory irrigation management, Muang Fai, water management, equality, sociology of irrigation, structural-functionalism, sustainable development, natural resource management

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### **Introduction**

Irrigation technology has been incessantly developed and a large number of modern irrigation systems built in the post-war period are well equipped with sophisticated technologies, sometimes to the extent that being so fantastic obscures their necessity and functions. Still, irrigation engineers are constantly faced with the same old question of how to make the irrigation hardware serve its purpose in an efficient, effective and sustainable way. It

is clear that the answer cannot be found solely in the innovations because irrigation is an applied science that is always challenged by the real-world complexity of hydraulic, biological and human situations. Thus, irrigation managers need physical and information technologies for hydraulic and biological control as much as an instrument for directing human behavior. The managers who can afford high, and often expensive, technologies can be successful in preparing an efficient irrigation management plan and, if they have the totalitarian

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power, they can make all water users follow their plan. But in reality, not many managers can afford such technologies and the totalitarian power is not well-received in the civil society. As a result, their plan cannot realize its efficiency potential in an effective and sustainable way.

Among the array of irrigation management alternatives, participatory irrigation management has gained attention as a promising approach for solving the problems. Irrigation engineers are working domestically and internationally to realize it in many different ways, depending on their working contexts and their perceived definitions of participatory irrigation management. In this paper, I will analyze the approach and principles that helped farmers in northern Thailand successfully manage the development, operation and maintenance of their Muang Fai (literally ditch and weir) irrigation systems on their own. Two Muang Fai systems were previously reviewed (Ounvichit *et al.*, 2006 and Ounvichit *et al.*, 2008), each representing a small- and a large-scale Muang Fai system. I hope the practice of the farmers in these systems will provide food for thought for irrigation engineers interested in participatory irrigation management, provoke their “cognitive respect” to the rural people (Berger 1977 in Chambers 1983) and recognize the indispensability of technical and social integration in irrigation management.

### Pongsak Muang Fai System

This Muang Fai system in the Pai River is highly representative of the ubiquitous small-scale Muang Fai systems in the rugged terrain of Pai District, Mae Hong Son Province where limited arable land features small scattered patches. The system was initiated approximately 30 years ago by eleven lowland farmers who wanted to improve the productivity of their rain-fed paddy production. Each of these pioneers invested an equivalent of US \$100–125 for the construction. Thirteen other farmers were later accepted into the system upon their payment of approximately US \$450 for the expansion of the system capacity to serve them. The headwork of the system, a 37 meter long and 3–4 meter high crib weir fabricated with locally available materials like boulders from the river and trees from nearby forests, could be realized only through collective, not individual, action. The upper part of

the 2.5 km distribution channel served as a feeder canal meandering through rugged terrain down the steep slope while the lower part served as a supply canal running along the higher elevation side of farms.

In view of the large and dense forest serving as their catchment area (2000 times larger than their irrigation area on a topographical map) and clearly abundant river flow, the farmers decided to build their irrigation system with the capacity to serve every member continuously and simultaneously in spite of its high initial investment and subsequent maintenance costs. They calculated the capacity of their weir and canal by summing up the farm intake widths that each member chose independently from a selection of 20, 15 or 10 cm. Blocking the canal flow in order to divert water into specific intakes was forbidden because the farmers supposed that every farm should be subjected equally to the fluctuations of water level in the canal. When faced with water shortages, the first measure they took was to get more water by raising the weir crest, stopping leakages in the weir and canal, or setting a simple 45 cm tall bamboo barrier to intercept the dry-season low river flow into the canal. A time-based water distribution method was not favorable because it primarily needed more time and cost for water management and monitoring and, more importantly, could easily stir up suspicion and water conflicts.

Using simple technology, the Muang Fai system was not physically sturdy. It degraded fast and needed maintenance annually. The cost of its maintenance in 2005 was as high as US \$2,965 or 41% of its initial investment cost. Such high cost made continued membership an important factor for the existence of this small-scale Muang Fai system. With only 24 members, the Muang Fai group could not take the risk of losing any members; otherwise the remaining members would not be able to sustain the system. The overall annual maintenance cost was calculated based on the previous years' cost and water conditions. Heavy floods in the past year meant a need for higher cost than normal years. The calculation as well as the distribution of the cost was clearly disaggregated according to the purposes, i.e. the weir maintenance cost and the canal maintenance cost, as well as the categories of the costs of wood, labor and cash. The distribution

of the high cost was cautiously done to make the members confident that they were fairly treated. They based the cost distribution on the farm intake width or the volume of water each member used. The standard rates of cost for a 20 cm intake in 2005 was set at 10 man-day labor each for weir and canal maintenance works and US\$12.5 cash for necessary expense and remuneration. The 15 and 10 cm intakes bore 75% and 50% of the standard cost rates, respectively. The allocation of labor workload considered both the quantity and difficulty of the work and a working roster was well-recorded because not every member participated in the maintenance work on every working day. For canal maintenance, the farmers were organized into 3-4 teams of about 5-6 members to work on an assigned 8 m section in the first block until completion and then the teams moved to work in the next section in the second block. The process was repeated until the end of the canal was reached. Working in blocks like this allowed tail-enders to monitor the farm intake width and elevation of all other farms as well as the capacity of the main canal in its entire length. The head-enders accepted to work until the end of the canal even though they did not use the lower reach section in order to reciprocate the tail-enders who shared with them the tough load of weir and feeder canal maintenance.

All members participated actively in the cross section of the system management. They discussed and made verbal agreements on the system development, on water and cost distribution method, and on collective activities schedules under the leadership of a manager who came into position through direct election. This manager contributed to the group just as other members did. He served as the focal point in coordinating activities, informing members when to maintain the system, keeping accounts and working rosters, handling logistics, and monitoring and policing the system. His was remunerated by individual members based on their intake width after the harvest of wet season crop. In 2005, he was entitled to US\$5 per year from a 20 cm intake. The manager was given the mandate to publicly declare the final agreements of the group, and to punish violators, if any. He briskly expressed his principles in treating every member equally, keeping the group agreement intact, and

making all management activities transparent to all members so that they had confidence the system was fairly managed, hence their willingness to sustain the system.

Through these practices, the impact of the Muang Fai system was remarkable as proven by its annual cropping intensity which stood as high as 200% of its irrigation area, with 93%, 93% and 14% for paddy, high-valued garlic and soybeans, respectively.

### Soprong Muang Fai System

The Soprong Muang Fai system is in the Ping River. It comprises a rock-filled weir with a height of 1.5-2.8 m and length of 80 m. The weir diverts water down its 7.8 km main canal to 937 hectares or 740 farms in 12 villages in four sub-districts of Sanpatong District, Chiangmai Province. This irrigation system has successfully changed the rain shadow area into farms with year-round cultivation and extensive diversification into high value crops.

With so large number of dispersed farms, it was not possible for all farmers in the Muang Fai system to directly participate in the cross section of the system management as in the small-scale Pongsak system. The Muang Fai group used their village social system as a scaffold in establishing a participatory management structure. The farmers nominated their village irrigation delegates whose status was endorsed by their village headmen. The use of village social relation for classifying regional irrigation units in this system was distinct from the use of hydraulic relation based on physical irrigation facilities in government-funded irrigation systems. The farmers also chose through direct election the Muang Fai manager to function as the top leader, giving him the authority, mandate and sanction of the Muang Fai group. The triangular social relation between the farmers, the delegate and the manager supported the equilibrium of the management structure. The manager worked with the village irrigation delegates in exchanging and cross-checking regional hydraulic, biological and human information to lay the groundwork for creating a joint irrigation management plan. The delegates had the horizontal duty to serve and solicit contributions from Muang Fai farmers in their villages while the Muang Fai manager had the vertical duty to ensure that the system served every farmer re-

ardless of his/her village. Thus, the management team must try to create a system-wide water management plan and village-wide water management plans that are complementary. In exchange for their contribution to the group, the members had access to veto or seek a modification of the system-wide irrigation management plan as proposed by the management team at the annual general assembly. The Muang Fai manager had the mandate to publicly declare the plan that was proven as serving every member as the Muang Fai agreement that every member must abide by.

Hydraulically, the Soprong Muang Fai group supplied water down their main irrigation canal on a continuous basis, similarly to the Pongsak group. In the rare case of water shortages in the main canal, the manager, in consultation with the delegates, decided a fixed rotation schedule and personally handled rotation violations publicly with a highest penalty of US \$57. Water shortages in lateral canals were subject to the agreements between related village delegates. Intra-village irrigation management varied from village to village. The delegates were committed to make the lateral canal operation and water distribution inside their villages compliant with the system-wide plan, so their ability to understand and compile the hydraulic, farming, and social information in their villages and in the entire system was the key to serving every member in their groups without undermining the system-wide plan. Their social status as the "delegates" of the members equipped them with sanction instrument to enforce the orderly irrigation operation in their villages.

For the maintenance and management purposes, the Soprong members contributed US \$4.5 per hectare and the delegates were committed to send one man-day labor per 1.6 ha (10 *rai*) of irrigation area in their villages. Of the contribution, 23.6% was set aside as the Muang Fai group fund to be used for maintenance of common facilities. The remaining funds were used to remunerate the management team members including the manager, his assistant, the delegates and a weir tender. Regarding the labor contribution for the weir and main canal maintenance activities, small farm holders were allowed to combine their acreages to form a labor unit through personal arrangements and at the acknowledgement of the delegates. Absentees were

subject to a US \$5.7 per man-day penalty which the delegates could use for employing substitute workers. The distribution of labor workload for system-wide maintenance activities was based on farm acreage. Similarly to the Pongsak group, the assignment of the workload considered both the quantity and the difficulty of the work. The problem in assigning the mid-section of the weir which was the most difficult work was solved by distributing weir work sections by drawing lots. The main canal maintenance work was allocated to each village on the basis of 1 m of canal length per 0.16 ha (1 *rai*) of irrigation area. Instead of working on the entire length of the canal together like in the Pongsak system, each village irrigation group worked until the last irrigation intake inside its village. Only the tail-ender group worked until the end of the canal. The key factor that influenced this arrangement was the skewed distribution of membership toward the upper reach, and the magnitude of the burden on the tail-ender groups who had to work at most one day more than the head-ender groups. Overall, this large-scale system enjoyed an economy of scale when compared with the small-scale Pongsak system. Its maintenance and management cost was only 8% and 57% of the Pongsak system, respectively.

## Discussion

### *Water Abundance and Structural Functionalism*

Farmers in the two study cases were keen in water resources development. They located their systems in the sites where river flow was abundant and built a system with the capacity that was large enough to supply water to all farmers (in a small-scale system) or all farmers groups (in a large-scale system) on a continuous and simultaneous basis even though that cost them high investment. This hydraulic condition bailed them out of water conflicts that were constantly faced by farmers in areas with inadequate natural endowment or farmers in irrigation systems which are designed with high aspiration for investment cost efficiency. As a result, irrigation management in these two Muang Fai systems was not oriented toward conflict management. Rather, they followed a structural approach for participatory management. The self-reliant Muang Fai members created a structure in which related social entities and management ac-

tivities have specific functions to perform towards their irrigation goal in effectively and sustainably providing adequate and timely irrigation water to all members.

### *Structural Equilibrium and Social Interactions*

In performing the three major management processes of exchanging and compiling information, making agreements on water management method and cost contribution and implementing the agreements, social interactions inside the Muang Fai management structure helped the Maung Fai groups achieve equilibrium. In the small-scale system, the equilibrium was maintained through habitual horizontal interactions between the manager and the members in performing their development, operation, maintenance and management functions. Constantly, the members could directly witness what was going on in their irrigation system. Preciseness was a delicate issue; as a result, the small-scale Muang Fai group opted to use farm intake width or an equivalent of water volume as the basis for water and cost distribution, and their manager needed to prepare highly straight working rosters and cost accounts. In the large-scale system, the equilibrium was maintained through the horizontal and vertical interactions between the members, the delegates and the manager so that their development, operation, maintenance and management functions at the farm, village and system levels was synchronized. The pattern of social interactions (Coward, 1985) that made the Muang Fai groups accomplished orderly irrigation management could be considered as social capital (Uphoff, 2005), often overlooked or bereaved by external irrigation engineers (Norat, 2003).

### *Risk Management and the Principle of Participation*

The highest risk of the Muang Fai groups was the loss of their structural equilibrium and the members (and their delegates in the case of the large-scale system) stopped performing their functions and activities. To control the risk, the groups applied the principle of equality. Constantly, the Muang Fai managers demonstrated they were applying this principle in managing their groups. In the horizontal relation, the manager tried to make all treatments transparent to all members. The clear-cut allocation of water and cost in the

Pongsak case and the cross-checking of information before inter-village irrigation agreements were made in the Soprong case illustrated well this point. In the vertical relation, the well-disaggregated working rosters and cost accounts kept by the manager of the Pongsak system, the direct election of the Muang Fai managers, and the right to seek modifications and endorse the joint irrigation management plan at the annual general assembly by the members in the Soprong case were transparency and accountability measures taken to confirm the members that they were equally treated.

The managers of both scales of Muang Fai systems in this study were very clear about the indispensability of the principle of equality. Failing to observe the principle in the small-scale system would mean an inability to maintain adequate membership and a collapse of the Muang Fai group. The risk of the large-scale system was not as whisk as in the small-scale system but rather corrosive and disintegrating the system in a more slowly way. Because of an economy of scale and lower unit cost, the large Muang Fai group was more lax in choosing their basis for cost distribution. Farm acreage was more susceptible to a gloss than farm intake widths and tolerated unfairness to some extent. In addition, the influence of the majority on the irrigation agreements could also pose a risk on their equilibrium as illustrated by the distribution of canal maintenance workload in the Soprong case which was influenced by a spatial skew of farm distribution toward the upper reach of the system. Unless the manager of the group, with accountability to all farmers regardless of their farm location or villages, applied the principle of equality and reduced unfairness in the extent the disadvantaged farmers could withstand, the Muang Fai group would shrink and the unit cost would increase and the Muang Fai group would lose its equilibrium.

### **Conclusion**

With keenness in water resources development, the self-reliant farmers in both a small- and a large-scale Muang Fai systems under this study located their weirs where they could get abundant river flow and built their irrigation systems with an adequate capacity to supply water to all members on a continuous and simultaneous basis. This starting hydraulic conditions bailed them out of

recurrent water conflicts that farmers with limited natural endowment and irrigation infrastructure would face. Hence, their attitude toward irrigation management was not geared towards conflict management. Rather, they were more oriented toward the structural approach in bringing about orderly irrigation management. Their participatory management process was composed mainly of a platform for exchanging information on physical conditions, water requirements and farming schedules, a forum for deciding a joint irrigation management plan, and a public commitment to honor the plan. The farmers who had agricultural productivity as their incentives and voluntarily identified themselves as Muang Fai members participated in the cross section of collective activities or functions, directly in the small-scale system, and through village sub-groups in the large-scale system. With close proximity, the small Muang Fai group used irrigation intake widths, which were relatively more precise, as the basis for water and cost distribution and kept straighter working rosters and financial accounts. With economy of scale, the large Muang Fai group used the more sloppy irrigation acreage as the basis for water and cost distribution and faced more risks of dysfunctions in their management process. However, the Muang Fai structural approach achieved an equilibrium because, in devising a harmonious irrigation management at the farm, village, and system levels, the horizontal as well as vertical social interactions between the members, their village irrigation delegates and their Muang Fai managers adhered to the principles that all members shall be equally treated, and all man-

agement activities shall be transparent and accountable to the members. Hence, they could maintain participation of their members and attain a proven success in irrigated agricultural development.

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