



Villagers build a traditional wooden water-barrier to hold back water in a muang faai reservoir. Muang faai water-management systems enable villagers to divert, store and divide swift streams so that they can be used in wet-rice agriculture. A study of these systems shows the many complex interrelationships between communities, technology, production and natural resources. (Photo: Chatchawan Tongdeelert)

The Muang Faai Irrigation System of Northern Thailand

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For centuries rice-growing lowland villages in Northern Thailand have depended on a type of locally-controlled water management adapted to a landscape dominated by forested highlands and swiftly-flowing streams. The system they have developed is now under threat from modern patterns of resource management promoted by international and state agencies. The conflicts which have resulted hold important lessons for both aid organizations and environmentalists.

Northern Thailand consists mainly of long mountain chains interspersed with valley bottoms where streams and rice fields dominate the landscape. Most of the remaining forests of the North are found at higher altitudes. The forests ensure regular seasonal rainfall for the whole area and at the same time moderate runoff, so that there is water throughout the year. Streams carry organic matter from decomposing vegetation through hill fields and rice paddies, ensuring fertility.

Until about 20 years ago, the mountains were occupied principally by various tribal groups who had settled there in the last few centuries and practised shifting or rotation swidden agriculture.

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More recently marginalized lowland Thais have migrated in huge numbers into the hills and now outnumber the hilltribe population by approximately six to one. The bulk of the region's people, however, remain settled in ethnic Thai farming communities along the relatively fertile and well-watered valleys, which cover less than 10 per cent of the region's land area.

The lowland communities have developed an agricultural system adapted to, and partially determining, the distinctive ecosystems of their areas. Practising wet-rice agriculture in the valley-bottoms, the lowlanders also raise pigs, ducks and chickens and cultivate vegetable gardens in their villages further up the slopes. Rice, beans, corn and native vegetables are planted in hill fields above the villages, and wild vegetables and herbal medicines are gathered and wild game hunted in the forests higher up the hillsides. The forests also serve as grazing grounds for cows and buffalo, and are a source of wood for household utensils,

cooking fuel, construction and farming tools. Fish are to be found in the streams and in the irrigation system and wet-rice fields, providing both food and pest control. These interrelated elements have constituted the basis for self-reliance among these communities for generations.

A Traditional Water-Management System

At the centre of this traditional village livelihood lies the *muang faai* water-management system. *Muang faai* is an elegant response to a common requirement of Northern communities: the need to divert, store, divide and slow down the swift and heavy flow of streams running down from forested mountains so that it can be used in the delicate pursuit of transplanted wet-rice agriculture.¹ For between 700 and 1000 years, the prerequisite to opening rice paddies in the region has been the ability to construct such a system and adjust it year after year so that it remains optimally effective and suited to changing local social needs and the local ecosystem.

In its essentials, a *muang faai* system consists of a small reservoir which feeds an intricate, branching network of small channels carrying water in carefully calibrated quantities through clusters of rice terraces in valley bottoms. The system taps into a stream above the highest rice field and, when there is sufficient water, discharges back into the same stream at a point below the bottom field. The water in the reservoir at the top, which is diverted into a main channel (*lam muang*) and from there into the different fields, is slowed or held back not by an impervious dam, but by a series of barriers constructed of bunches of bamboo or saplings which allow silt, soil and sand to pass through. The tops

of the barriers are set at the level villagers determine is appropriate for a certain year, so that any excess water immediately passes over and through the barrier and downstream.²

Water from the *lam muang* is measured out among the farmers according to the extent of their rice fields and the amount of water available from the main channel. Also considered are the height of the fields, their distance from the main channel and their soil type. The size and depth of side-channels are then adjusted so that only the allocated amount of water flows into each farmer's field.

Muang faai systems come in a wide variety of shapes, sizes and degrees of complexity, from a five-family system watering one and a half hectares to a system which encompasses 25 separate

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communities and irrigates 1100-1600 hectares of rice land. *Muang faai* communities are to be found along nearly every watercourse in Northern Thailand, even in the vicinity of quite small mountain streams, and can also be found in the central region.³ In the mid-1980s, 2000 *muang faai* systems were benefiting about 96,000 hectares in Chiang Mai province, while four large government irrigation dams were providing water to only 52,000 hectares in this major northern province.⁴ Across the entire upper North, *muang faai* is probably still dominant in as much as 80 per cent of



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agricultural areas, with the small remaining proportion under irrigation by the state.

Rituals and beliefs connected with *muang faai* reflect the villagers' submission to, respect for, and friendship with nature, rather than an attempt to master it. In mountains, forests, watersheds and water, villagers see things of great value and power. This power has a favourable aspect, and one that benefits humans. But at the same time, if certain boundaries are overstepped and nature is damaged, the spirits will punish humans. Therefore, when it is necessary to use nature for the necessities of life, villagers take care to inform the spirits what they intend to do, simultaneously begging pardon for their actions.

Such rituals help unify village society and enable the *muang faai* system to be passed on from generation to generation. At the beginning of every agricultural year, before villagers get together to repair the reservoir, redredge the main channel, and pull out any grass and small trees which are interfering with the flow of water, they meet to fête the spirits. Gathering at the tiny *faai* spirit house which is erected near every reservoir, the villagers offer food to the *faai* and forest spirits and lords of the water and give an incantation asking that water be plentiful and the harvest good during the coming growing year, that the water-users be happy and untroubled by disease, and that the *muang faai* repairs take place without injury to anyone. After a meal the villagers discuss problems which have arisen with the *muang faai* system during the previous year, the adjustments which must be made, amendments in regulations for the coming year, and other matters of mutual concern.

Rights and Duties

Keeping a *muang faai* system going demands cooperation and collective management, sometimes within a single village, sometimes across three or four subdistricts including many villages. The rules or common agreements arrived at during the yearly meeting amount to a social contract. They govern how water is to be distributed, how flow is to be controlled according to seasonal schedules, how barriers are to be maintained and channels dredged, how conflicts over water use are to be settled, and how the forest around the reservoir is to be preserved as a guarantee of a steady water supply and a source of materials to repair the system. Despite this variety of tasks, management systems are generally simple, unbureaucratic and independent (sometimes defiantly so) of government authority.

The fundamental principle of water rights under *muang faai* is that everyone in the system must get enough to survive; while many patterns of distribution are possible, none can violate this basic tenet. On the whole, the systems also rest on the assumption that local water is common property. No one can take control of it by force, and it must be used in accord with the communal agreements. In dry years, for example, the side-channels of farmers occupying the upper part of some systems may be closed



Rules posted by a village *muang faai* committee near a *muang faai* reservoir. The rules prohibit opening or closing the mouth of the main channel and fishing with dynamite, electricity or hook in the area. Many *muang faai* communities will also post prohibitions on the overuse of forest or vegetation on which the system depends. (Photo: Chatchawan Tongdeeler)

off for a time by mutual agreement to ensure that the needs of those lower down, whose supply is more uncertain, is met first. Although there are inequalities in landholding, no one has the right to an excessive amount of fertile land. The way in which many *muang faai* systems expand tends to reinforce further the claims of community security over those of individual entrepreneurship. In the gradual process of opening up new land and digging connecting channels, each local household often ends up with scattered holdings over the whole irrigation area. Unlike modern irrigation systems, under which the most powerful people generally end up closest to the sources of water, this arrangement encourages everyone to take care that no part of the system is unduly favoured or neglected.

In one larger *muang faai* system in Chom Thong District, Chiang Mai Province, however, it is generally agreed that those who arrived on the land first (and thus settled closer to the top or upstream end of the system) have priority in receiving benefits (as well as more responsibility in maintaining the system), at least in part because they helped build the original system. Groups who grow rice as opposed to those who raise cash crops or fruit are also accorded a privileged status, on the ground that rice is a subsistence crop for which the system was originally designed, and requires more frequent releases of water.⁵

After construction, the heaviest duty connected with membership in a *muang faai* system is maintenance. A large system such as the one in Chom Thong, which covers 800 hectares of fields and boasts 500 farmer-members, requires heavy seasonal and emergency maintenance and repairs. Canals silt up, banks collapse and channels have to be re-dug. Teams of workers equipped with hoes, baskets, axes, bamboo, sandbags and wood thus have to put in long hours and work has to be inspected and labour accounts kept. Cleaning out the main Chom Thong channel can require 150-400 workers, and the yearly cycle of regular repairs alone can require upwards of 5000 person-days. All this is in addition, of course, to emergency work and the work farmers need to put in on their own holdings to keep water flowing properly through the fields. A small system at a higher altitude, by contrast, may require much less maintenance once the original arduous task of digging its



A modern concrete muang faai dam. The concrete dams rapidly clog up with silt and debris, requiring special machinery to clean them out. The amount of labour and finance needed to maintain an "improved" muang faai system is often prohibitive and may cause the system to fall into disuse. (Photo: Chatchawan Tongdeert)

channels out over sloping terrain is complete. Water flows through the steep channels swiftly, meaning less siltation and need for re-digging.⁶

How much farmers work depends on the size of their holdings and thus how much water their fields receive. A farmer who has 10 *rai* (1.6 hectares) may have to work 10 days per year; one with only one *rai*, one day. There may be other regulations as well; at Chom Thong, for instance, landowners but not tenants sometimes have to contribute cash for materials, and those at the downstream end of the system, who settled last on the land, have to contribute double the ordinary amount of labour. In all systems, not coming to work results in a penalty except in extenuating circumstances. On the other hand, there may be compensations for those who volunteer extra work — use of an extra quantity of water, exemption from having to cut bamboo or saplings for the water-barriers, or, if the work is hard, gifts of rice to show good feelings and thoughtfulness.

Administration

In the *muang faai* system, each member is responsible for helping both to set and to enforce rules, and each person is regarded equally as a proprietor of the system. This mutual responsibility is encouraged by the fact that any shirking by one will mean others have to work harder, and any theft of water will lead to dearth elsewhere. Communal monitoring, meanwhile, is facilitated by the fact that everyone's side-channels are constantly open for inspection by people passing between village and fields. Any weed buildup in waterways or illicit forest cutting is also unlikely to escape notice for long.

Frequent meetings and face-to-face contact among villagers in the course of their tasks build a personalized, community-orientated web of information, commentary, teasing, jokes and indirect criticism which ensures that any problems with the system are widely discussed even without formal meetings. There may also be attempts to head off the need for punishment of wrongdoers: in Chom Thong, if a farmer steals water before it reaches the field below, a warning message may be pinned to a post at the mouth of the channel entering the fields of the party in question.

As a matter of procedure, however, every *muang faai* member

is obliged to report problems or violations to an elected irrigation committee, which has formal responsibility for monitoring water distribution and administering weir and channel maintenance.⁷ This may be done either directly, or, in a large system, through written inquiries. The leader of the committee will then investigate and, if there has indeed been a violation, set a punishment strictly according to the regulations which have been laid down.

Small *muang faai* systems may be administered by a single official called a *kae faai*. In larger systems there will be a *laam faai* to communicate with all the members. Still larger systems may need assistant *kae faai* or additional *laam faai*. Every few years there is an election at which new officials are chosen. Those who have failed to fulfil their responsibilities can be thrown out then or at other times. The position of experienced leaders is likely to be secure, however, if they have done their job well and have the confidence of the other *muang faai* members. Top leaders may be compensated for their time by receiving a share of production or an exemption from having to supply labour.⁸

Theft of water is punished by fixed fines. When water is plentiful the fines may not be great, but when water is scarce in the dry season, they will be more severe. Penalties are often also handed down for misuse of the upland or highland forests whose streams feed the system. For example, under the written community laws Toong Yao village, in Lampoon province, has developed over the past 60 years, the local *muang faai* committee is empowered to levy a penalty on anyone cutting down trees for sale on the market or for unauthorized personal uses not connected with making tools or collecting materials to repair the *muang faai* system. Because all such penalties carry a significant social stigma, it is virtually impossible for them to be treated by aspiring village entrepreneurs as simple "costs of doing business" and weighed against the benefits to be derived from stolen water or wood.

Challenge, Adaptation and Resistance

Both the technology and the administration of *muang faai* systems are homegrown, adaptable and open to continuous participation by all members. The materials and tools used are overwhelmingly local. Labour is provided by local members, who not only comprehend but also are able to build, control, regulate, repair and alter the technology themselves. Like the technology, the set of rules governing each area's *muang faai* system tends to be refined and elaborated over the years out of a few common basic princi-

ples through continuous discussion and trial and error, so that it takes full account of local ecological peculiarities, the habits and characters of the members and new developments.

This flexibility has helped ensure *muang faai*'s survival through a number of challenges over the centuries. Among these have been the administrative and tax changes which came with increased control from Bangkok in the period 1888-1932, population growth and the rush to modernization dating from the late 1950s. The first two led to the segmentation of communities, the colonization of new land and the construction of new *muang faai* systems, as villagers fled tax officials or responded to the pressure of increasing numbers.⁹

The challenges posed by modernization have proved more difficult to handle. Government-sanctioned logging, particularly following the opening of new areas by modern roads, has resulted in depleted forests in dozens of *muang faai* areas in the last three decades. Mountain slopes have been increasingly cultivated with cash crops such as ginger, baby corn, soybeans, cabbage, carrots and potatoes, which encourage extensive forest clearance, the use of pesticides and social conflict between lowlanders and uplanders.¹⁰ The promotion of modern cash crops and the cash economy by the state and its foreign advisers has also driven farmers into debt and thus into forest cutting or colonization. At the same time, *muang faai* is regarded in official circles as being "behind the times". A special programme creating jobs in the countryside has led to many wooden *muang faai* water-barriers' being replaced with modern concrete structures.

Closer links with state and market have meanwhile led to growing gaps between rich and poor in rural areas and a loosening of ties of community interdependence. Commercial success has become an important criterion for village leadership, and government bodies have attempted, often successfully, to assimilate *muang faai* committees into the official apparatus, thereby changing their power base, accountability and functions. In at least one village the agricultural year now begins with a meeting with the government bank for agriculture rather than with a ceremony for the *faai* spirit.¹¹

Many of these changes, especially the ecological ones, have hit the *muang faai* system hard. Increased runoff due to deforestation has stripped soil off slopes and deposited it downstream, where it accumulates in the beds of streams and behind the new concrete dams. One result is an increased work load for villagers, who have to try to clear out channels and reservoirs filling with an unprecedented load of silt and debris. Another is reduced storage in *muang faai* reservoirs, particularly those behind the new dams. The more forest is destroyed, meanwhile, the less steady the water supply becomes. Silt-ridden streams begin to dry up during the dry season and flood during the rainy season. As one villager whose *muang faai* system was affected by upslope logging expresses it: "At the place where we took our buffalos to bathe in the river, the water which used to cover their backs came up only to their knees. Soil and sand got into our rice paddies. What was the good of trying to plant anything?"¹²

When the silt and debris clogging the *muang faai* reservoir reaches the top of a concrete dam, special machinery has to be hired to clean it out. In the end the amount of labour and finance needed to maintain a system already ravaged by the effects of deforestation often becomes prohibitive, and the system falls into disuse. Some *muang faai* communities have not planted wet rice for several years for lack of assistance in repairing the "improved" systems. The result is that villagers are increasingly forced to seek income through illegally cutting wood in the forest or clearing

new land — both of which undermine the traditional system further.

As water supplies falter, meanwhile, demand increases, in part due to the new cash crops many villagers are now planting in their paddy fields in the idle periods between rice harvests. These crops — soybeans, onions, garlic, tobacco, Japanese cucumbers, water-melons and others — require less water than rice but still constitute a burden on the system during the dry season.

Yet the tightly-knit social organization which *muang faai* both requires and makes possible has enabled many communities to weather such developments with some degree of success. By necessitating vigilant and well-developed systems of local forest-management, for example, *muang faai* communities have sometimes been able to prevent the intrusion of loggers. Even in areas where other aspects of community life have been taken over by the state (including roads, schools, temple design and forest management), water management often remains in the hands of villagers, through their *muang faai* systems. And some *muang faai* leaders

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are able to turn the state's new recognition of their status to their communities' advantage, by requesting special assistance or opportunities.

Where attempts at adjusting to or sidestepping the pitfalls of modernization have failed, moreover, *muang faai* villagers have often been at the forefront of creative resistance, leading efforts to restore damaged ecosystems. The local movements which joined conservationists in the successful national campaign to ban timber harvesting in the late 1980s were disproportionately from *muang faai* areas. It was *muang faai* villagers as well who embarked on a battle in 1989 against a Member of Parliament who had degraded forest and blocked a stream in Chiang Mai province in order to

From a muang faai perspective, it is impossible to view forests, water, land and agriculture as separate entities.

build a resort. Following petitions, legal actions, marches and blockades to force the MP's workers off the land, a local leader was assassinated, but in the face of unyielding protests the government finally suspended the rental agreement and admitted the right of the villagers to look after the forest themselves — the first official recognition of the rights of local communities to forests on state land.

Where *muang faai* systems have been completely replaced by modern irrigation systems constructed with state or foreign aid funds, however, such responses become more difficult. Large "multipurpose" dams often displace and disrupt the structure of communities by flooding out river valleys, villages and *muang faai* systems alike for the sake of electricity-hungry urban industries and limited numbers of farmers elsewhere. Designed to supply water to extensive areas, they lack the flexibility and responsiveness to local needs of *muang faai*. For example, they can release water to each locality for only one or two weeks at a time. The gap between these releases is often so great that some of the rice crop dies in the fields.

Distribution of water within local areas, meanwhile, is placed in the hands of leaders who are not accountable to others in the community and who therefore tend to try to shunt the benefits to themselves and to relatives. Using their connections with local officials, the wealthy often pressure villagers to sell land which is to be watered by new irrigation systems, further undermining community management incentives. Displaced villagers are cheated out of compensation and whole river valleys endangered by shoddily-built dams, much of the necessary construction budget for which has been embezzled.¹³ In the end, the bulk of the benefits of modern irrigation systems go to business, large landowners and state bureaucracies (including the army). Golf courses, resorts, housing developments, cattle ranches, and agribusiness plantations have been among the more notable beneficiaries of recent state irrigation projects in the North. Even from a strictly economic point of view such projects have been a waste of money, if intended to boost agricultural production, but if ecological side effects are taken account of, the damage has been severe indeed.¹⁴

Lessons From Muang Faai

Several lessons can be drawn from a study of *muang faai* and the problems facing it today.

First, *muang faai* is not a system for solving "water problems". Rather, it is a system that villagers use to manage water to meet local needs in wet-rice agriculture. Its small size allows villagers to control and manage water in a way which fits the ways of life of various communities. In all this, *muang faai* is more successful than modern state systems dominated by big dams.

Second, solving water problems which have recently arisen requires restoring the entire ecosystem. From a *muang faai* perspective, it is impossible to view forests, water, land and agriculture as separate entities. A consideration of *muang faai* helps bring into perspective the mutually supportive relationships between communities, technology, production and natural resources.

Third, solutions to such problems demand that support be given to village efforts to maintain power over local resources through community-administered forests, the *muang faai* system proper, and ecological agriculture. The failure of any one of these pillars of village livelihood will threaten the others. The state should not be allowed to monopolize the management of resources for the benefit of capital.

Fourth, it is important that we learn from *muang faai* villagers how to live together with nature in friendship and submission rather than trying to master it.

Community systems such as *muang faai* are likely to be found in many countries. Seeking solutions to environmental problems requires a belief in the abilities of villagers who have consistently struggled to preserve their local resources.

Notes and References

1. For a pithy exposition of the technical intricacies involved in this type of agriculture, and a comparison with the very different but equally intricate adaptation involved in traditional swidden systems, see Clifford Geertz's classic *Agricultural Involvement* (University of California Press, 1963), pp.28ff.
2. A similar method is known from the period of Khmer dominance in the last millennium, when farmers in what is now Thailand "raised runoff in streams at the beginning of the rainy season by means of bamboo stakes so that they could be assured of earlier seed beds and, on part of the fields, earlier transplanting". (Van Liere, W. J., 'Mon-Khmer Approaches to the Environment', in Siam Society (ed.), *Culture and Environment in Thailand*, Siam Society, Bangkok, 1989, p.154.)
3. Hirsch, P., *Development Dilemmas in Rural Thailand*, Oxford, 1990, p.98.
4. Uraiwan Tan Kim Yong, 'Ongkorn sangkhom nai rabob chonprathan muang faai lae karn radom sapayakorn: priap thiap rawaang choomchone bone thii soong lae choomchone phuen raab nai phaak nuea khong pratheet thai', *Sangkhomsat* (Chiang Mai University), Vol. 7, No. 1-2 (1984-5), pp.158-194.
5. Ibid.
6. Ibid.
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8. Uraiwan, op. cit. 4; Hirsch, loc. cit. 7.
9. Uraiwan, op. cit. 4.
10. An ill-conceived 'development' project funded by Norwegian Church Aid attempting to wean upland tribal farmers off opium and onto cabbages has led to extensive forest clearance in Chom Thong District, Chiang Mai. Erosion, drought and pesticide contamination of water supplies downstream has led to conflicts between uplanders and lowlanders. Significantly, it is a *muang faai* committee which has formed the nucleus of a lowlanders' association to protect and restore the degraded watershed forest.
11. Moerman, M. and Miller, P.L., 'Changes in a Village's Relations with Its Environment', in Siam Society (ed.), op. cit. 2, p.310.
12. Witton Permpongsacharoen, 'Widerstand gegen Waldzerstörung: Lektionen aus den Dörfern Thailands', in Arbeitsgemeinschaft Regenwald und Artenschutz (ARA), *Naaturerbe Regenwald*, Focus Verlag, Gießen, 1990.
13. *Private Eye*, 21 December 1990, p. 15.
14. Dr Prakorb Wirotnikoot, 'Khuen kap karn cholprathan', presentation at a seminar on dams, their effects and energy solutions, Chulalongkorn University, 10 June, 1990.