

Dynamics of water tenure and management among Thai groups in highland Southeast Asia: A comparative study of *muang-fai* systems in Thailand and Vietnam¹

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Abstract

Community-based water management systems for irrigation have been extensively described for the lowlands of Thailand and Vietnam as participatory, sustainable and fairly equitable water allocation institutions. Much less is known about the structure and dynamics of the so-called *muang-fai* systems of different Thai groups in highland areas. *Muang-fai* irrigation systems of Thai communities in Thailand and Vietnam share the same long-standing tradition and consist of a sophisticated network of canals (*muang*) and weirs (*fai*). The impact of the markedly different political and economic developments in the past decades on community-based water management, however, has induced diverging trajectories of the systems in the two countries.

The objectives of this paper are to present the complexity of water rights and to analyze the dynamics in tenure systems and the driving forces behind changes in water management. The study is based on in-depth surveys conducted between 2002 and 2005 in a Thai market-oriented village in Mae Rim district, Chiang Mai province, a subsistence-oriented Shan village in Pang Ma Pha district, Mae Hong Son province, both in Thailand, and a subsistence-oriented Black Thai village in Yen Chau district, Son La province of Vietnam. Semi-structured interviews with key persons, quantitative farm household surveys and a GIS-based inventory of water storage and conveyance systems provided insights into local water management schemes from various perspectives and different data sources.

Results suggest that control and use rights of water in both study villages in Thailand are characterized by a high tenure complexity and reflect local power relations but differ strongly depending on the degree of market integration. In the Shan village water is still communally managed in a fairly intact *muang-fai* system, while in the Thai community a dramatic shift from communal to individual management of water resources has occurred in recent years, reflected in the construction of private wells. However, in many cases individual water rights remain bound to former membership of the *muang-fai* system despite the rapid decline of its physical existence. Results in the study village in Vietnam show a community-based water management that owes its complexity both to the traditional, pre-socialist *muang-fai* system of the Black Thai and to the remnants of the cooperative system of the 1980s and the early 1990s. A more pluralistic water governance system is currently evolving with indicators for an individualization of water rights at the village level and an increasing control over water resources by local government bodies at the provincial and district level.

We conclude that while communal water management institutions have remained resilient for centuries, they are now facing increasing pressure to adapt to new economic and political realities. Instead of being simply replaced, they form part of a more diverse portfolio of water

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governance institutions. Recognition of this legal complexity of local water tenure regimes and a careful assessment of location-specific management systems are keys for identifying sustainable solutions to increased competition for scarce water resources.

Keywords: Community-based water management, irrigation, water rights, legal pluralism, Thailand, Vietnam

1 Introduction

Community-based water management systems are often presented as a ‘counter-model’ to state-dominated water governance in irrigated agriculture. Scholars in the field of property rights and collective action have amassed considerable theoretical reflections and empirical evidence to identify the conditions under which such communal systems are appropriate and sustainable institutional arrangements to govern common-pool resources, such as small size of community, clear boundaries of the resource, low market pressures and strong enforcement mechanisms (Wade, 1988; Balland and Platteau, 1996; Ostrom, 2001; for an overview see Agrawal, 2001).

Among the Thai/Tay ethnic groups in northern Thailand and in northwestern Vietnam, communal water resource management has a long tradition and has been described as an efficient, sustainable and participatory system of water allocation. These systems, locally known as *muang-fai*, have been the focus of several studies (e.g. Sirivongs Na Ayudhaya, 1979; Surarerks, 1986 and 1998; Tan Kim Yong, 1995; Cohen and Pearson, 1998). However, most studies focused on a rather static description and tended to neglect the dynamics of these systems in different socio-political contexts and in a rapidly changing economic environment. There is also a lack of comparative studies across the countries where Thai/Tay groups have established these systems.

In this paper, we present three case studies from different Thai/Tay groups, namely Shan and northern Thai (*khon muang*) in the northern Thai highlands and the Black Thai in the northwestern mountains of Vietnam. These groups have common ancestors in Southwest China who migrated southwards centuries ago to establish powerful states and principalities in various parts of upland Southeast Asia (cf. Wyatt, 1984). Wherever they found areas suitable for wet rice cultivation, they began to develop highly sophisticated water management schemes, many of which have survived until today. The objectives of this comparative study are to:

- discuss the complexity of water rights in relation to the degree of market orientation and under different political conditions;
- illustrate the development of water use and the dynamics of water tenure systems; and
- analyze the driving forces behind these changes and factors influencing the evolution of the system.

Following this introduction, we discuss the historical foundations and recent challenges of communal irrigation systems of Thai/Tay groups in the two countries (section 2), followed by a brief description of the study areas and methods of data collection in section 3. In section 4 we present a detailed account of the communal irrigation systems in the three study areas and show how institutional arrangements have evolved under increased commercialization and changing socio-political realities. A synthesis of the findings and conclusions are presented in section 5.

2 Historical Foundations and Recent Challenges of Communal Irrigation Systems in Northern Thailand and Northwestern Vietnam

2.1 History of *muang fai* in northern Thailand

The *muang fai* system was first mentioned in documents dated back 1400 years, which underscores the important role that irrigation has played in the life of the Lanna Thai People from the past until the present (Surarerks, 1986). When King Mangrai founded Chiang Mai more than 700 years ago, he acknowledged the importance of the irrigation system and expanded irrigation projects by construction of canals (Surarerks, 1998). Some of the facilities constructed many centuries ago are still in use today. He also established the irrigation law determining regulations for water management and penalties for breaking these rules (Attwater, 1997). The old laws and regulations from King Mangrai had been maintained until the central government in Bangkok got involved in irrigation, which started with the People's Irrigation Act 1939 and National Irrigation Act 1942 (Surarerks, 1986).

In the *muang-fai* irrigation system water is diverted from rivers or creeks by an artificial weir (*fai*) and directed over primary, secondary and tertiary canals (*muang*) to the fields (Cohen and Pearson, 1998). The right to water is closely intertwined with the land use. Renting land in the area of the *muang-fai* system includes also becoming member of the irrigation community with all rights and obligations (Tan Kim Yong, 1995). In exchange for the right to use water for agriculture, all members have the obligation to provide labor, construction material and tools for repair and maintenance (Cohen and Pearson, 1998). Regulations and schedules regarding the water use and the maintenance are documented in an agreement which all users have to sign (Surarerks, 1986). Some of these agreements include also specific regulations for forest protection in the headwater area (Sirivongs Na Ayudhaya, 1979 cited in Surarerks; 1998; Ganjanapan, 1998).

The organization and supervision of the communal work is the task of the *gae muang* who is usually elected every four years during a meeting of all users of the system (Tan Kim Yong, 1995). Beside organization of the maintenance work, the *gae muang* is also responsible for the equitable allocation of the water, imposing fines on the members who violate the rules, e.g. by stealing water, and for the organization and performance of the ceremony for the weir spirit (Cohen and Pearson, 1998).

The authors of different studies concluded that this system:

- was highly efficient in terms of technology adoption and in resolving conflicts between users (Surarerks, 1986);
- was an integrated system based on local village technology and cooperation between water users and guarantees an equitable water allocation (Tan Kim Yong, 1995, 51);
- provided an efficient basis for an intensive system through a complex social organization (Cohen and Pearson, 1998, 88).

2.2 Recent dynamics and challenges of *muang fai* systems in Thailand

Despite the apparent advantages described above, communal irrigation systems have faced severe challenges in the last 25 years which have induced a steady erosion of *muang-fai* organizations in many locations (Charoenmuang, 1994). The rapid development of the urban and industrial sector has increased the competition for water resources between different sectors (Cohen and Pearson, 1998). With the commercialization of agriculture and the increasing water demand, these systems have difficulties to provide a steady supply to all users and to exclude non-members from use (Charoenmuang, 1994). Centralization of resource management and expansion of state-run irrigation system have undermined local management systems (Santasombat, 2003) and have weakened social cohesion and collective action (Barker and Molle, 2002).

At the same time, the northern parts of Thailand are facing serious water problems, such as water scarcity in the dry season, flooding in the rainy season and pollution with agrochemicals and industrial waste.

Traditionally, irrigation water was only used to supplement the natural supply during the rainy season. With the economic development from the 1990s onwards an expansion of irrigated land for production of cash crops and an intensification of dry season cropping has taken place. The agricultural sector remains the main user for water in Thailand and its demand is further increasing. Population growth, urbanization and industrialization have also led to a growing demand of water in the non-agricultural sectors. Competition for scarce resources has created a multitude of conflicts between users of different sectors, upstream and downstream communities and between farmers within communities (Charoenmuang, 1994; Ganjanapan, 1998; Rerkasem, 2003).

2.3 History of *muang fai* in northwestern Vietnam

The communal irrigation water system of the Thai people in Vietnam has developed over several centuries. Like in northern Thailand and parts of Southwest China and Lao PDR, this community-based water system is called *muang-fai* by the Tay/Thai groups and represents a technologically and socially sophisticated water management system. Water resources and water allocation systems have always been a vital part of religious, political and socio-economic activities in the Black Thai society (Izikowitz, 1962). The high importance of irrigable land and water systems can also be seen in the fact that traditionally upland fields were under an open access regime whereas irrigable land and water resources were communally owned resources, managed and allocated under supervision of local officials and elites (Izikowitz, 1962). Paddy fields could not be individually owned, but were regularly reallocated to households according to their needs. Water sources and the water distribution system were communally managed, and all villagers were obliged to help constructing and maintaining the water system. Scholars have ascribed a “strong cohesion as a group” (Smith et al., 1967: 569) to the Black Thai, which is one explanation why the *muang-fai* system has been fairly resilient to externally induced changes.

Various Thai groups in the northwestern region of Vietnam had a long history of self-government. Land and water tenure evolved in the context of the Black Thai’s socio-political and economic organization which paid tribute to more powerful suzerainties but could preserve a high degree of political independence. Consequently, the *muang-fai* irrigation system has not been exposed to major impacts from outside and was continuously under the management and use of Black Thai nobility and commoners. *Sip Song Chau Thai* (“The twelve Thai Principalities”) became part of a greater political system only in 1954, when this region was absorbed by North-Vietnam after the defeat of the French at Dien Bien Phu (Pitiphat, 1980). Customary institutions and regulations concerning access, use and management of water systems had thus been maintained until the 20th century when the Vietnamese government introduced a new political system.

Traditionally, irrigable land belonged to the social entity of a *muang* and could not be owned, inherited, sold or rented. To be a member of this socio-political body and agricultural system included the use rights for irrigation and consumption water and implied the obligation to provide labour force, material and tools for the repair and maintenance of the *muang-fai* system (Izikowitz, 1962).

The *muang-fai* irrigation system is used on fast flowing streams, across which weirs (*fai*) are built up. The *fai* holds back water and direct it into major and minor canals (*muang*) in which gates control flow rates. Where a *muang* can be constructed by diverting water from a river, no *fai* is needed. Traditionally, weirs were constructed from bamboo and wooden stakes whereas nowadays they are mostly concrete. The way a *fai* is built allows water to pass

through and over the barrier while restricting the rate of flow sufficiently to raise the water level (Falvey, 2001). Similar to northern Thailand, the social organization allowing the management of the *muang fai* system evolved to rely on officials, such as the *Liep (Nam) Na*, as managers of systems on behalf of the ruler. In the traditional Black Thai society the duties of water managers, who had been appointed by the head of the *muang*, included the calculation of the amount of water and its allocation to individual farmers, coordination of the initial construction of weirs and canals, coordination of the annual repair work required after each rainy season, collection of fees for irrigation system maintenance, and associated rituals.

2.4 Recent dynamics and challenges of *muang fai* systems in Thai communities in northwestern Vietnam

Since the agricultural collectivization in the 1970s when new economic and administrative units – the agricultural cooperatives – were formed, the traditional institutions of water tenure and management have undergone crucial changes. Old institutions and organizational bodies, e.g. the *Liep Na* (also known as *gae muang*), were either abandoned or integrated into the new management boards on different administrative levels, the so called *Ban Quan Ly*. The *Liep Na*'s duties, then and today, has been to control and monitor the *muang-fai* system and an equitable distribution of water, while being obliged to inform the management board of the cooperative about the condition of the water system. It is the task of the members of the management board to appoint the water manager, to gather people for repairs, to impose fines and set regulations of use.

After the decollectivization process which started in the mid 1980s, when agricultural cooperatives were gradually dissolved, villages emerged as the smallest administrative units with the village management board as the decision-making and executive institution concerning all social, political and agro-economic issues. Despite a strict top-down hierarchy, where the local authorities on village level have to follow the recommendations and regulations from higher levels, management and use of the water systems still retain semi-autonomy. But it can be observed that an increasing investment in and improvement of local water systems by the state is accompanied by an enhanced grip on water resource control by high level authorities in order to ensure proper operation of the irrigation constructions, e.g. small and medium-sized dams. Simultaneously, a slow individualisation of small-scale water resources and parts of the water distribution systems is taking place.

3 STUDY AREA AND DATA COLLECTION

3.1 Study areas in Thailand

Two villages in two provinces in northern Thailand representing differences in cropping pattern and market access were selected (see Figure 1 and Table 1).

The Shan village **Mae Lana** is located in the valley of the Mae Lana River in Pang Ma Pha district, Mae Hong Son province and is the oldest settlement in the sub-district with a history of more than 200 years. The plain valley area is classified as suitable for permanent agriculture and thus the farmers have official land use rights. The surrounding mountains are classified as watershed class 1, which implies that this area should be maintained as protection forest with no agricultural cultivation being allowed. Mae Lana has limited access to the market with partly earthen roads and a long distance to the provincial capital. As a consequence, paddy rice production for subsistence is the main agricultural activity. Since the irrigated land is not sufficient, upland fields are cultivated with maize, sesame and fruit trees.

Figure 1. Location of the study villages in northern Thailand

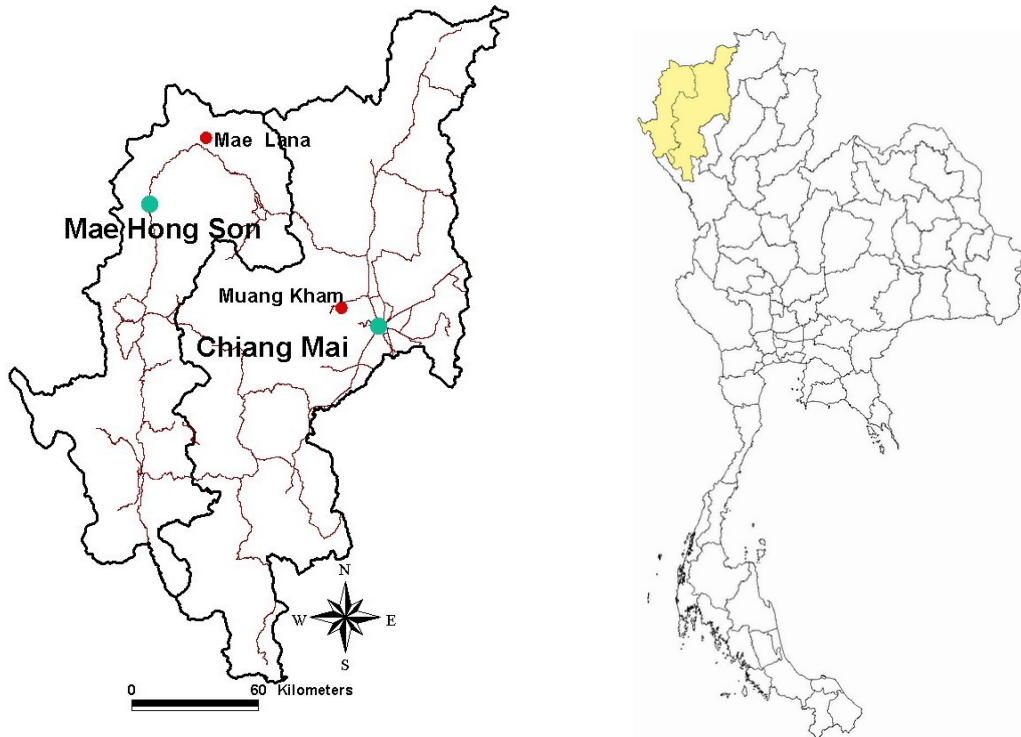


Table 1. Characteristics of the study villages in northern Thailand

	Mae Lana	Muang Kham
Province	Mae Hong Son	Chiang Mai
Ethnic group	Shan	Thai
Altitude (masl)	800 - 1150	750 - 950
Population	550	850
Market access	Limited	Very good
Main crops	Paddy rice, upland rice, sesame, soy bean	Sweet pepper, chrysanthemum, chayote

The Thai village **Muang Kham** is located in the Mae Sa Watershed in Chiang Mai province, only 30km from the provincial capital and thus has an excellent market access. It was founded 1914 and is one of the oldest villages in the watershed. Most of the farmers have land ownership or use rights, documented in official title deeds. Muang Kham has a relative rich endowment with water sources, several creeks passing from the mountain to the Mae Sa river in the valley. In the last 20 years the village has experienced a dramatic change of the production system from subsistence oriented wet rice cultivation to market oriented cultivation of flowers and vegetable.

3.2 Study area in Vietnam

The village **Ban Tum** is located on a mid-level plateau on around 350masl between a steep mountain range and the valley of Yen Chau. It belongs to the Chieng Khoi commune, Yen

Chau district, Son La province of Vietnam (see Figure 2). Black Thai settlements in this area have a history of several hundred years. The flat plateau is exclusively used for paddy rice cultivation and the peripheral upland fields at the slopes for cropping maize, cassava and some cotton. The land allocation process was completed in 1999, and all households have received an equitable share of agricultural land according to land category and number of household members. The Chieng Khoi commune is well endowed with water resources and every household has paddy and upland fields as well as fish ponds. Aquaculture plays an important role in the agricultural system of the village. Consumption water is taken from wells and the water resources for irrigation are the Chieng Khoi Lake (artificial dam, built in 1974) and several smaller sources. The two outflows of the dam are the river and the main irrigation canal which allow two paddy crops per year in the flat plateau area. The surrounding hills and mountains are classified as use forest, protection forest or reforestation forest. Ban Tum is accessible on a 3 km dirt road from the Yen Chau district centre along the national highway No. 6. This relatively good market access has induced a slow tendency to change the production system from subsistence oriented to market oriented. From both a socio-cultural and agro-economic perspective paddy rice is the most important crop and predominantly produced for home consumption. Maize and, to a lesser extent, cotton are the only crops exclusively produced for the market; however, the area under maize and cotton of Ban Tum is comparatively small. Since agricultural production is almost the only possibility to generate cash income, the farmers of Ban Tum are highly interested in gradually increasing their production of cash crops.

Figure 2. Location of the study village in northwestern Vietnam



3.3 Data collection

Data were collected through in-depth surveys conducted from 2002-2004 in the two villages in northern Thailand and from 2004-2005 in the village in northwestern Vietnam. Open and semi-structured interviews with key persons (e.g. village headmen, government officials, heads of water management committees and women groups) provided insights into the water use and management for both irrigation and household consumption. Users of different sources and members of water user groups were asked about the practices, regulations and conflicts of water use. The researchers also visited water sources, storage and conveyance system with selected, knowledgeable villagers and asked about the specific users and management regulations. The location of the various water sources and management system were determined with a mobile Global Position System (GPS) and integrated in a Geographic Information System (GIS).

4 RESULTS

4.1 Communal water management in a subsistence-oriented system – the case of the Shan village Mae Lana in northern Thailand

4.1.1 Communal irrigation system

The only water source for irrigation in the Shan village Mae Lana is the river of the same name. It has its headwater near the border to Myanmar and flows along the valley passing several villages before disappearing in a cave at the end of the valley in Mae Lana.

Water management is still based on the traditional communal *muang-fai* system which has existed for centuries. Paddy rice as the main crop is cultivated only in the rainy season. In the dry season some farmers in the upper part of the village territory cultivate soybean, onion and garlic.

Mae Lana has three weirs built from concrete which replaced the old constructions made of bamboo and stones (see Figure 3). For each weir, a different government agency provided the funds. The canals leading from the weirs to the fields are also made from concrete and were constructed by the Royal Irrigation Department and by the Local Administration Office. The intervention of numerous organizations reflects a high degree of institutional pluralism in the village.

Weir 1 was constructed by the Department of Public Works 25 years ago and provides water for the major part of the paddy fields south of the village. The canal leads from the weir through the whole village and separates on the paddy fields into two. It is also an important source for household water and people would do their washing and bathing in the *muang*. Weir 1 and the respective canal constitute the only system in the village managed by the *gae muang*. The current *gae muang* has been in charge for the last ten years. He was assistant of the former *gae muang* and elected when his predecessor retired which points to the continuity of the management of the system.

The responsibilities of the *gae muang* are:

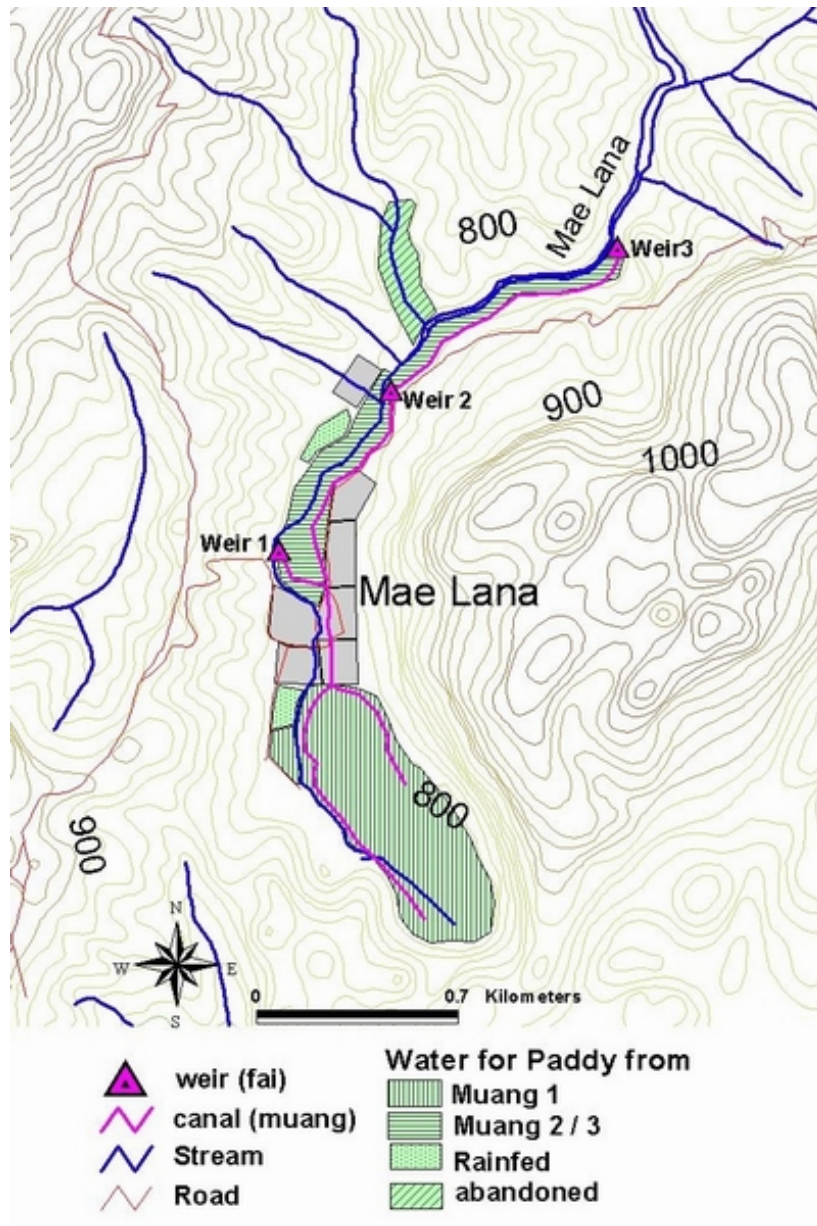
- 1) Water allocation during the rainy season by damming the canal with small wooden weirs and allowing the water to flow through pipes at the side of the canal to the fields. The diameter of the pipe depends on the area to be irrigated. Each farmer will inform the *gae muang* about the schedule of cultivation and the needs for water in the respective plot.
- 2) Organizing and supervising the communal cleaning of the weir and canal which is done twice a year and, in cases of damages, after flooding. As the weir and the canal are from concrete there is no need for replacing wood or other materials. The main

work is to clean the riverbed directly behind the weir by cutting shrubs and removing debris and soil to guarantee an undisturbed water flow. The canal has to be cleaned from sediment and vegetation. All users of the system, whether owner or sharecropper, have to participate. Farmers who are not able to join this communal work have to hire labor to do the work. The name of the participants and the work carried out are documented in a report approved by the village headman.

- 3) Performance of the ceremony for the water spirit prior to the irrigation season at the headwater of the Mae Lana river to ask for abundance of water and protection of the crops.

As compensation for the work the *gae muang* receives a specified share of the rice harvest.

Figure 3. Irrigation system of Mae Lana



A special characteristic of the system in Mae Lana is the water allocation between upstream and downstream users which contrasts with neighboring regions where fields in the area most upstream are irrigated first and surplus water would flow down to the other fields. In Mae Lana the plots most downstream are planted first and each irrigation term would also start at the end of the canal. This characteristic is related to the topography of the area. The plain area is surrounded by a mountain range forming a dead-end valley and the only access to the fields is from the village. There is no way through the fields and in the irrigation season the plots are only accessible by walking on the dikes. If the farmer upstream started cultivation before the fields downstream are ploughed and planted, downstream farmers would have to pass with their buffaloes or small tractors through the planted fields causing severe damage.

The *gae muang* and some of his relatives own land at the lower end of the irrigation canal. This would be in accordance with the regulation in many communal irrigation systems which balances the head and tail benefits and guarantees an equitable distribution of the water, as tail-enders are naturally in a more disadvantaged position (Tan Kim Yong, 1995). Since the *gae muang* in Mae Lana is receiving water first, this rule is turned upside down in this particular case. On the other hand, according to Tang (1992), irrigation systems are better maintained when the power is concentrated at the tail-end, as the incentive is higher to organize and maintain the system so that sufficient water reaches the end of the canal. It could not be determined whether these aspects were considered for the election of the *gae muang*.

Despite this fact, farmers in the villages appear to be satisfied with the achievement of the *gae muang* and stated in the interviews that the water distribution is equal for all farmers. The whole system seems not to create a high potential for conflicts. The area and number of farmers is small, which supports the build-up of collective action (cf. Tang, 1992). Hence, the villagers show a strong social cohesion and have enough incentives to cooperate and appropriate sanctions if members do not. Many farmers prepare the nursery for rice together on slightly elevated areas, and the harvesting of the rice is also done as a group on the basis of shared labor. In case of any noncompliance of the customary regulations a committee of elders will define the penalty. The last case occurred ten years ago when one farmer withdrew a larger share of water by extending the outlet in the canal. He had to pay a certain amount of rice, determined by the elders of the village, as a fine to the local temple.

Weir 2 was built by the Local Administration office 12 years ago and is of simple structure. Only the sides of the weir are constructed from concrete and the villager will use bamboo stakes in the center to divert water to the canal. Weir 3 was constructed by the Accelerated Rural Development Unit in the same time as weir 1. The canal leads from weir 3 partly underground to weir 2 where both canals join and then further along the street to the village. Weirs 2 and 3 provide water for the narrow valley north of the village for the fields of 15 farmers (see Figure 3 above). These farmers managed the system as a group by themselves. They organize the maintenance and cleaning of the weir and canals as communal work, and each farmer allocates water to the fields as required. The farmers in this area would start the cultivation before the users of weir 1. As they are the first users in Mae Lana, water is also sufficient to allow some farmers to cultivate during the dry season.

4.1.2 Access to water

In total, around one quarter of the households own land of different size suitable for wet-rice cultivation and possess registered land use rights. These villagers are mainly descendants of the first settlers. Selling of this land is not common as it is the main asset for these families and the reason for their higher social and economic status. The land is controlled by the head of the family clan and cultivated by different families of the clan according to their needs and

labor capacities. Households that do not belong to the long-established families cultivate upland rainfed fields without any legal land rights or depend on leasing contracts of paddy fields. In this sharecropping arrangement – under which they have to give 50% of the harvest to the landowner – the tenant receives not only the right to use the land but also the right to share the water from the communal irrigation system described above. Thus, land and water rights are closely intertwined as only farmers, whether owners or sharecroppers, with fields in the plain area along the canals can get access to irrigation water from this system. Access to water also depends on the location of the fields. Paddy fields located at a higher altitude than the canal would need water-lifting devices to benefit from the system. Due to financial constraints, these fields are only used under rainfed conditions and therefore generate lower yields and have a higher risk of crop failure (see Figure 3 above).

4.2 Individualization of water rights in a commercialized system – the case of the Thai village Muang Kham in northern Thailand

The water management system in Muang Kham is characterized by a high complexity and dynamic regarding access to water and tenure rights. A multitude of water sources, distribution and management systems for irrigation and household water exists, giving the villagers a wide range of possibilities to get access to water.

4.2.1 Dynamics of the irrigation system

Until the mid 1980s farmers in Muang Kham produced mainly wet rice with the traditional *muang-fai* system. A multitude of canals in the valley, fed from the creeks dammed by weirs or directly from springs, led water to the plots. The weirs were made from stones, soil, and bamboo until the replacement with permanent construction by the Royal Irrigation Department.

With the economic and infrastructure development and improved market access, farmers changed their cropping pattern to profitable cash crops which induced the individualization of water management (see Table 2). With this development the quantities of water used and the requirements on water quality have increased.

Table 2. Changes of cropping patterns in Muang Kham

Crops	Period	Water source	Irrigation system
Paddy	Until mid 1980s	Creeks	<i>Muang-fai</i>
Cabbage and onion	~ 1986 – 1991	Creeks	Furrow
Strawberry	1992 – 1993	Creeks and wells	Furrow
Cut flower	1994 – today	Creeks and wells	Sprinkler
Sweet pepper	1998 - today	Wells	Hydroponic, Drip irrigation
Eggplant	2004	Creeks and wells	Furrow

After several years of cabbage and onion production, strawberries were produced and some farmers started to construct wells to ensure water supply, especially in the dry season. Strawberry production was abandoned just after two years because of soil problems and the introduction of cut flowers. The artificial lights needed during the night to produce cut flowers inhibits flowering of strawberries. Today, more than half of the farmers produce cut flowers (mainly chrysanthemum) all year round and also irrigate them in the rainy season because the plots have to be covered with foil to avoid damage of the blossom through rainfall. Hence, this production system goes along with a high demand for water during both the rainy and dry season. In 1998, a Dutch company introduced hydroponic sweet pepper production on the basis of contract farming. This system requires high investment in

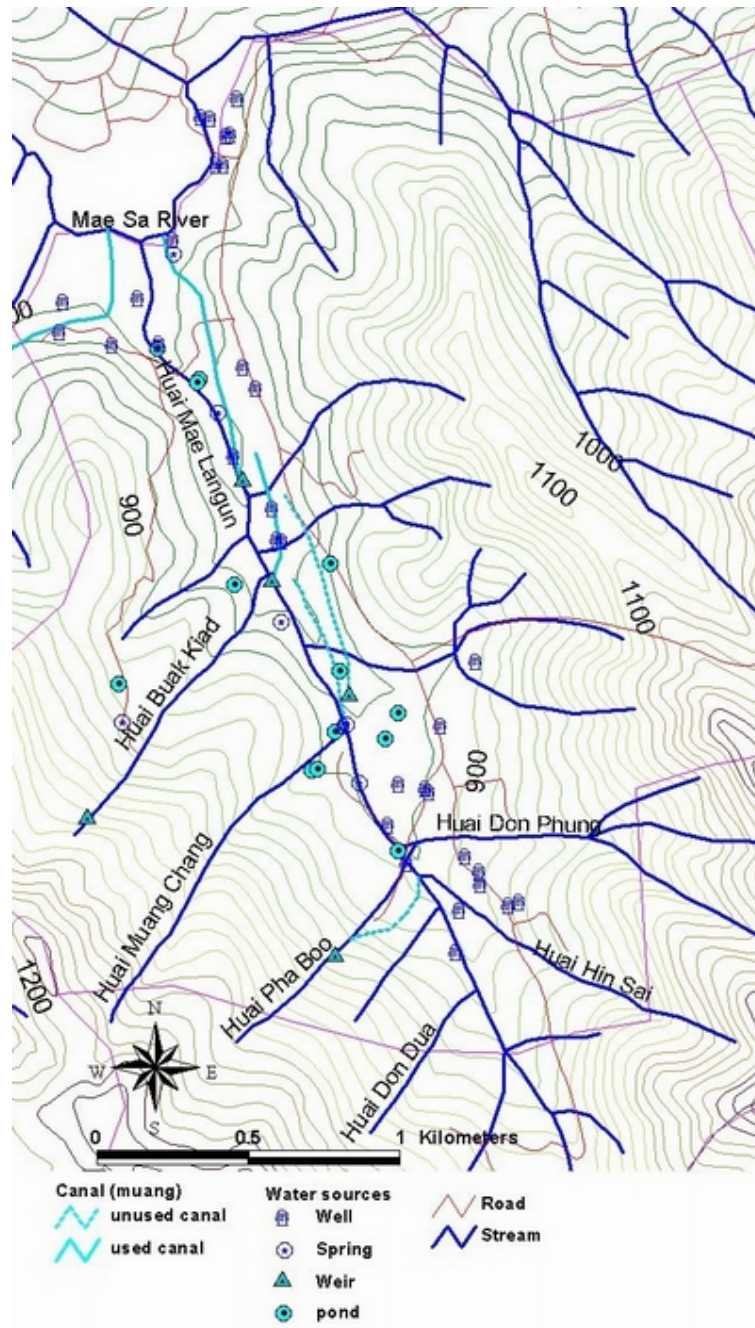
greenhouses and water conveyance system and high water quality because of the use of drip irrigation and to prevent water-borne diseases such as mould. This production system induced many farmers to construct private wells for groundwater extraction to guarantee sufficient quality of water.

4.2.2 Water sources and management

For irrigation there are three main types of access to water:

- the traditional *muang-fai* system
- surface water in creeks and springs
- access to groundwater via private wells (see Figure 4).

Figure 4. Water sources of Muang Kham



As described above the *muang-fai* system lost its importance with the widespread abolition of paddy cultivation. Today, rice is cultivated only on one plot and does not have any economic significance. However, three *muang* continue to exist and are used by 24% of the farmers. They are mainly used for irrigation of the flowers and vegetable, as the quality of the water is not sufficient for sweet pepper cultivation.

The canal fed by a weir in the Mae Sa River in the neighboring village is used by 17 farmers and still managed by a *gae muang*. However, role, power and task of this position have changed, and he also does not receive any compensation. The only task is to organize the maintenance of the weir and canal twice a year in which all users have to participate. Failing to comply with this commitment to the water user group will be fined. The water is not allocated on a communal basis, but withdrawn by each farmer individually. This practice makes sense because today – unlike in the paddy cultivation with a fixed schedule for preparation, planting, irrigation and harvesting – each farmer grows a variety of crops in different seasons which requires flexible access to water.

The management of the other two canals is not communally organized anymore. The lower canal of the creek Mae La Ngun is used by ten farmers to irrigate flowers, sayote (*Sechium elude*) and the only paddy field in the village. The upper canal is used only by some farmers as a reserve to supplement the supply by another water source. There is no communal maintenance of the system and the allocation of water is done individually.

Most of the farmers (almost 80%) take water directly from creeks, springs or ponds fed by underground springs. In total there are ten creeks, six springs and thirteen ponds used by the farmers with differences in the spatial distribution. The western side of the valley has comparatively abundant water from four creeks and the majority of the farmers use these sources. On the eastern side there is only one creek with sufficient water, two others are used by four farmers only. The two bigger creeks Mae La Ngun and Mae Sa in the valley are not used by many farmers directly, but mainly through the remaining *muang-fai* system. Almost all springs and ponds are located in the valley bottom and are used for all crops, but especially for sweet pepper as they provide clean water.

The creeks and springs are dammed by a small weir made from stone, sand sacks or concrete. Ponds located in the valley bottom are equipped with pumps. Pipelines lead the water from the source to basins or storage tanks beside the creek or directly on the plots from which water is distributed to the plantations.

Water allocation facilities are individual or, in few cases, shared between relatives or independent parties across family boundaries. Farmers using the same creek organize the management in some cases together in user groups. In many cases these user groups are a continuation of the group who used the source in the *muang-fai* system for paddy cultivation. Although water is distributed via individual pipes to the plots, the access to certain sources is still based on the former *muang-fai* system. Only farmers who used water from the source in former times for paddy cultivation are allowed to connect a pipeline. Newcomers need the permission of all members of the group to install a pipe. This is also the case for the second spring which is used by eleven farmers. In the past the water was distributed by a canal to the paddies and the users organized the maintenance together. With the changes in the cropping pattern and irrigation system the canal was abandoned, and farmers connected pipelines directly to the source instead. The diameter and number of pipes were determined according to the area used under rice cultivation which has led to an unequal access to water. Long-established user rights and social structure of the user groups remain unchanged even under the dynamics of the irrigation system.

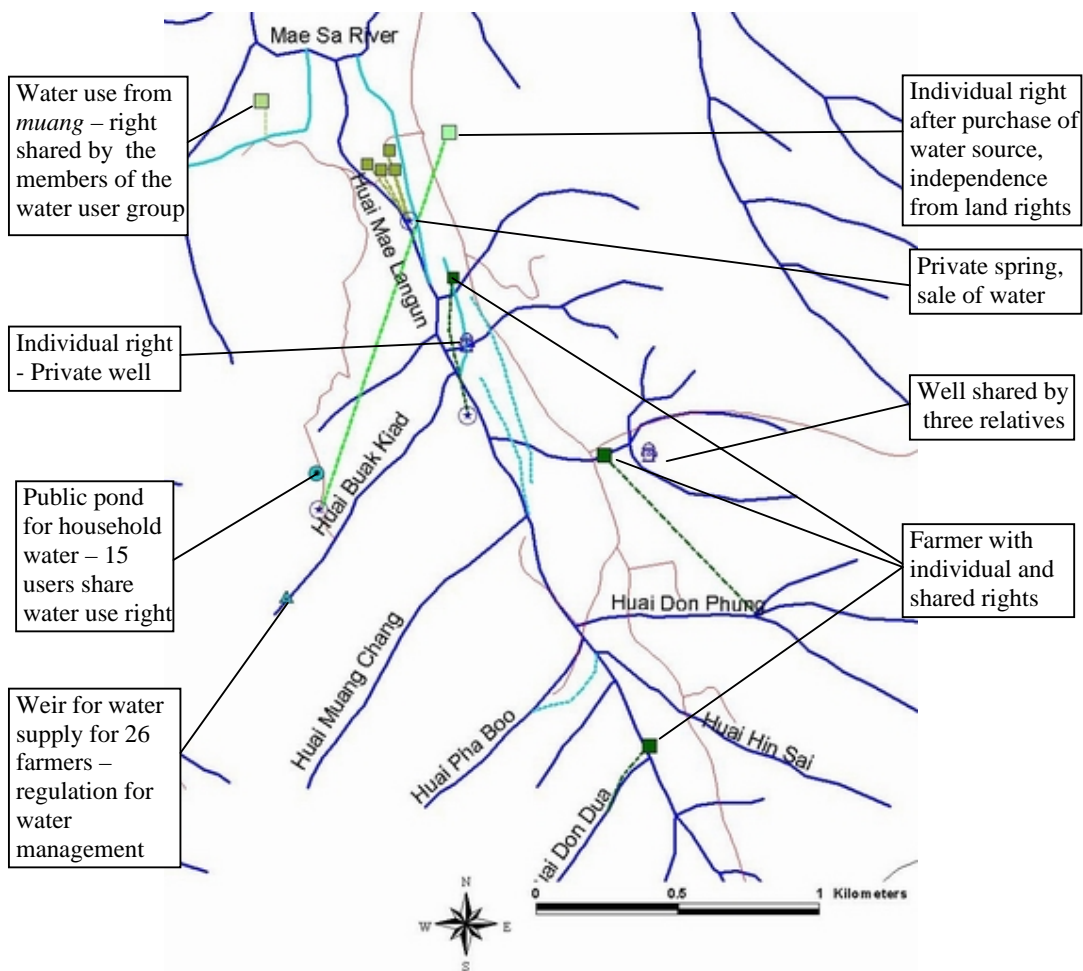
The construction of private wells for ground water extraction is closely related to the introduction of cash crops. Today, there are more than 35 wells in the village, located mainly on the eastern side of the valley and 14% of the farmers use water from this type of source.

Due to the unequal distribution of surface water, farmers were forced to invest in wells to ensure an adequate water supply. This also has led to a concentration of sweet pepper production on this side of the valley, as only high value crops allow the repayment of the initial investments. Beside some shallow wells along the river, most wells extract water from a depth of more than 50m, which requires high construction costs, but also guarantees a good water quality. Farmers reported that the groundwater table has decreased continuously, exemplified by wells with a depth of 20m which recently fell dry.

4.2.3 Complexity of user rights and changes of values

The complexity and pluralism at village and household level are exemplified by selected cases in Figure 5.

Figure 5. Complexity of water rights at village and household level in Muang Kham



Currently there are four main user rights for access to irrigation water:

- Individual water user rights
- Relatives sharing same well or pond
- User groups sharing the same creek, spring or *muang*
- Purchase of water

36 farmers (19%) have more than one type of water access; in most cases these farmers share a creek or spring with others and also have access to water from their own well. *Individual users* have direct access to a water source which they can use exclusively. In Muang Kham these are privately constructed wells or ponds on private land. 30% of the farmers enjoy these individual rights.

Despite the high investment costs for the construction of wells only few farmers *share water sources with their relatives* (only 7%). Individual construction seems to be preferred compared to a shared arrangement that entails the potential for conflicts. The most common arrangement for water access is the joint use of the *creek, spring or irrigation canal* (75% of all farmers). Some of the users form groups and elaborate regulations for the use of water to solve and prevent conflicts. Others are not organized and use the source independently, but still consider the needs of other users.

14 farmers (7%) *purchase water* for agricultural production and/or for household consumption. One source, where water is sold, is a spring beside the Mae La Ngun with abundant and high quality water the whole year. The spring is located on the land of a female villager and therefore considered as her private water source. She rents out the land including the water source, and the tenant has authorized four other farmers from the surrounding area to use the water for irrigation of sweet pepper or for household purpose against payments in cash. Access to water cannot only be bought temporarily but also permanent as the example of the transfer of a spring illustrates. In this case a farmer bought a spring located on another farmer's land and thus received an individual ownership right to water.

These cases demonstrate that the time when water could be regarded as a free good has passed. With increasing commercialization of agriculture, water is gradually transferred into a commodity with high value that can be either communally controlled or individually owned. The findings also show that the rights to land and water under such a commercialized system are not necessarily intertwined any longer, as ownership and use rights can be purchased, and water can be transferred over long distances to the fields.

4.3 Customary water management of a Black Thai community in the Vietnamese context - the case of Ban Tum in northwestern Vietnam

4.3.1 Water resources

A diversity of water resources exists in Ban Tum for different purposes. Farmers use water from wells and natural sources for consumption. Irrigation water comes mainly from the Chiang Khoi Lake which emerged from the Chiang Khoi River when a dam was built in 1975. There are two outflows at the dam:

- The overflow which runs into the river when the lake exceeds the capacity.
- The flow-out into the main irrigation canal called *muang na khem*.

The Chiang Khoi River is used for household purposes as well as for irrigation and bathing. The river carries water all year round – albeit with a very low water level in the dry season – and is fed by the dam, irrigation canals and several small sources along the way until it flows into the Vat River in Sap Vat commune. Additionally, several smaller natural sources are used for irrigating fields in the vicinity of the sources.

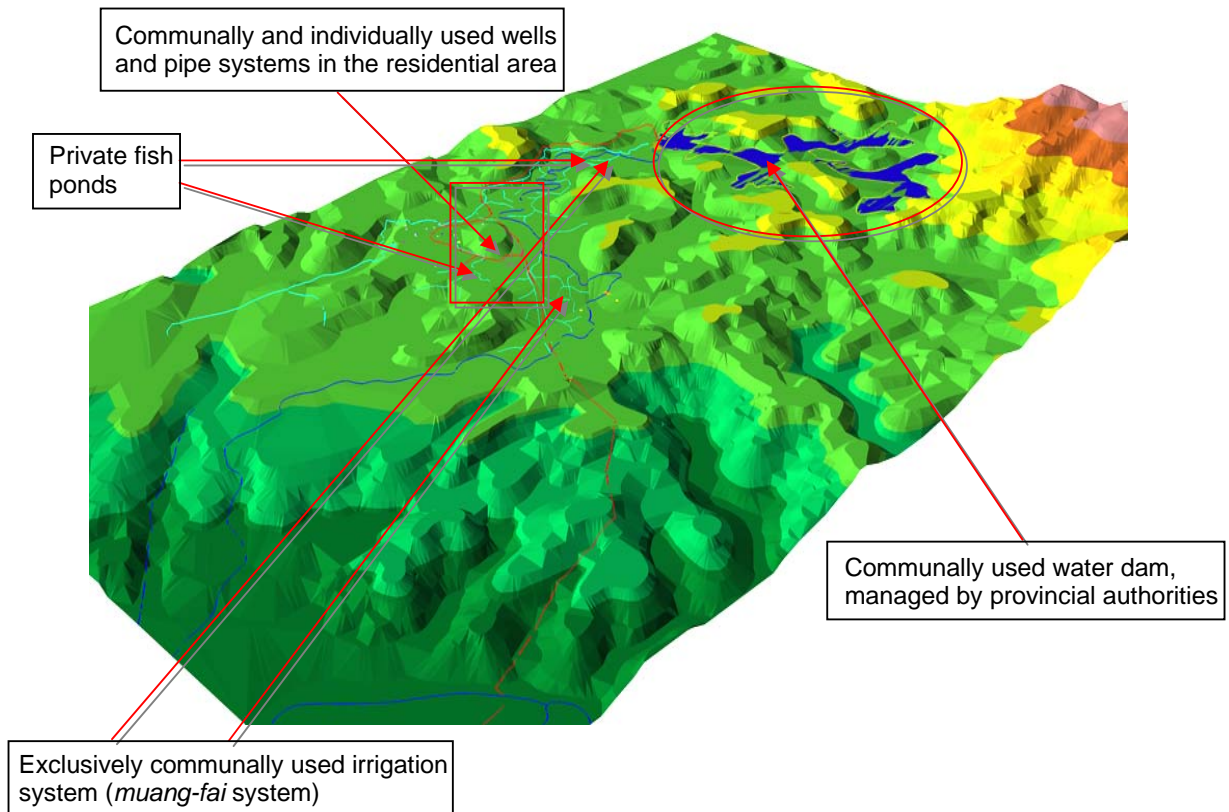
4.3.2 Management of irrigation water

Water for irrigation is mainly needed for paddy rice cultivation, aquaculture systems (fish ponds) and vegetable gardening in the winter time after rice harvest. Maize, cassava and other crops are grown on rainfed fields. Almost every household in the village has at least one fish pond, most of which are connected with the *muang-fai* irrigation system. Before the dam

existed, several weirs were built at the Chieng Khoi River to divert irrigation water along the canals into the wet rice areas. Sources for irrigation water were the river with its origin at the *Vang Ranh* spring and several major and minor springs.

Since its completion in 1975, the Chieng Khoi dam was upgraded several times for safety and improvement reasons and is now the most important water resource for farmers in the Chieng Khoi commune. The households in Chieng Khoi did not have to provide any money, labor or in kind payment for the dam which was planned and built by the provincial government of Son La. Due to the high investment, the complexity of maintenance and the agricultural significance of the dam as water resource, it is managed and maintained by employees of the provincial Department for Irrigation (Figure 6).

Figure 6. Complexity of water rights at village and catchment level in Ban Tum



The duties of the dam managers are to measure the water level on a daily basis, to regulate the water out-flow of the lake and to maintain and repair it. A contract was concluded between the intermediate user villages in Chieng Khoi commune and the provincial Department of Irrigation regulating the use and management of the dam water. Besides other regulations, it had been determined that local users can influence the quantity of water flow through meetings between village heads and dam managers and also that users have to pay a fee for water. All household have to pay 270.000 Vietnamese Dong (VND)²/ha for the irrigation of the first wet rice crop in February and 190.000 VND/ha for the second crop in July. The fees for the first crop are higher because the irrigation period falls into the dry season when the water level of the Chieng Khoi Lake is very low. The village headman is

² 1 Euro is about 20.000 Vietnamese Dong (VND).

responsible for collecting the fees from each household. It has been decided by authorities that 40% of the sum is given to the managers of the dam and 60% is used to repair and maintain the *muang-fai* system in the commune.

The main out-flow of the dam directly leads into a canal with a weir. At this point near the dam, water is diverted into the main irrigation canal and partly into the river. The main *muang* flows along the plateau in north-western direction and in irregular intervals smaller canals distribute water into the rice fields. Currently, only two *fai* exist and are used by the commune. *Fai* 1 was constructed by the villagers in 1995 with money and material support (concrete, steel, etc.) by the People's Committee of Yen Chau district and is located between Ban Me and Ban Tum. Canals originating at this weir are important for the irrigation of wet rice fields and fish ponds in the central area of the Chieng Khoi plateau. *Fai* 2 is a traditional construction made of stones and wood and has existed for many generations. Its importance has decreased since the dam construction and the improvement of the irrigation canal system, and at present it distributes water into an only small part of the central paddy rice area.

The main irrigation canal (*muang na khem*) directs water from the dam through the upper part of the Chieng Khoi plateau into the *Na Khem* wet rice area. This canal is very important for paddy rice as well as aquaculture systems in the north-east part of Chieng Khoi. Due to yearly floods in the rainy seasons, canals and weirs were regularly damaged and destroyed. Therefore in 2001, the 925 program provided money and workers from Hanoi to upgrade the canals and make a concrete instead of earthen construction. Further, this canal is to be extended into the eastern direction of Ban Tum where it is intended to exploit a new wet rice area. At the head of the irrigated rice area a second major irrigation canal separates from the main canal and flows along the north-western part of the plateau. Hence, the irrigated rice and pond area is bounded by the two major irrigation canals whereas the river runs in the middle of the plateau. This second major irrigation canal is an earthen construction and therefore must be well maintained and repaired. Originating in the main canals, many minor canals flow into the fields and ponds along the course of the canals. The whole irrigation system is very complex and interconnected as water runs in and out of all components of the irrigation system including rice fields, fish ponds, irrigation canals and the river.

The 925-Program enacted in 1998 by the Ministry of Agriculture and Rural Development provided workers and material for the construction of the wells in 1999 and the upgrading and extension of the main irrigation canal in 2001. The program includes a bundle of different projects on various sectors, e.g. irrigation, infrastructure, and education, and is implemented by a multitude of ministries and organisations. Even a small part of the program, like the improvement of the irrigation system in Chieng Khoi, is prepared, implemented and monitored by various departments on district and provincial level as well as by several ministries on state level. At first, the Ministry of Defense contracted this construction but later withdrew and transferred it to a private contractor. The proper use and maintenance of the irrigation system are monitored by the Irrigation Department on district level and the Water Exploiting Company, both under the Department of Agriculture and Rural Development of Son La Province. Another example for the institutional and legal pluralism is the *Vang Ranh* spring which is controlled and maintained by the province, namely the Department for Agricultural and Rural Development but also the Department of Forestry because this source is located in mountainous forest. Other major but less important springs are managed and maintained by the communal People's Committee and minor springs and wells are managed on village or household level.

In analyzing the different resource systems and resource units as well as the involvement of institutions and organisations in construction, management and use of water resources, a distinctive legal pluralism, defined as "the coexistence and interaction of multiple orders within a social setting or domain of social life" (Meinzen-Dick and Pradhan, 2002: 8), can be

identified³. For both the irrigation and consumption water system we can distinguish various kinds of rules and regulations:

- state law in accordance with national resource policies,
- customary law on water use and distribution regulations,
- project law and regulations associated with particular projects or programs,
- organizational law made by the village management board or a water user group.

The water management in Ban Tum is closely related to the administration on commune and district level. The village management board, called *Ban Quan Ly*, consists of the village headman, the treasurer, and the accountant; the latter two serve as assistants to the headman. These three men are the executives and are responsible for planning, implementing, and controlling all common activities in the village. Their duties concerning water management are to check the irrigation system regularly, make the contract with the Chieng Khoi Lake managers, and coordinate collective activities of villagers. However, all final decisions must be made in accordance with the cadres of the Communist Party as the most influential institution on all levels. Besides the members of the management board on village level, the *Liep Na* (water manager) is in charge of the irrigation water system. His responsibilities are an equitable water allocation, maintaining minor weirs and canals, protecting fields from destruction by ruminants, and observing the development of plant diseases within the village boundaries; hence, his tasks extend well beyond the mere management of water for irrigation. The *Liep Na* is appointed by the headman for an undetermined time, with agreement of the villagers, and is obliged to inform the headman on a regular basis about the condition of the water and rice systems. As compensation for his efforts he gets a fixed amount of rice after harvest (cf. the case of Mae Lana in section 4.1.1).

The water use regulations in Chieng Khoi are valid for all villages in the commune as they are dependent and interconnected with each other by the water system. The structure of a decision-making process can be described as follows. If a decision is to be taken about water use, quantity, and quality, the headman calls a meeting with representatives of all households during which they try to find an agreement concerning the reviewed issue. Then the headmen of all villages in the commune hold a meeting together with the dam managers and the officer for Transport, Irrigation, Forestry and Agriculture as representative of the People's Committee of the commune. This group finally would find an agreement on issues like the irrigation fees that every household has to pay for the respective cropping period or the quantity of the water out-flow of the lake. Further user rules for consumption and irrigation water exist, regulating how to maintain, prevent from damage and keep the water resources clean. It is the responsibility of the water users to follow the rules and the final control institution on village level is the headman. Regulations limiting or allocating only a specified water quantity are established in times of water shortage from February to April and are set by the decision-making group mentioned above. If a person or domestic animals damage, pollute or over-exploit the water resource system, the offender or animal owner will be fined and has to pay a certain amount of money or rice into the village fund. Minor decisions on water management within village boundaries can be made by the village management board, after approval by the Secretary of the Communist Party.

The scheduling of flooding the fields and transplanting the rice seedlings is not the responsibility of the *Liep Na* anymore since a centralized schedule is set up by the commune authorities. However, local farmers have the possibility to influence the time-frame if a majority disagrees with the proposed timing. With this centralized planning it is also intended to prevent conflicts while water distribution by providing water to all fields in a determined

³ For legal pluralism with reference to water rights and management, see e.g. von Benda-Beckmann et al., 1997; Neef et al., in press.

time-frame. Occasionally, water conflicts were reported, e.g. when a farmer accused his neighbor to prevent water from flowing into his field. Conflicts of this kind are mediated by the village headman or the *Liep Na* and, if serious, by the next higher administrative level and the culprit will be fined. Rules to balance the head and tail benefits as described in the example of Mae Lana in northern Thailand (p. 10 above) are not in existence in Ban Tum, because the land allocation process in Chieng Khoi commune led to a relatively equitable allocation of agricultural land to households regarding size, quality and location. Therefore, the conditions of irrigated rice fields are very similar for all farmers in Ban Tum and the whole commune.

In Ban Tum and Chieng Khoi commune the influence of the government and its representatives is strong with regard to social, cultural, agricultural and political aspects. As mentioned above the cultivation schedule is recommended by the authorities and labor-points must be earned by villagers for collective work. The field research provided evidence, however, that collective action in the *muang-fai* irrigation system and social cohesion among the Black Thai are not just products of a coercive top-down hierarchical system, but much more a product of voluntariness and traditional forms of cooperation.

4.3.3 Access to water

Since the 1993 Land Law, all households in Ban Tum land have received land certificates for residence and agricultural purposes. The area of the allocated land depended on the number of household members. In Ban Tum, households received 300 m² of irrigated land for wet rice cultivation per capita and 500 m² of rainfed upland fields per capita. The so-called Red Book Certificate (RBC) guarantees the land use rights for the allocated land for a period of 20 years. Through the RBC farmers are bound to the commune where their land is registered and moving to other areas is very difficult and restricted by the Vietnamese government. Especially for ethnic minorities, the establishment of a household outside their native commune is extremely difficult; newcomers in Ban Tum are usually Kinh people (ethnic Vietnamese) who have been resettled from the overpopulated Red River Delta. However, moving from one village to another within the same commune occurs often caused by marriage or other family relations.

Access and use rights to water are closely related to land and residence rights. Thus, households which can prove their right to residence in the village and commune will automatically receive the right to access and use the water resources of the community. Access to water or certain water resources does not depend on the location of the paddy land, clan affiliation or power structures. Moreover, for the Black Thai private or individual water access and use is traditionally unknown and even today individual households or subgroups of the village can not gain private access and use rights to irrigation water.

It is thus unlikely that Ban Tum and other Black Thai villages in the area will follow a similar trajectory as the commercialized and individualized system in northern Thai villages like Muang Kham. Commercialization of agriculture and diversification of cropping systems are still confined to the rainfed upland areas, while the irrigated areas remain important resources to sustain rice self-sufficiency and food security of the villagers.

5 SYNTHESIS AND CONCLUSIONS

This comparative study of *muang-fai* systems in Thailand and Vietnam shows that control and use rights in community-based irrigation systems are influenced by several factors, such as local power relations, geographical conditions, technical possibilities, the socio-political context, and the economic environment, particularly the degree of market integration. Only in purely subsistence-oriented regions, exemplified by the case of Mae Lana in northern

Thailand, where the influence of both the state and the market has remained weak, the *muang-fai* system was able to maintain its original characteristics. The case from Vietnam shows that the socio-political context has modified the institutional set-up (e.g. by changing the role of customary irrigation managers) and added to the already existing institutional complexity (e.g. through the introduction of village management boards), but never replaced the *muang-fai* system nor undermined its main function of providing an equitable and reliable share of water to its members. The strong social cohesion and willingness to fulfill collective activities among the Black Thai communities provides a solid basis for a continuously stable and equitable irrigation water management on a communal basis. A disruption of this stability is to be expected in those Black Thai communities that will have to accommodate households under a resettlement scheme connected to the construction of a huge hydro-electric dam in Son La. Some villages reportedly will see their population double within the next few years, which will certainly put the communal resource management systems – not only for irrigation water, but also other natural resources – under a serious test.

In the market-oriented systems of northern Thailand, communal water management systems still exist but are subject to a particularly dynamic process. In adaptation to external factors, such as market forces and state interventions, regulations for water management and tenure institutions are changing. However, as the case of Muang Kham shows, water rights are still bound to membership of the former system and communal structures remain intact which demonstrate the social importance and acceptance of the system. With the shift to commercialization, the share of individual water rights increases, providing a flexible and independent access to water and creating a higher degree of complexity of rights (Neef et al., in press). In this process the perception of the value of water changes. Water is not considered as a common good for the benefit of all members of the community, but as a commodity of high value that can even be traded in a local market.

We conclude that while the *muang fai* systems have remained resilient as communal water management institutions for several centuries, they are now facing increasing pressure to adapt to new economic and political realities. Instead of being simply replaced, they form part of a more diverse portfolio of water governance institutions. Recognition of the resulting legal complexity of local water tenure regimes and a careful assessment of location-specific management systems are keys for identifying sustainable solutions to increased competition for scarce water resources.

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