

Chapter 3

Arrival of Tai Agriculture

The emergence of the Tai tribe coincident with the decline of Mon-Khmer domination reformed agriculture in the region. While known in China before the eleventh century as wet rice cultivators, Tai and their technologies may better be deduced from cultural associations with similar technologies across the Tai diaspora. With the gradual southward movement of the Tai prior to the twelfth century, and in particular in the thirteenth century and after, Tai technologies in irrigation and agriculture mixed with those of the Khmer and Mon. As valley dwellers, they had developed and refined technologies through experience and contact across valleys from Assam to Vietnam. Their water management systems complemented those developed by Mon-Khmer. In particular, the *muang fai* irrigation system represented a technological and socially sophisticated system which proved sustainable through at least eight centuries.

Blending technologies and human resource management systems provided the basis for expansion of a self sufficient Kingdom. The agricultural systems which supported this emerging force, the human resource management systems which were critical to its persisting, and the environmental beliefs of the Tai, are discussed in this chapter.

Chinese Tai

The development of agriculture in areas such as China and India was associated with an eighty fold increase in population over the period of 10,000 to 400 BC. Irrigation in China is first mentioned in 563 BC in the context of opposition to the introduction of a novel technology; the Chinese may thus have been the last

of the great civilisations to utilise irrigation.¹ By way of contrast, rice cultivation in China appears to predate barley cultivation in the Middle East by several centuries. Still today more than ninety percent of the rice of the world is produced and consumed within Asia making it the staple food of more people than wheat. The gradual development of rice technologies suggests that while double-cropping of rice was known in China from the twelfth century, it was probably imported from technology developed for the earlier maturing varieties of rice known as Champa from Vietnam about 300 BC.

The development of technologies around environmental opportunities suggests their separate origins and slow diffusion. For example, the use of draught animals in rice cultivation is based on lightweight ploughs which required smaller, often single, animals than were required for the heavy mould-board ploughs of Europe;² the use of dual draught cattle equipment in southern Thailand, like bull-fighting traditions,³ probably reflects coastal Indo-European influence. However, before draught animal technology came irrigation technologies which allowed substantial modification of the natural environment to suit rice production.

The Tai of whom the Chinese wrote universally lived in lowlands and valleys, having developed an economy based on wet rice cultivation.⁴ Linguistic and cultural associations suggest contact between the Tai culture and for example, Hua Xia culture of southern China more than one thousand years ago.⁵ Domestic livestock including cattle, or perhaps buffalo, were significant as a measure of status and wealth or as part of rituals, as much as for their utility for draught power.⁶ The progressive southward migration of the Tai introduced their *muang fai* irrigation system to the narrow river valleys of northern Thailand, as indicated by the associated innovation, the *luk*, a huge bamboo water lifting wheel used in Thailand since before the Sukhothai period. The *luk*, powered by the river current, used short sections of bamboo attached to the outer rim of the paddle-wheel to collect water and lift it above the level of the riverbank and empty the water from each bamboo cylinder into a drain leading to a field. Dismantled or abandoned prior to the river

¹ Ho, P.T. (no date)

² Evans, L.T. (1998)

³ Chantalakhana, Charan. and Skunman, Pakapun. (2000)

⁴ Kato, K. (1998)

⁵ Yamchong, Cheah (1996)

⁶ Wyatt, D.K. (1984)

rising each wet season,⁷ *luk* seem to have used by Tai for more than ten centuries with *muang fai* irrigation systems and glutinous rice culture in southern China and northern Thailand.⁸

Muang Fai

The *muang fai* irrigation system was used on fast flowing streams up to twenty metres in width, across which weirs elevated water by up to two or more metres.⁹ The *fai* held back water which was directed to major and minor canals known as *muang* in which gates, *tang*, controlled flow rates. Where a *muang* could be constructed by diverting water from a river, no *fai* was needed. Constructed from bamboo and wooden stakes driven into the river bed against which rocks, poles and sand were placed, the *fai* allowed water to pass through and over the barrier while restricting the rate of flow and thus raising the water level. Annual maintenance necessitated by peak wet season water flows and siltation formed the basis of the community ownership of these resources and the development of a democratic Tai administrative system. The system allowed the development of States with a ruler over several *muang fai* in a river valley, although independent systems appear to have existed in parallel with consolidated arrangements through to the nineteenth century on the larger northern rivers.¹⁰ The porous weirs with water brimming over the top enabled successive *fai* to be built on a river. The system as depicted in Figure 3.1 required sound social organisation¹¹ and appeared as early as 757 to have been managed through the local rulers as a means of coordinating irrigation or rice fields belonging to a significant proportion of the populace. The well documented northern reign of Mengrai in the thirteenth century indicates a widespread and well managed irrigation system in the northern river valleys.

The social organisation allowing the management of the system evolved to rely on officials, such as the *Khun Nai Fai* and the *Hua Na Fai*, as managers of systems on behalf of the ruler. These offices become local leaders and were elected by those participating in the irrigation system. The irrigation manager's responsibility

⁷ Penth, H. (1994)

⁸ van Beek, S. (1995)

⁹ Surareks, Vanpen. (1998)

¹⁰ Cohen, P.T. (1980)

¹¹ Attwater, R. (1998)

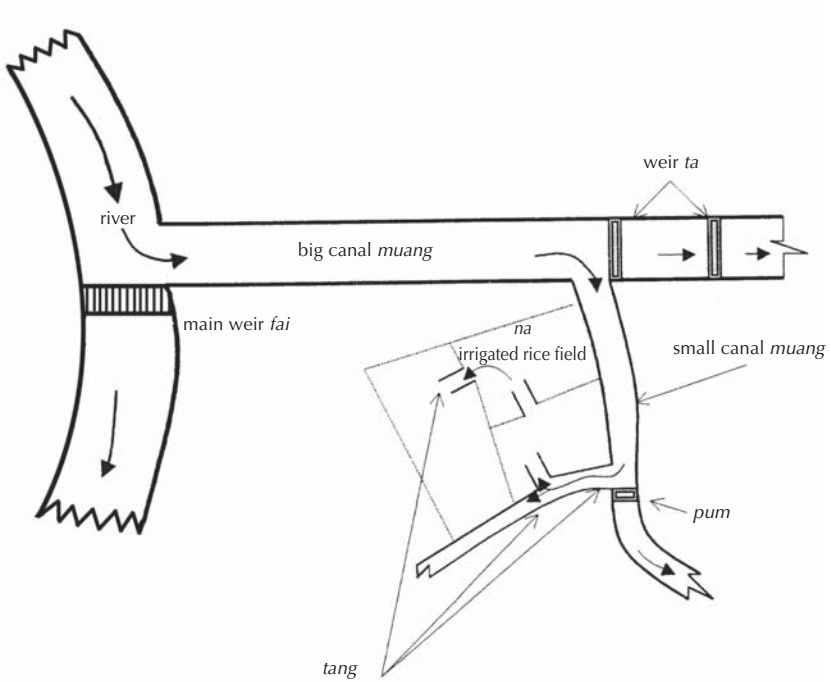


Figure 3.1 The Muang Fai Irrigation System¹²

was to:

- calculate the amount of water and its allocation to individual farmers
- coordinate the initial construction of weirs and canals
- coordinate annual repairs required after each wet season
- manage propitiatory and other rituals associated with rice culture
- collect fees for irrigation system maintenance and associated rituals.

Requirements of farmers to provide labour on the basis of their area of paddy fields formed part of an early user-pay system within a community-based activity which was uniquely Tai. This sustainable social system was critical to its technical sustainability. Elaborate rules evolved to maintain systems and to avoid damage, with policing power vested in the irrigation manager. Serving Thai agriculture until the twentieth century, the *muang fai* system was eventually

¹² Surareks, Vanpen. (1998)

incorporated in the national Royal Irrigation Department system where it was superseded by developments in pumping and piping technology.

The *muang fai* system suited the valleys draining northern Thailand although it was universally popular with other ethnic groups. Even in this century, some hill tribe groups have eventually engaged northern Thai persons to advise on the techniques of irrigation, weir construction, and canal orientation, with an incidental outcome of adoption of rituals and prayers directly from the northern Tai language as part of the 'development package'.¹³ The *muang fai* system was less suited to delta areas of the Central Plain with its heavy river sediment loads and extensive flood plains. In these areas, the opportunistic use of minor earthworks to delay receding flood waters continued as the basis for rice cultivation until later merging of Mon-Khmer and Tai approaches to water control enabled settlement of the hitherto lightly populated delta.

The talents of the Tai people with the *muang fai* system were a critical input to the development of Sukhothai, and subsequently, Ayutthaya. While the rising influence of the Tai at Sukhothai is difficult to separate from their assumption of Khmer ideology, culture, and technologies, the later Sukhothai period when Tai control was well established suggests that sediment settling ponds used as ritual architectural artefacts were of less interest to the Tai than the Khmer. Tai inscriptions from Sukhothai refer to the use of the *muang fai* system to irrigate crops adjacent to smaller streams in conjunction with more opportunistic system of bunding to retain receding water in areas protected by flood barrages. Thus Sukhothai, represents a blending of the smaller scale community *muang fai* irrigation system of the Tai with the extensive system of the Khmer and their agriculturally less significant pond and gravity feed system. It is from this era that the two different approaches to irrigation in Thailand have thus been classified as:

- inter-montane basin farming systems, *muang fai* and others
- delta farming systems.¹⁴

¹³ Kunstadter P. et al (1978)

¹⁴ Tanabe, S. (1994)

Integrating Technologies

The interface between Tai and Khmer technology led to the diversion of major river waters into canals built at the river's natural height. This allowed swamps and old river bows to fill when flows were high, and for that water to be trapped and subsequently drained quickly towards the end of the rainy season. By this means, the simple earthworks which delayed receding flood waters as practiced from the time of the agro-cities through to the Khmer period could be used to greater effect. As the Tai had not been associated with large rivers and broad flat plains for centuries,¹⁵ it is probable that these technologies were developed elsewhere and transmitted through the extensive network of Tai people extending from southern China through Vietnam, Laos-PDR, Thailand, Myanmar, Bangladesh, India, and Bhutan, and along trade routes which passed Angkor and Sukhothai. Nevertheless, this technology, while widely used on rivers with a significant gradient, was inappropriate for the meandering delta distributaries of the Chaophraya River in the Central Plain.

The relatively scant rice-based agriculture of the Central Plain supported a small population based on simple water engineering. Abundant flood water enabled areas which flooded naturally for four to five months a year to be used with minor earthworks to enhance the depth of water, and retention rate at the margins. Through this period, the deposition of sediment and a gradual fall in sea level, led to the creation of natural distributary canals in the alluvial mud, thereby creating potential rice fields in adjacent areas. These changes in the natural environment provided a significant advantage for a rising population in the Chaophraya River delta. The annual replenishment of fertility through sedimentation, and the abundance of water to irrigate rice and other crops, provided a basis for further expansion which modified irrigation technologies derived from the *muang fai* and Mon-Khmer systems.

The bountiful irrigated rice production system allowed the Tai peoples to develop crafts as part of their evolving culture. Even at the village level today these crafts can still be seen in the sensitive and time consuming skills of designing such utilitarian items as fish baskets. One basket design for example, designed to keep

¹⁵ van Liere, W.J. (1989)

fish alive after they have been caught resembles a duck which the fisher pulls along in the water while seeking further fish.¹⁶ These crafts were developed long before the emergence of a Thai identity, which was to require wisely managed assimilation policies to obtain scarce resources, usually labour. Tai characteristics of adoption of new technologies, innovation within their own environment, and the changes which migration itself induced, allowed realisation of the natural potential of this new land for production of the essential ingredient of civilisation and expansionism, reliable paddy fields.

Critical to the emergence of Thai agriculture, the Tai were a self sufficient race with high levels of adaptability and innovation. The origins of these people provides further information about the essential ingredients which contributed to the successful development of the Chaophraya basin, the northern rivers, and the Khorat Plateau.

Tai Agriculturists

According to a theory which links the development of three language groups, one of them Tai, with the development of rice agriculture, the association between Tai and irrigated rice flows through early southeast China history.¹⁷ Suggestions of historical traces of the Tai in an area between the Yellow and Yangtse Rivers date from about four and a half thousand years ago;¹⁸ these Chinese sources report that tribes such as Tai had settled in the land north of the Yangtse River by 2,000 BC and in about 1,600 BC these settlers, by then referred to as Tai, had settled in the Yangtse region itself, thus providing the first indication of what appears to be an extended southward migration.¹⁹ These persons were subsistence farmers producing rice and vegetables while tending cattle and other domestic animals and supplementing their diet from streams, rivers, and the forest. Sharing of labour for harvesting rice and other agricultural crops was probably the first major form of communal operations of an agricultural enterprise among these groups.²⁰

¹⁶ Suchitta, P. (1989)

¹⁷ Bellwood, P. (1992)

¹⁸ Chakrabongse, C. (1967)

¹⁹ Donner, W. (1978)

²⁰ Wyatt, D.K. (1984)

The next entry of Tai into history²¹ appears to be their contentious involvement in the management of Nanchao Kingdom²² of southern China. Including Tai peoples, the Kingdom had been a buffer between Tibetan and Chinese interests until 1253, when Kublai Khan accelerated the pace of integration and migration for various ethnic groups. Those Tai peoples remaining in what was Chinese-influenced territory were largely assimilated while those who migrated found more wet rice lands, developed techniques to assume ownership of others' fields, and utilised displaced owners as soldiers in bids to gain further fields. By the thirteenth century the Tai assumed the void left by the decline of Mon-Khmer influence. The political organisation of the Tai, which had developed around their irrigation management, provided a foundation for superior organisational techniques possibly learned from the Chinese; such techniques included fortification walls around towns which served as centres of agricultural and military activities rather than trading.

Migrating Farmers

The southward migration of Tai took place over centuries, rising to a critical peak at the time of Kublai Khan. Migration is confirmed by Tai presence in Angkor records around the beginning of the twelfth century. The absorption of some Mon laws into the Thai system suggests that Tai contact with the Mon predated the dominance of the Mon Dvaravati Kingdom by the Khmer Kingdom under Suryavarman I around 1,000.²³ Thus small, possibly separated Tai groups were probably scattered across the region for centuries before their emergence as a force at Sukhothai.

Around 1,300, Chinese annals note that the Tai who migrated to what is now Thailand benefited from the fertile soils of the region, while those who migrated to Lao-PDR inherited soils less suited to wet rice agriculture. Buddhist missionary campaigns from 307 BC had assisted the emergence of the Mon-Khmer culture through subsequent centuries, later also providing a basis for conflict when the King of Pagan attempted to forcibly standardise Buddhist practices across the region.

²¹ Carter, M.D. (1952)

²² Pholdi, Orathai. (2000)

²³ Seidenfaaden, E. (1946)

The Tai, who had possibly learned skills in administration, customs, land allocation procedures, and taxing of agricultural produce in southern China,²⁴ were well placed to take advantage of weakened areas between powerful Empires.

In migrating, the Tai found themselves the occupants of upland river valleys surrounded by the Vietnamese State centred in the Red River Valley and delta regions, the Kingdom of Champa on the coast of central Vietnam, the Khmer Empire centred at Angkor and the Kingdoms of the Mon and Pyu of Myanmar. These States were oriented to either the coast or their own State-religious Empires. Widespread shortages of labour in expanding Kingdoms meant that campaign victors took slaves; through such mechanisms the Tai experienced different techniques of agriculture across the whole region. Tai slaves were mentioned in an inscription of the Champa Kingdom of coastal Vietnam during the eleventh century.

Independent Tai States of southern Yunan were recognised in Chinese chronicles as having entitlements to revenues from northern Thailand, northern Vietnam, Laos, and Sipsongpanna. By the end of the thirteenth century, Tai chieftains had established their right to manpower within their realms. From the differing Tai involvements across the region, Tai were to either form a Kingdom capable of assimilating other cultures into a new (Thai) culture, or be absorbed as they assumed leadership roles in a new culture, as occurred in the case of the Ahom Tai of Assam.²⁵ In any case, it appears that agriculture was a more common unifying theme of the Tai than the, perhaps, more romantic version of an increasing militaristic Tai group marching southward to take over the fertile valleys of the Khmer.²⁶

Tai in Thailand

The migration of Tai groups across several countries was associated with river valleys, river-based irrigation systems, and the grasping of opportunities. Southern China experienced famine while the Tai found themselves in an untapped land where climate change further favoured wet rice agriculture. Mon-Khmer power had passed its zenith and, by the time they assumed its mantle at Sukhothai, the Tai

²⁴ Thomson, V. (1967)

²⁵ Wyatt, D.K. (1984)

²⁶ Terwiel, B.J. (1991)

had established a river-valley communication system and stable communities which flourished to become the major northern valley centres of Luang Prabang, Chiang Mai, and Chiang Saen.

Thus Tai migration was not necessarily *en mass* or stimulated by Kublai Khan.²⁷ It blended with the assimilatory Dvaravati then Mon-Khmer cultures until the latter's demise when Tai assumed Khmer trappings of power while continuing with their adopted religion, which was common with that of the Dvaravati. Continued assimilation ultimately produced a culture now known as Thai; while for other Tai groups such as the Ahom, integration with another culture led to diminution of Tai traditions.²⁸

The upper Chaophraya basin into which the Tai migrated in increasing numbers from the thirteenth century provided an isolated area for the development of local autonomy within the mixture of existing ethnic groups.²⁹ In the smaller river valleys of the north, the development of Kingdoms separated by mountains³⁰ provided a secure rice production base for residents, the absorption of migrants moving south, and encouragement for those travelling to areas short of labour for development of further wet rice. The numerous Tai speaking settlements of the era emerged as four groupings according to the river basin of their location:

- the Mekong River group which is found in Sipsongpanna region of Yunnan Province of China and extends down through the northern areas of Myanmar, Lao-PDR, and Thailand, and includes the northeastern region of Thailand
- the Salween River group which is concentrated predominantly in northern Myanmar, although part of this group subsequently moved to the Phrommabutr River Basin in India
- the Red and Black Rivers groups which include the Tai speaking groups of present day Vietnam
- the Chaophraya River group which includes the Tai speaking groups of present day Thailand.

²⁷ Yuting, D.E. and Lufan, Chen (1989)

²⁸ Terwiel, B.J. (1983)

²⁹ Loubere, S. (1969)

³⁰ Kasetsiri, C. (1976)

Tai Traits

The small cultural differences between the different Tai speaking groups are overshadowed by their overwhelming cultural similarities which include language, rice cultivation systems, consumption of glutinous rice, and the distinctive form of raised-floor house construction. In particular, the association of Tai people with glutinous rice appears to have been almost absolute. Other groups who planted and consumed glutinous rice were related to, or closely associated with, Tai groups. While during the modern era, groups with whom the Tai mixed in delta regions have forsaken glutinous rice production and consumption, their rituals continue to reflect Tai origins; sticky rice is used in spirit and ancestor offerings, marriage ceremonies, as well as a component of specialised dishes, now regarded as delicacies. Glutinous rice remains the preferred diet in the northern part of the Mekong area in northeastern Thailand³¹ and in the northern river valleys.

Descending via river valleys in small relatively continuous migrations over several centuries and settling on the tributaries of main rivers or on flood plains, the Tai occupied land previously considered unsuitable for agriculture. Growing a range of crops on the river banks and practicing *muang fai* and receding flood agriculture for rice production, the Tai introduced new ideas to their neighbours with whom they apparently coexisted satisfactorily for several centuries.³² Traits of readiness to travel, open-heartedness, and assimilation of and with other cultures, may be derived from such early migrants.

However, the association with wet rice production is the overwhelming Tai trait. It saved many Tai from the population pressure which had outstripped agricultural production in their Chinese homeland leading to the 1793 Malthusian predictions of Hung Ling-Chi.³³ Extreme food shortages along the Yangtse fuelled the civil war known as the Taiping Rebellion in the mid nineteenth century. Wet rice agriculture which had in part, fuelled their southward migration, had yielded its harvest for the Tai people in a manner reminiscent of second century BC observations that the proto-Tai people of the Yangtse River were then blessed by a

³¹ Wongthes, P. and Wongthes, S. (1989)

³² van Liere, W.J. (1989)

³³ Hung Ling-Chi (1793)

bounty of food in an area not subjected to floods or droughts.³⁴ Wet sticky rice was the hallmark of the Tai; as the first culture to develop wet rice agriculture,³⁵ Tai were the most suited migrants of the region who, as the Thai, eventually developed the country to be the world's largest rice exporter.

Eighteenth century Thailand was to be eulogised in similar words by French visitors who noted the bounty of nature for irrigated rice agriculture requiring minimal labour inputs.³⁶ By this time, the Tai people had mixed with the peoples of the Mon-Khmer Kingdoms with their Indian Buddhist and Hindu associations and languages incorporating Pali and Sanskrit words clipped to suit mono-syllabic languages.³⁷ In the form of the emerging Thai, one group had assumed control of Sukhothai, others had dominated much of the northern river valleys from Chiang Mai, others the Lang Xang Kingdom headquartered at Luang Prabang, while yet others took over Mon-Khmer centres such as Lopburi, and developed the powerful Ayutthaya culture. All practiced a reliable form of wet rice agriculture under levels of sustainability not approached by modern systems.

Inseparable from wet rice, the history of the Tai and later the Thai, includes cultural elements which have institutionalised; religious observance, farmer approaches to self sufficiency, and bureaucratic systems funded by rice levies, as well as maintaining some ancient beliefs about natural environment management, and propitiation of its spirits.

Environmental Traditions

Thai environmental management has been pragmatically agricultural insofar it modified the natural environment sufficiently to ensure a sustainable output of rice. It has followed the common path of:

- seeking to increase the availability of a natural resource such as water, soil, or nutrients, or to increase the availability of feeds for animals, or reduce crop and animal losses by controlling predators, diseases or weeds
- managing the evolution of both plants and animals by selecting those genotypes

³⁴ Gutkind, E.A. (1946)

³⁵ Eberhard, E (undated)

³⁶ Turpin, M. (1771)

³⁷ Rajadhan, P.A. (1989).

which suit human needs of the time and the environments in which the plant and animal products are to be produced; where genetic manipulation through breeding is not feasible, foreign species have been introduced

- improving the efficiency of human management techniques in the areas mentioned above in order to gain higher efficiencies of utilisation of limiting resources.³⁸

Each of these approaches has been practiced globally from hunting and gathering stages, through opportunistic forms of food production leading to early agriculture, through to the traditional agricultures of recent centuries, and into the modern areas of molecular biology and substantial manipulations of land, water, atmosphere, and nutrient regimes. If swidden agriculture was the first system devised by humans to manage the production of food and other requirements from forested areas in which hunting and gathering had taken place, one might expect some inherent environmental management values to have passed into early agriculture and perhaps even be recognisable today. Likewise, specific beliefs of such tribes as the Tai in their close association with the development of wet rice agriculture might be expected to include environmental management principles of value in the today's quest for sustainability. Clues to such values exist in the myths, ceremonies, and practices of Tai agriculture; some may be reinvented for a modern socio-cultural context as part of national identity building, while others may claim such traditional origins to encourage sound environmental management practices in accordance with Western perspectives.³⁹

The significant historical impact of irrigated rice agriculture can easily overshadow the viability of swidden agriculture which allowed experimentation with new techniques in a reliable food production system capable of adjusting to changing climatic conditions. At low population densities, swidden agriculture represents a balanced ecosystem in which human populations can exist in relative harmony with the natural environment.⁴⁰ Swidden cultivators often encouraged the re-establishment of forest by scattering tree seeds, yet as with all forms of agriculture, the range of plants encouraged was much narrower than that

³⁸ Falvey, L. (1996)

³⁹ Harris, I. (1995a)

⁴⁰ Harris, D.R. (1969)

occurring naturally, culminating in the tiny diversity of major food crops in evidence today.⁴¹

The beliefs of Thai hill tribes, themselves mainly recent immigrants, provide interesting insights as to what may have been once absorbed into the wider belief structure. Invocation of spirits to assist with epidemics, ants and other pests which exceed human powers of intervention in the swidden agricultural systems of hill tribes today contrast with labour intensive efforts to exclude rats by dead fall traps, snares, fences, and diversions, and wind and water powered noisemakers to scare bears and wild pigs away from crops.⁴² Abandoned swiddens allow reasonable grazing for cattle which complement income production and provide for roles of religious sacrifice, wealth, occasional pack or draught power, and status.⁴³ However, in the case of Thailand, the dominance of the wet rice culture means that any vestiges of environmental ethics from other agricultural systems are probably to be found in beliefs associated with irrigated rice.

The harmony between the rice production environment and the Thai peasant farmer indicates the evolution of the system over centuries. Responses to seasonal or other environmental change are undertaken in a familial manner using knowledge passed on through traditions enhanced over time to become an unwritten, and largely unteachable, environmental management practicum aimed at ensuring a reliable harvest of rice. That these practices appear more environmentally suitable than those more recently introduced reflects the time-frame over which practices have been assimilated within the environment and the human needs. Tai irrigated rice production may therefore be seen simply to have been a stable ecosystem based on an evolution of biological, physical, and cultural variables over successive centuries.⁴⁴ While this view does not preclude the development of new sound environmental practices, it removes much of the mystique surrounding traditional practices.⁴⁵

⁴¹ Tribe, D. (1996)

⁴² Kunstadter, P. et al (1978)

⁴³ Falvey, L. (1981a)

⁴⁴ Geertz, C. (1959)

⁴⁵ Falvey, L. (1996)

Man's association with nature can be separated into; domination, subordination, or neither. The last relationship is an appropriate interpretation of Tai agriculture where plants and animals were viewed as components of life and a successful person as one who lived in harmony with nature.⁴⁶ Folk beliefs and ceremonies which linked agriculture, living, and working in the environment, with religious ceremonies and beliefs, included Tai myths of genesis through the breaking of a ripe gourd, and of good harvests through the propitiation of the rice goddess *Mae Phosop*. Spirits which inhabit plants, particularly large trees, and animals, the planting and raising of auspicious plants and animals according to their appropriate location for houses and community facilities, and dietary rules and weather forecasting associated with plants and animals, have been claimed to show a special Tai relationship with the natural environment. However, such beliefs and attitudes are common.

It is more likely that Tai peoples did not have any special ethic about the natural environment. The absence of specific words for nature in Tai languages, and the negative connotations of words used for forest are suggestive of the need to modify them to create value. Such an attitude fostered a separation between the natural and the human-created environment. Tai perceptions of beauty were expressed in human-created terms, even when applied to the natural environment. By the time of Sukhothai, this perception is clear in the Ramkamhaeng inscription which described forests, farm lands, residential areas, and orchards as being as beautiful as if arranged by man.⁴⁷ Even allowing for the cosmological landscape architecture of the Khmer at that time, the Tai view of forests appears to be one of conversion to fields, in common with most other major agricultural communities. Before the Tai assumed Buddhism, embodying their animistic practices within it, religious observance seems have occasionally dominated practical agricultural axioms. Black Tai beliefs in Vietnam of recent times concerning the aspect of cities and buildings echo those of the Ramkamhaeng inscriptions in requiring approaches to landscape to suit spirits. Tai groups across the region always settled near a forest which assumed a utilitarian role retained in Assam Tai description of their traditional toilet as 'going to the forest'. The Ahom also held tree planting ceremonies, unlike other Tai groups.

⁴⁶ Kriengkraipetch, S. (1989)

⁴⁷ Khanittanan, W. (1989)

A further indication of Tai Buddhist relations to the environment may be gained from the Tai of Sibsongpanna in southern China. This includes the introduction of cultivated plants associated with Buddhism (Table 3.1), a conception of holy hills linked to forests, and cultivating of fuel wood. Consolidated in 1180, Buddhism was enhanced through contact with other Tai groups, which led to, for example, plants being categorised as Buddhist ritual plants. Fruit trees and ornamental species, many of which derive from this Tai area, were carried into Southeast Asia.⁴⁸ Trading routes established during the Han dynasty as the Old Silk Road linked to the maritime trading route through the area of Sipsongpanna⁴⁹ and Thailand provided a corridor for exchange of cultivated plants between Tai and other Theravada Buddhists.⁵⁰

Holy hill remnants have been found at archaeological sites in Thailand, probably complementing paddy fields, home gardens, and cultivated fuelwood forests as a naturally forested area. The maintenance of such a forest, assumed in Thailand to be associated with fuelwood, could have served an ancient purpose of maintaining pristine forest as part of a traditional ecosystem (Figure 3.2), and as a toilet area. The preferred fuelwood species of Sipsongpanna is that of *Cassia siamea* LAM., a native of Thailand.

Table 3.1 Plants of Southeast Asia Cultivated in Sipsongpanna Temples⁵¹

Botanical Name	Sipsongpanna Tai Name	Use or Significance
<i>Accacia pennata</i> (L.) Willd.	Songbai	Dye for making the sutra more readable
<i>Aleurites moluccana</i> (L.) M.A.	Maiyao	Seed oil used as lamp oil
<i>Areca catechu</i> L.	Gema	Fruits used as offering
<i>Bixa orellana</i> L.	Gemaxie	Flower used as an offering and as a dye
<i>Crinum asiaticum</i> L.	Linuolong	Flowers used as offering
<i>Dipterocarpus turbinatus</i> Gaertn.	Mainamanyan	Resin used as lamp oil
<i>Ficus altissima</i> Bl.	Maihongnong	Held sacred by Buddhists
<i>Ficus glomerata</i> Roxb.	Gelei	Bark used for making paper
<i>Gmelina arborea</i> Roxb.	Maisuo	Wood used for sculptures
<i>Livistona saribus</i> (Lours.) Merr.	Geguo	Offering
<i>Streblus asper</i> Lour.	Gehui	Bark used for making paper
<i>Tectona grandis</i> L.f.	Maisa	Wood used for sculptures
<i>Citrus grandis</i> (L.) Osb.	Mabu	Shaddock

⁴⁸ Sheng-ji, Pei (1985)

⁴⁹ Needham, J. (1956)

⁵⁰ Sheng-ji, Pei (1985)

⁵¹ Sheng-ji, Pei (1985)

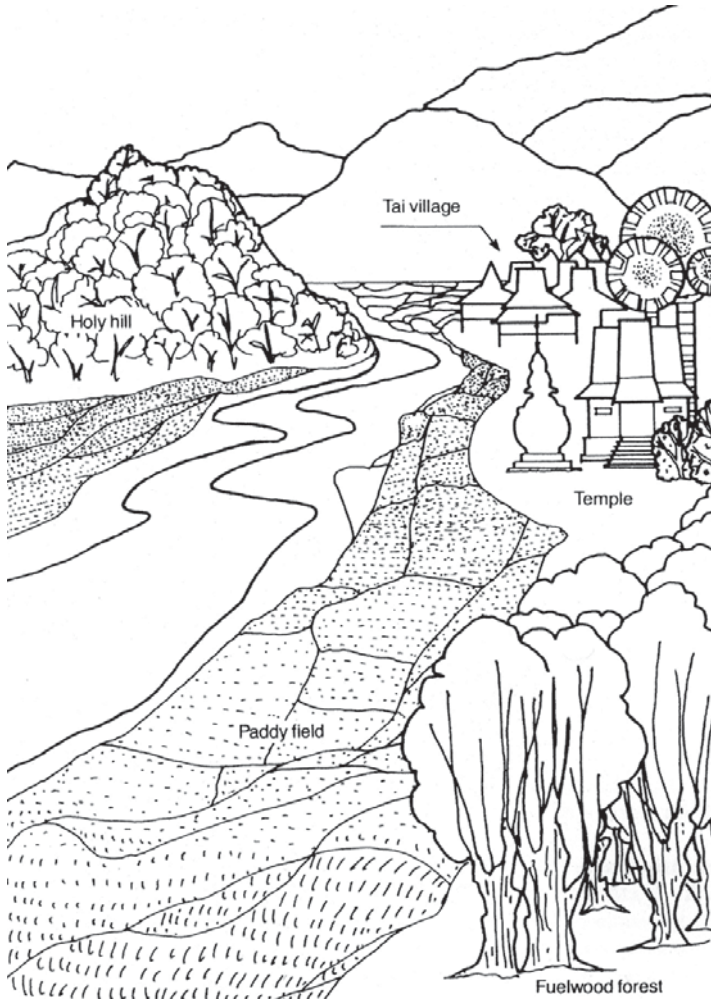


Figure 3.2 *Traditional Sipsongpanna Tai Agro-ecosystem*⁵²

With the rise of Tai Buddhist States, religious concepts such as impermanence inspired early Tai literature. Whereas Western literature romanticised the natural environment, traditional Tai literature expressed aesthetic wonderment about its permanence. Respect and gratitude for nature and its agricultural bounty

⁵² Sheng-ji, Pei (1985)

are thus perhaps the best indication of unique Tai environmental beliefs. Later Thai literature was corrupted by foreign influence which rendered it largely indistinguishable from Western environmental romanticism.⁵³ The impact of Tai agriculture on the environment in an era of low population density was very minimal; after assuming power over larger Kingdoms, agricultural practices became less environmentally benign.

Tai and Buddhist Environments

Absorbing the Mon-Khmer culture, led Tai to clearing of lowland forests for rice fields and city development on a scale which rendered the retention of the small holy hills and forests insignificant. Extensive bunding to create paddy fields changed the soil and water relationships by slowing drainage rates, retaining silt in paddy fields, and undercutting river banks. Changes in soil fauna and flora, in combination with the anaerobic environment of paddy fields, led to changes in soil chemistry.⁵⁴ Seen by agricultural scientists as a fortuitous development which led to a sustainable production system, its very success caused its wide application and hence irreversible impact on the natural environment.

As they developed this productive agriculture, the Tai merged their traditions with those of other cultures to produce a range of ceremonies which were protected under the broad veil of Thai Buddhism. Some such beliefs and ceremonies include:⁵⁵

- The *Naak Hai Nam* system of measuring water use related to agriculture such that a year of abundant water may be said to have up to seven *Naak (Naga)* present, a belief deriving from the widespread *Naga* and water association across the region.
- Protection of the soil by *Phra Mae Thoranee* and water by *Phra Mae Khongkha* lead to their worship until today.
- Eighteenth and nineteenth century practices of *Pharajaphithi Lai Ruea* and *Pharajaphithi Lai Nam*, meaning 'boat chasing' and 'chasing the water' respectively; during periods of flood, the King and his entourage were to face

⁵³ Rutnin, C.L. (1989)

⁵⁴ van Liere, W.J. (1989)

⁵⁵ Sriwatanapongse, S. (1997)

the waters on the royal barge to prevent it rising to levels which would affect the rice harvest.

- During periods of drought, the *Pharajaphithi Phirunsat* was to be performed based on Brahman rituals from the Sukhothai period in association with Buddhist and Brahman monks, with requirements for the King to remain chaste and to be continually bathed.
- *Bang Fai*, a ceremony which continues particularly in the Northeast, is traced to a Khmer King firing a huge sky-rocket to ensure rain; today practiced in conjunction with the Buddhist sacred day, *Visakha Bucha*, the ceremony has been combined with other monastery rituals; decorative carving of rockets may be a phallic link to *Naga* as provider of the water of life and hence temporal fertility.
- *Songkran*, the traditional Tai New Year celebration practiced widely across the region is associated with bathing of Buddha images, sprinkling of water, parading of floats, and ingenious water driven devices which mimic the Hindu-Buddhist cosmology of Mount Meru as the centre of the universe and origin of the seven major rivers of Asia; vigorous participation in the Songkran festival in the past, as today, is associated with ensuring good rainfall in the imminent rainy season.
- *Pharya Mae Phosob*, the rice goddess whose spirit is invited to dwell within the rice prior to each planting season and whose encasement within harvested rice creates the feeling of respect for rice which remains evident among Thai people today.
- Links between the rice spirit and Buddhism in terms which suggest the co-origination of rice and Buddha, and hence an association of rice with transcendent virtue.⁵⁶

By ensuring satisfactory conditions for agriculture, the King was linked to the religion in a manner which adopted the God-King model of the Mon-Khmer system while allowing the organisational hierarchy of the Tai irrigation systems to both become integral parts of the combined culture. The names of the future cities of Ayutthaya and Bangkok both reflect this heritage in the first word of their official titles, *krung*, which originates from a Mon word meaning 'river' or 'canal' and carries the connotation that whoever controls the river is *defacto* occupant of the royal seat. The respect accorded Thai forest monks which derives from their purer

⁵⁶ Conway, S. (1990)

Buddhism, is now mixed with broad environmental statements. Emphasised as an indication of a continuing Tai or Thai environmental ethic, such tenuous arguments retain emotional appeal when lapses in social behaviour highlight the benefit of common-sense values. As the repository of Tai and other cultural beliefs, Thai Buddhism contains a mix of beliefs which are foreign to the origins of the religion, yet may suit an emerging Thai environmental ethic, as described in a later chapter.

Historic associations between religion and agriculture in India have also influenced Thailand through Buddhist, Brahmanic, and Hindu rituals, now modified as Thai Buddhism. Tracing the statements of Indian philosophers from 400 BC to 1300, and their similarity to and links with ancient Greece, regional agricultural practices have been shown to predate those of China, and to warrant reconsideration of agricultural history.⁵⁷

While it is difficult to specify a unique Thai environmental management, the society contains fortuitous mechanisms for establishing strong linkages between culture, history, environmental management, and agriculture. However, the next stage of Thai agricultural history was predominantly one of expansion as Sukhothai assumed a Thai face, and as a separate Tai group consolidated power around Ayutthaya, as detailed in the next chapter.

Summary

Key points pertinent to Thai agriculture which may be elicited from this discussion of Tai agriculture and environmental attitudes include:

- From lowland wet rice growers in China more than a millennium ago, the Tai brought in their southward migration, glutinous rice associated with their *muang fai* irrigation technology, which with refinement proved sustainable into the twentieth century.
- Integrating with the Mon-Khmer system, the Tai widened their agricultural capabilities and administrative system to breach larger northern Thai rivers while evolving a complex blend of animism and Buddhism which incorporated traditional ceremonies of the cultures blending to form the Thai.
- Despite modern searches for Tai historical environmental values, no unique Tai

⁵⁷ Nene, Y.L. (1999)

ethic is evident; rather, modification of the natural environment was paramount although retention of holy wood lots and fear of spirits may have provided a higher level of interest in forests than might have been expected in scattered settlements.