The Dynamics of Dai Lue Vernacular Houses: A Comparative Study of House Forms and Spatial Organization in Xishuangbanna, Yunnan, China and Mainland Southeast Asia

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Abstract

Although the traditional homeland of the Dai Lue ethnic group is located in Xishuangbanna, Yunnan province, Southwest China, the Dai Lue people have migrated to places in Mainland Southeast Asia, including Myanmar, Laos, Vietnam, and Thailand. Currently, Xishuangbanna society is undergoing major changes in lifestyle and culture, some of which are reflected in Dai Lue houses. This article focuses on Dai Lue house forms and spatial organization to understand the people's lifestyle and culture through vernacular houses in different contexts. The study argues that both environmental and socio-cultural factors determine the houses' building materials, construction, and settings. The findings show that the characteristics of Dai Lue houses in Xishuangbanna differ from those of traditional houses, while those in dispersed settlements better retain the traditional form and are changing more slowly.

Keywords: Dai Lue dwellings, changes in vernacular houses, spatial organization, Xishuangbanna, Mainland Southeast Asia

Introduction

This article examines the dynamics of Dai Lue 'vernacular houses,' a term indicating local houses that demonstrate the culture and way of life of the Dai Lue ethnic group in Xishuangbanna, Yunnan province, southwest China. This region is the cultural center of the Dai Lue people, located in the Middle Mekong River Basin in China's Yunnan province and Mainland Southeast Asia, covering the eastern Shan State in Myanmar, northern parts of Laos, the northwest region of Vietnam, and the northern area of Thailand (Figure 1). In the past, the Dai Lue people migrated south for political reasons—to seek asylum from war, to avoid being taken prisoners of war, and to seek new arable land sources. More recent immigration has involved economics, trade, and the search for relatives forcibly removed in the past.

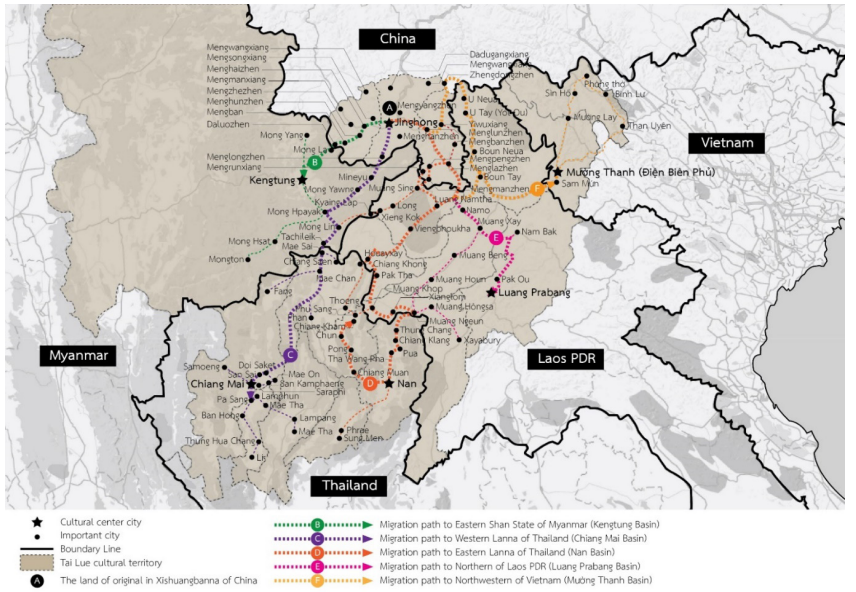


Figure 1 Distribution of Dai Lue settlements in China and Mainland Southeast Asia

The distribution of Dai Lue settlements in China and Mainland Southeast Asia described above reflects the transformation of Dai Lue society caused by environmental and socio-cultural dynamics from the original land to the destination country, which are different in terms of environment and socio-cultural context. Moreover, the social situation in China is likely to change as the Chinese political, social and economic

aspects intervene immensely in the way of life of the Dai Lue people. However, the Dai Lue people in Mainland Southeast Asia have retained their traditional way of life and culture, including the house forms and spatial organization, to a greater degree based on awareness and adaptation of the environment and culture. There are some differences and as well as similarities, such as the complexity of the roofs, selection of decorative material, sequence of access to living spaces, and the size of functional space.

Notably, Amos Rapoport (Rapoport, 1969) proposed that architectural formations and transformations were caused by two main factors—environmental and socio-cultural. Rapoport's study informs the conceptual framework of this article, while supporting evidence is based on fieldwork data collected from China, Myanmar, and Laos and a literature review of previous research based on fieldwork data in these countries (Wu, 1997; Zhu, 1992). Therefore, this article addresses the following question: Since the Dai Lue people live in locations with varying rates of development, how and to what extent have they retained their original culture and traditions? Few studies have investigated Dai Lue houses' comparative characteristics in Xishuangbanna and other distribution areas. Therefore, to critically evaluate Dai Lue houses' similarities and differences, this article compares houses in those areas where the borders of China, Myanmar, and Laos meet.

Above all, this study evaluates ways in which differing Dai Lue house patterns have developed, describes aspects of Dai Lue culture and lifestyle, and demonstrates how those patterns have been formed and transformed to relate to their social and cultural contexts or to reflect cultural exchange among countries. Although house forms differ in each country, the use of interior space retains its original pattern. Therefore, changing house forms offer a new source of information, showing the dynamics of each period, even as the symbolic meaning embodied in the house can forever preserve Dai Lue values and spiritual culture.

In Xishuangbanna, China, general characteristics of Dai Lue houses are related to the region's cold and rainy weather. Houses there are usually large and complex since they shelter extended family

members and respond to rapid changes in society and culture. By contrast, dwellings in Southeast Asia usually require better heat dissipation, so Dai Lue houses there are quite open to allow unobstructed airflow. Moreover, because of the area's gradual socio-cultural development, they are smaller and use more basic materials.

Research Objectives

This study limits its comparison of Dai Lue vernacular houses to those in Xishuangbanna in China, the Shan State in Myanmar, and northern parts of Laos, an area where the three countries' borders meet. It focuses on Dai Lue house forms and spatial organization, using the conceptual framework of architectural formation and transformation that is influenced by environmental and socio-cultural factors. In this way, the study is intended to facilitate understanding and recognition of symbolic meaning through vernacular architecture, which can indicate the culture and lifestyles of the geographically separated Dai groups.

Research Methodology

This research project used the qualitative case study approach to analyze data collected from field surveys in Dai Lue villages in three areas: 1) Xishuangbanna Dai Autonomous Prefecture of Yunnan province, China, 2) eastern Shan State in Myanmar, and 3) northern Laos. As for the criteria for selection, the villages are located in important cities in each country on the migration route from the center of Dai Lue culture (Figure 1), which is Jinghong in Xishuangbanna, China. Then the distribution of settlements to each country in Southeast Asia follows the route in the map from Figure 1 by finding representative case studies from both sources. The primary data is from fieldwork, including from Ban Hok in Myanmar (Route B); Manbiancun, Manhong in China; and Ban Pungnanun, Ban Tha Fah in Laos (Route D, E). The secondary data is from literature reviews to represent each route of distribution of settlements. These settlements include Ban Jiang Tai in China (Location A); Ban San, Ban Tao, Ban Na Di in Myanmar (Route B); Longfei, Ban Muang, Ban Nong Kaew in China (Route C); Ban Waen,

Ban Long Nim (Routes D, E); and Ban Xiang Xiao, Ban La, Ban Ngai Nuea, Ban Boun Nuea, Ban Kong in Laos (Route F). These are summarized in Table 1 to distinguish the data sources of the case study villages.

Table 1 Case study villages from field surveys and literature reviews

Distribution route	Primary data: From fieldwork data collection	Secondary data: From literature reviews
Location A	-	**Ban Jiang Tai** in Chiang Rung (Jinghong), Xishuangbanna, China
Route B	**Ban Hok** in Chiang Khang, Shan State, Myanmar	**Ban San** in Mueang Ma, **Ban Tao** in Mueang La, and **Ban Na Di** in Mueang La Mai, Shan State, Myanmar
Route C	-	**Longfei**, **Ban Muang** and **Ban Nong Kaew** in Menglongzhen, Xishuangbanna, China
Routes D and E	**Manbiancun** in Menglunzhen and **Manhong** in Mengmanzhen, Xishuangbanna, China and **Ban Pungnanun** and **Ban Tha Fah** in Bo Kaeo province, northern Laos	**Ban Waen** and **Ban Long Nim** in Menglazhen, Xishuangbanna, China
Route F	-	**Ban Xiang Xiao** in U-Nuea, **Ban La** in U-Tai, **Ban Ngai Nuea**, **Ban Boun Nuea** and **Ban Kong** in Boun Nuea, Phongsali province, northern Laos

Remarks:
Location A is a cultural center city, Chiang Rung (Jinghong), in Xishuangbanna, China.
Route B is a migration path to eastern Shan State of Myanmar.
Route C is a migration path to eastern Shan State of Myanmar and the western Lanna region of Thailand.
Routes D and E are migration paths to northern Laos and the eastern Lanna region of Thailand.
Route F is a migration path to northern Laos and northwestern Vietnam.

For the criteria for selecting houses, the different house forms were selected first. This is a target group of house sampling with the purpose of separating the data according to two methods. The first method collected fieldwork data through observation, semi-structured interviews, in-depth interviews, photography, and architectural measurements and surveys. The second method collected data from case studies obtained from literature reviews for data comparison. Collected data is based on the two issues mentioned earlier: house forms and spatial organization, using Rapoport's conceptual framework of architectural formations and transformations caused by environmental and socio-cultural factors. Thereafter, architectural drawings are analyzed comparatively.

The main issues addressed here are house forms and spatial organization. It is assumed that both issues are affected by environmental as well as socio-cultural factors, yielding architectural formation and transformation in each context (Rapoport, 1969). House forms vary from one country to another because of differences in climate and geography. In addition, the complexity of roofs depends on the number of family members and their need for living space. Meanwhile, spatial organization (division of the house's interior) is executed according to the social and cultural hierarchy. In other words, the placement of functional areas is organized to facilitate the house's ventilation and natural light, essential conditions for living in a tropical climate and reasonably signified to create safe stilt houses for the Dai Lue people in southwestern China and upper Mainland Southeast Asia.

Results

Tradition and Transformation of Dai Lue Houses

1. House forms

A traditional Dai Lue house is known as a '*hon hen,*' meaning 'phoenix house.' According to the origin myth of the first house, the legendary leader Pa Ya Shanmudi attempted to build many shelters (Figure 2), such as flat-roofed sheds and lean-to's (Zhu, 1992) for his

people who had taken refuge in caves during a massive flood. But a golden swan drifted down to land, stretching its neck, wings, and tail to cover the ground to help Pa Ya Shanmudi form the first house to protect the people from natural disasters.

Indeed, in adapting to the climate and environment, Dai Lue people often use local resources to build houses, to prevent moisture and sunburn, to keep shelters open for ventilation, and to prevent danger from wild animals and flooding. Thus, for construction, tropical areas offer abundant wood and bamboo so that wood dominates the main elements of Dai Lue houses, including its stilts, pillars, beams and rafters. Even so, Dai Lue people often still use bamboo to construct the 'bamboo house,' the traditional Dai Lue house (Wu, 1997). In addition to grass used for thatching, roofs are a mix of gable and hip roofs that protect interior space from sun, wind, and rain, and keep the house airy.

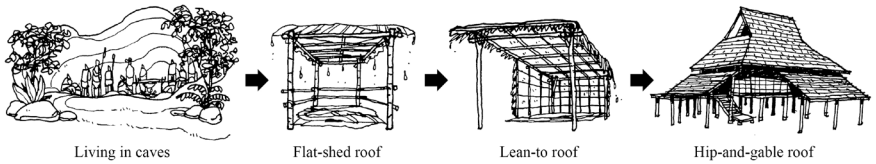


Figure 2 The tradition and development of Dai Lue houses in Xishuangbanna, China

2. Spatial organization

For living space, Dai Lue houses generally have two floors, with the ground floor under the house often used as a corral for domestic animals and as storage for agricultural tools and for pounding rice. The upper, or first, floor is divided into three areas: the enclosed space, the semi-open space, and the open space.

The enclosed space is generally divided into two main areas. The first is a bedroom where all family members sleep. It is designated as a restricted area for outsiders. If someone enters without permission, it is considered a violation of the spirits.[1] In other words, outsiders who

[1] Dai Lue people call it '*phid phi*,' it is an offense against the ancestral spirits in the house.

are not family members or relatives will have to pay a fine to the owner of the house.[2] The north and east are considered auspicious directions, and so people sleep facing these directions. In addition, according to the tradition of the Dai Lue people, the heir of the family must be the youngest son. Both the eldest daughter and eldest son must marry to create new families (Wu, 1997). The bedroom has an ancestor shelf[3] on a corner pillar, and the *'sao sautsaw*' rests there, symbolizing the man who is the leader in performing rituals worshiping the spirits of ancestors which take place there.

The second area of the enclosed space is the hall, known as *'na wang,'* which is the family area. Outsiders can only access this area with permission from the house owner. Also, this area is a barrier to spatial accessibility, restricting people from entering the area and preventing external ghosts or various inauspicious elements to enter the house. Therefore, an object known as a *'ta laew',* bamboo woven into a star shape, is found above the entrance doorframe in every house in Xishuangbanna. The hall can be used for a variety of purposes such as living, sleeping, eating, and cooking because it usually contains the hearth for cooking, for baking in the winter, and for accompanying births. Furthermore, the *'sao nang'* rests there, symbolizing the women. When a woman is giving birth, the area around a fireplace is used to warm the baby and strengthen the mother's recovery by fire, so she is said to *'yu fai'* (stay at the fire) in a practice called 'mother-roasting' (Poulsen, 1984; 63-70) or '*man kham duean.*' Thus, the enclosed space is divided not only according to activity, but also by these two symbols of gender (Gao, 1995: 121-131) (Figure 3).

The semi-enclosed space covers the front veranda and staircase and is without walls, merely surrounded by railings and covered with roofs and eaves. This area is used for relaxing with a cool breeze during the day, and is used as a hobby area as well as a meeting area for outsiders who come to meet and visit. The open space is a terrace

[2] Dai Lue people call it '*sia phi*,' It is an offense against the owner of the house to enter the restricted area.

[3] In local dialects, the ancestor shelf is called '*hing devada.*'

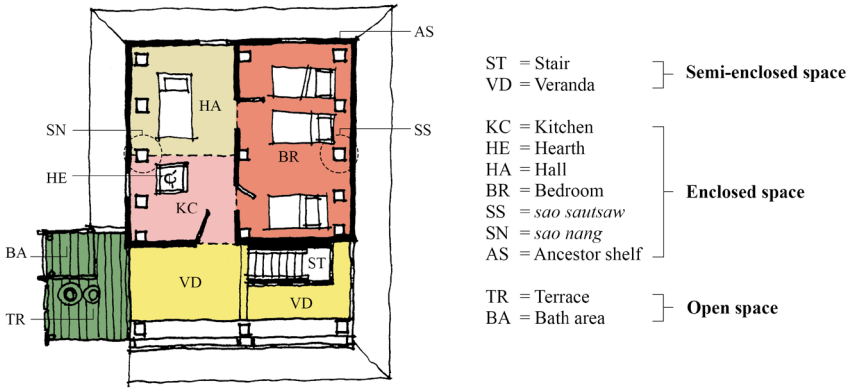


Figure 3 Positions of posts known as *sao sautsaw* and *sao nang* on the upper floor of the Dai Lue house

bounded by uncovered railings—a sunny area used for drying seeds and clothes. Consequently, the terrace flooring material must be well-drained and resistant to climate change. Nowadays, it is popular to change from bamboo flooring to reinforced concrete flooring for durability.

Finally, the terrace and bath area are placed to the south or west to take advantage of the sunlight and breezes while the north and east are considered auspicious directions for facing when sleeping.

3. Transformation and typology

At the present time, traditional Dai Lue houses have developed into many forms, with changes in structural patterns and construction materials. For instance, in many cases wood has replaced bamboo, enabling the expansion of living space and more complicated roof forms. However, bamboo houses are still being built today, and bamboo is still used as the main material for walls, floors, benches, chairs, tables, and decorations. The house form has developed from the original single gable to the multi-gable house, and each gable style is further divided into various forms. The *sao sautsaw* and *sao nang* still retain their original positions even the house form has changed. Significantly, these pillars indicate that the area under the roof is the main house (bedroom and living area), the first area built before potential expansions.

However, Dai Lue houses have evolved in several ways. As a result, scholars have tried to classify Dai Lue houses by categorizing them into various styles. Wanida Puengsunthon has classified the typology of Dai Lue houses in Xishuangbanna according to the relationship between the roof form and the type of wall (Pueungsunthon, 1990: 12-36): (1) straight-wall house with single roof, (2) straight-wall house with single roof and canopy, and (3) diverged-wall house with single roof.

Classified by roof forms, houses can be divided into six types (Pueungsunthon, 1990: 12-36): (1) single-gable roof, (2) single-gable roof with long eaves, (3) single-gable roof with porch, (4) double-gable roof or twin-gable roof, (5) single-gable roof with side-house, and (6) single-gable roof with front-house (Figure 4).

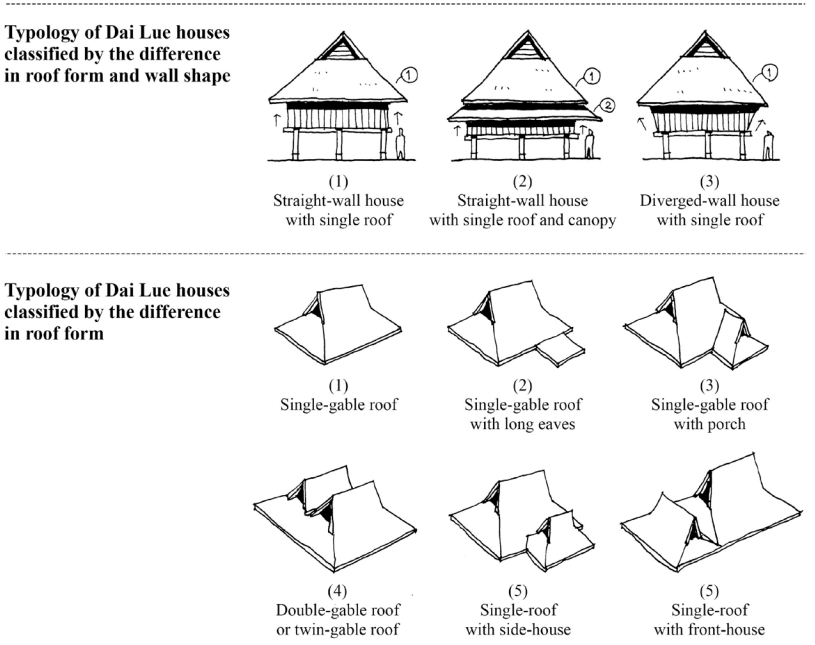


Figure 4 Typology of Dai Lue house forms in Xishuangbanna

In addition, Zhu Liangwen has divided Dai Lue floor plans into three types: traditional, extensional, and developed (Zhu, 1992) (Figure 5).

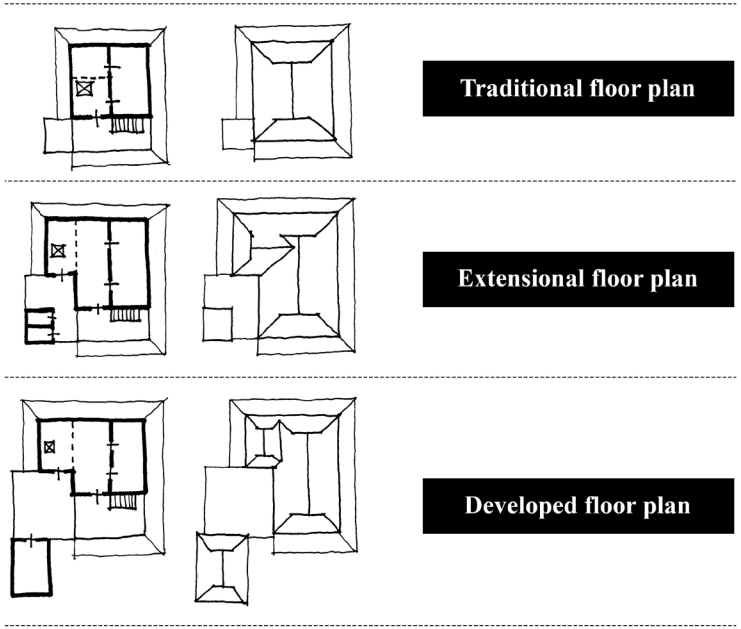


Figure 5 Typology of Dai Lue houses' floor plans in Xishuangbanna

Dai Lue Houses in Xishuangbanna, China

Xishuangbanna is located in a subtropical and warm humid climate zone. Its topography is a mountainous area alternating with valleys. There are scattered areas of river basins, and the main river is the Mekong, flowing through the middle of Xishuangbanna with tributaries branching off into the surrounding areas. For this reason, Xishuangbanna is a fertile area suitable for setting up the houses of the Dai Lue who rely on the river's water for rice farming. But nowadays the Dai Lue in China have begun to experience more influence from Han people on

their way of life and culture. The Dai Lue people's farming economy has changed from rice to rubber cultivation. The settlement patterns of the Dai Lue group in Xishuangbanna are varied, and include villages located along the highway, on the banks of the river, on a mountain slope connected to a plain, in a valley, on a highway passing through the middle, and on the edge of large cities.

This section's primary data was collected through fieldwork in two villages in Xishuangbanna: Manbiancun (BN) in Menglunzhen and Manhong (MH) in Mengmanzhen. Secondary sources from the literature review consist of the following six villages: Ban Jiang Tai (JT) in Chiang Rung (Thungsakul, 2005: 1-11); Ban Waen (BW) and Ban Long Nim (LN) in Menglazhen (Jandaeng and Oranratmanee, 2016: 101-121); Longfei (LF), Ban Muang (BM) and Ban Nong Kaew (NK) in Menglongzhen (Sukkri and Oranratmanee, 2016: 3-30). They are analyzed according to house form and spatial organization as follows.

1. House form

In Xishuangbanna, almost all Dai Lue houses developed from single-gable into multiple-gable houses rarely found in traditional construction. Since Dai Lue people live in large families, they frequently expand their houses to the side and the front of the main house to support usage and activities sufficient for numerous family members. The main structure, floor, and walls are made of wood. The roof is often covered with clay tiles, and some villages use fiber cement tiles. Houses have both slanted and straight walls, and their gables are small, used only for venting smoke from the inside. A unique feature of almost every house in Xishuangbanna is the *'pa'* (canopy), the lower roof that covers the surrounding house. In Xishuangbanna's sub-tropical area, there are heavy rains and low temperatures during the winter; thus, the people need to prevent rain and cold air from blowing into their houses. Significantly, this study can classify houses according to their roof styles: single-, double-, triple-, quadruple-, quintuple-, sextuple-, and septuple-gable houses (Figure 6).

2. Spatial organization

In most cases, the functional areas of Dai Lue houses in Xishuangbanna exhibit an extended floor plan; however, the traditional floor plan remains in a few houses, such as those belonging to the headman or to very large families, which are usually larger than extensional floor plan houses. Similar to traditional houses as described above, the living space is divided into and enclosed area containing the bedroom, living area, and kitchen, which is extended to the side of the main house. Notably, a bedroom is often extended from the main bedroom into the kitchen when space is inadequate. Also similar to traditional houses, open space is separated by railings or a bench and is covered. The stairs and the veranda serve as a connecting area between enclosed and open spaces. Again, when space is scarce, bedrooms sometimes extend into this area. Open space, such as a terrace, is exposed to sunlight and bounded by a handrail. Nowadays, concrete floors often support the weight of a water tank, and in some houses a shower room and toilet are on the terrace. Granaries rarely appear, but rubber tanks are found in a storage room on the ground floor of the house (Figure 7).

From the floor plans of all case studies in Figure 7, three main types can be identified according to the development of the house.

Type A: traditional floor plan of the 'male house,' with all functions in the main house,

Type B: extensional floor plan with side-house or -porch and front-house or -porch, which can be further divided into seven sub-types:

(B1) 'male house,' with the main house on the north,
(B2) 'male house,' with the main house on the south,
(B3) 'male house,' with the main house on the west,
(B4) 'female house,' with the main house on the east,
(B5) 'male house,' with the main house on the east,
(B6) 'female house,' with the main house on the south,
(B7) 'female house,' with the main house on the north,

Type C: developed floor plan, 'male house,' with the main house on the north with side-house or -porch and front-house or -porch and connected to a front-granary (Figure 8).

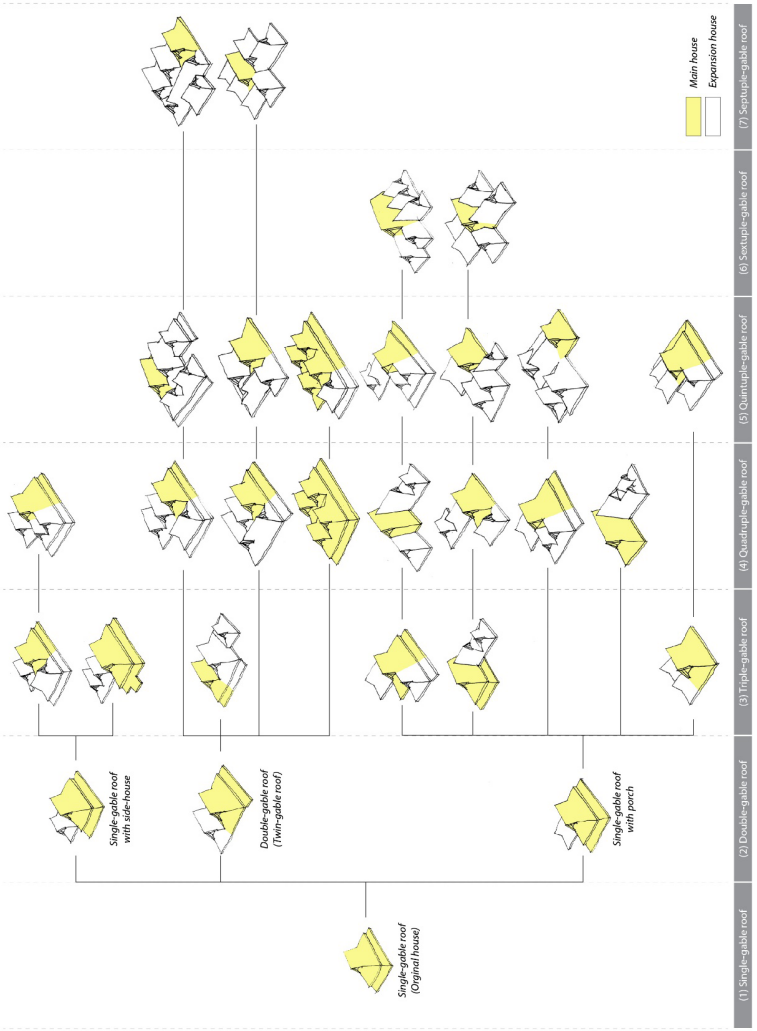


Figure 6 House forms of Dai Lue houses in Xishuangbanna, Yunnan, China



Figure 7 Spatial organization of Dai Lue houses in Xishuangbanna, Yunnan, China

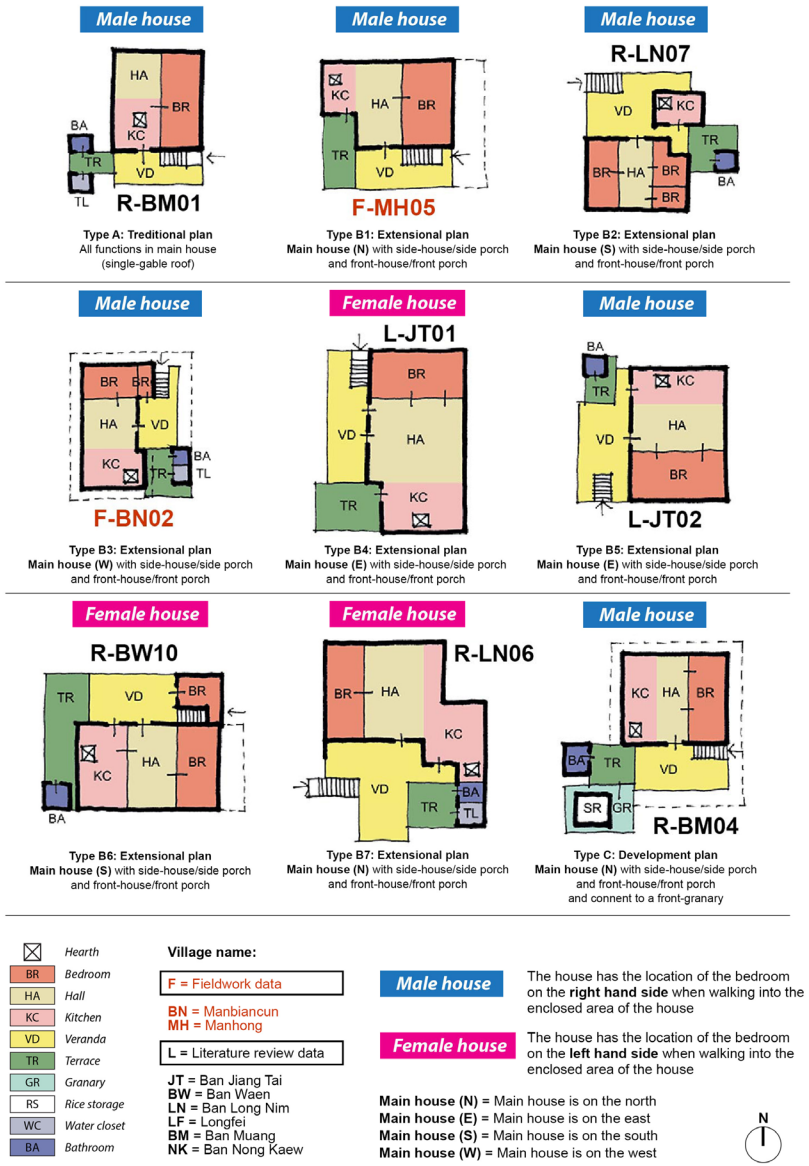


Figure 8 Type of floor plan of Dai Lue houses in Xishuangbanna, Yunnan, China

Dai Lue Houses in Shan State, Myanmar

Shan State, Myanmar, is located in a tropical climate zone. Its topography includes high mountains, tropical forests, a plateau, and hills. The Salween River cuts through the central part of the state and there are a lot of mineral resources. Shan State is home to many ethnic groups and several armed insurgent groups that are beyond the control of the central government. As a result, wars and political problems often occur, making Myanmar a politically fragile area and blocking exposure to outside cultures for various periods of time. Recently, however, the state has come under the economic and political influence of the Han people, especially in the eastern areas. The Dai Lue villages are usually located on high plateaus. There is still some rice cultivation area in the river basin.

Primary data came from fieldwork in one village, Ban Hok (BH), Chiang Khang, and secondary sources from the literature review of three villages— Ban San (BS) in Mueang Ma, Ban Tao (BT) in Mueang La, and Ban Na Di (ND) in Mueang La Mai (Bosab, 2009).

1. House forms

In the Shan State, single-gable houses still can be found and are mostly porch, side-house and front-house. Multiple-gable houses appear with double or triple gables. The roof gables are both small and moderate. The main structures of these houses consist of walls and floors of wood although there are some of bamboo. Most roofs are covered with clay tiles, but some are still thatched with grass. They have both slanted and straight walls. Roofs are moderately complex. Most are only one layer, generally having long eaves to cover the stairs, down to the opposite side for parking and storage. Shan State houses can be classified into many gable styles: single-, double-, triple-, quadruple-, and quintuple-gable houses (Figure 9).

2. Spatial organization

Dai Lue houses in Shan State mostly have an extensional floor plan or an additional floor plan. The traditional floor plan was found in only one of the ten case study houses while quite a few were found in field data collection from Ban Hok.

Living space is divided into the three areas as described in traditional and Xishuangbanna houses, above. However, some bedrooms are divided into multiple small bedrooms with both an expansional floor plan and an additional floor plan. Again, concrete floors are now often used to support a water tank, and some houses have a shower room and a toilet on the terrace. A granary is often found close to the house, and some households also adopt an open space to connect to the granary (Figure 10).

The floor plans, based on the case studies in Figure 10, can be classified into three main types according to the development of the house:

Type A: traditional floor plan, with all functions in the main house,

(A1) traditional floor plan of 'male house,'

(A2) traditional floor plan of 'female house,'

Type B: extensional floor plan with side-house or -porch and front-house or -porch, which can be further divided into six sub-types:

(B1) 'male house' with the main house on the north,

(B2) 'male house' with the main house on the south,

(B3) 'female house' with the main house on the west,

(B4-1 and B4-2) 'male house' with the main house on the west,

(B5) 'male house' with the main house on the east,

(B6) 'female house' with the main house on the south,

Type C: developed floor plan with side-house or -porch and front-house or -porch and connected to a front-granary, which can be further divided into seven sub-types:

(C1) 'male house' with the main house on the north,

(C2) 'female house' with the main house on the east,

(C3) 'male house' with the main house on the east,

(C4) 'male house' with the main house on the west,

(C5) 'female house' with the main house on the west,

(C6) 'female house' with the main house on the south,

(C7) 'male house' with the main house on the south,

(Figure 11).

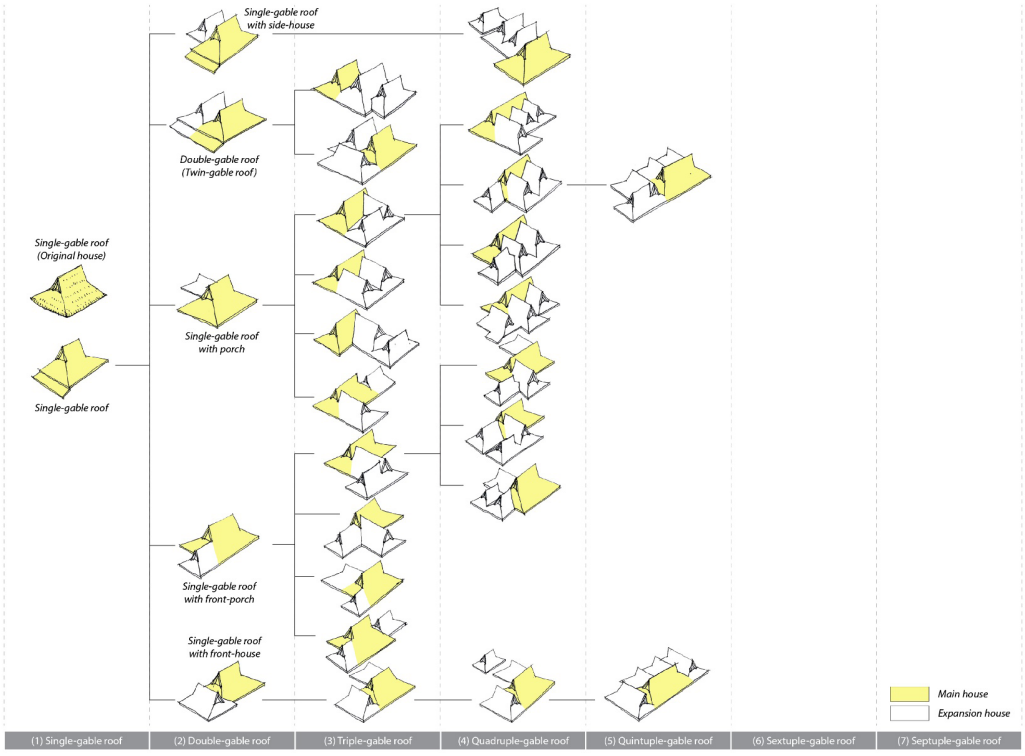


Figure 9 House forms of Dai Lue houses in Myanmar

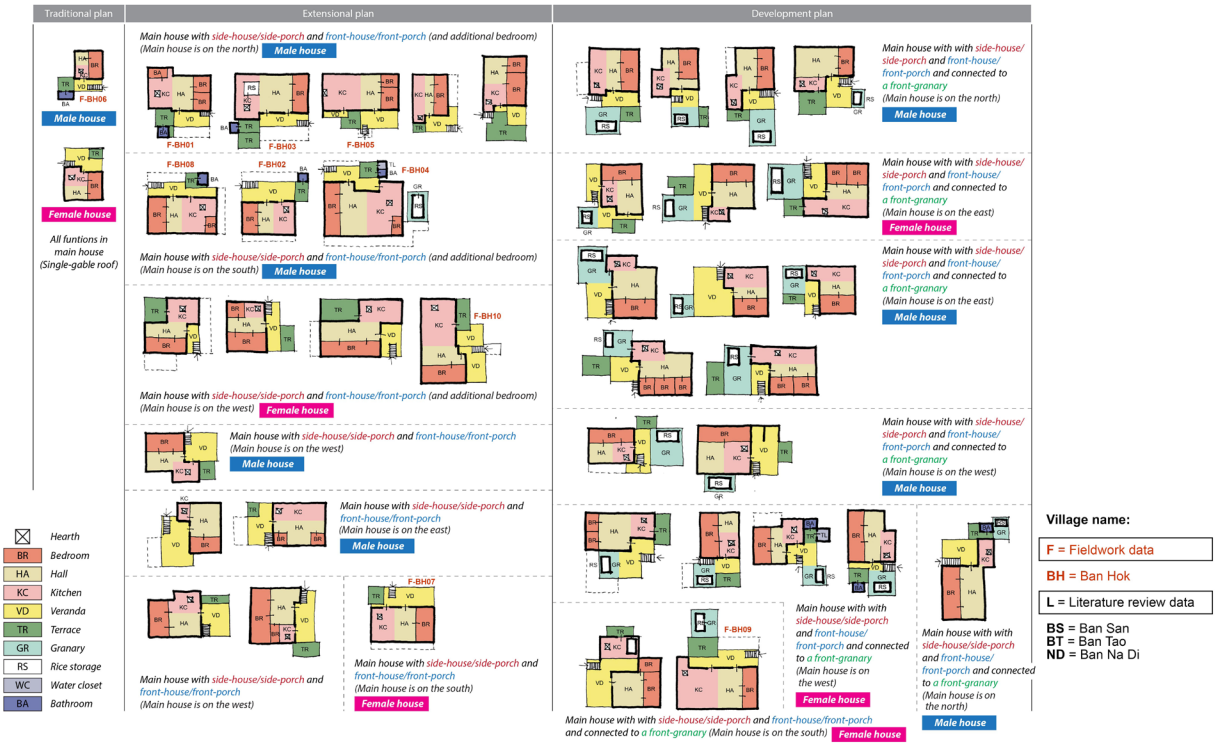


Figure 10 Spatial organization of Dai Lue houses in Myanmar

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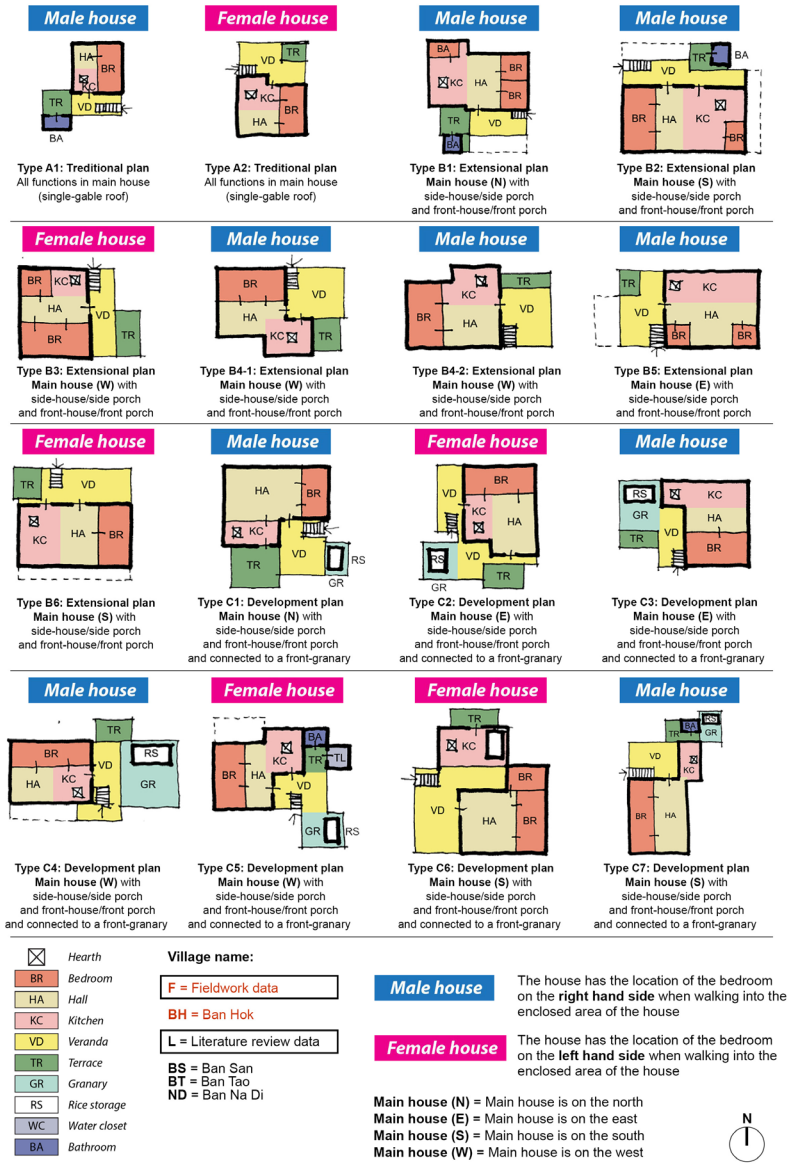


Figure 11 Type of floor plan of Dai Lue houses in Myanmar

Dai Lue Houses in Northern Laos

Northern Laos has a complex topography of mountain ranges and plateaus. However, most of the population lives in the lowland areas along the valleys. There are two types of climate zones: (1) a humid tropical climate in the area of Luang Namtha and Bo Kaeo subdistricts. There is an important river, the Ta River, and (2) a humid temperate climate in Phongsali subdistrict. There is an important river, the Ou River, which is the Dai Lue people's settlement, mainly to grow rice in the river basin. These people are classified as "Lao Lum" according to the division of people in Lao society. Nowadays, China's economic influence has become stronger in northern Laos. When the two countries formed an economic alliance, China began building a rail transport system connecting to Laos in order to trade with Southeast Asian countries. Bananas and rubber are economic crops that are exported to China.

In northern Laos, primary data were collected through fieldwork in two villages, Ban Pungnanun (PN) and Ban Tha Fah (TF) in Bo Kaeo province, and secondary sources from literature reviews of five villages: Ban Xiang Xiao (XX) in U-Nuea, Ban La (BL) in U-Tai, Ban Ngai Nuea (NG), Ban Boun Nuea (BU) and Ban Kong (BK) in Boun Nuea, Phongsali province (Khammoon and Oranratmanee, 2017: 22-49).

1. House forms

In northern Laos, particularly in Phongsali, Dai Lue houses have a single-gable roof. In most cases, they have long eaves, but porch houses are quite rare. Any multiple-gable houses, including double-gable houses, usually extend to the side and the front, while porch-type houses are rarely found. The main structure, floor, and walls are made of wood, but some are still of bamboo, and most roofs are covered with clay tiles. At Ban Ngai Nuea, however, many are still thatched with grass. Most houses also feature straight walls. Their gables tend to be quite large and have vents. Roofs have only one layer and generally feature long eaves to cover the stairs, down to the opposite side for parking and storage. Significantly, influences from the surrounding culture affect the houses' style. For example, at Ban Xiang Xiao in Phongsali, roofs tend to be curved like Chinese roofs and use Chinese roof tiles as well; meanwhile, Ban Kong houses resemble Lao houses in Luang Prabang. In addition, Ban Pungnanun and Ban Tha Fa in Bo Kaeo province are gable-roof houses. Consequently, this study classifies

houses in northern Laos into predominantly single-, double-, triple-, and quadruple-gable houses (Figure 12).

2. Spatial organization

In northern Laos, Dai Lue houses have mostly traditional and extensional floor plans. Like Dai Lue houses in the other regions, those in northern Laos have living space divided into the three main areas as described in traditional and Xishuangbanna houses, above. Nevertheless, some bedrooms are divided into multiple small rooms in an additional floor plan house. In Phongsali, the semi-enclosed space is small, while in Bo Kaeo, it is used as connecting space. The open space is small, but it is connected to the granary close to the house. Such houses are found almost everywhere in this area (Figure 13).

From the floor plans of all case studies in Figure 13, houses can be classified into three main types according to the development of the house:

Type A: traditional floor plan of 'male house;' all functions in main house;

Type B: extensional floor plan, which can be further divided into three sub-types;

(B1) 'male house,' in which the main house is on the north, with a front-house or -porch;

(B2) 'male house,' in which the main house is on the north, with a side-house or -porch,

(B3) 'female house,' in which the main house is on the north, with a side-house or -porch,

Type C: developed floor plan, which can be further divided into five sub-types:

(C1) 'male house,' in which the main house is on the east, with a front-house or -porch and connected to a side-granary,

(C2) 'male house,' in which the main house is on the east, with a side-house or -porch and connected to a front-granary,

(C3) 'female house,' in which the main house is on the west, with a side-house or -porch and connected to a front-granary,

(C4) 'male house,' in which the main house is on the west, with a side-house or -porch and connected to a front-granary,

(C5) 'male house,' in which the main house is on the north, with a side-house or -porch and connected to a front-granary.

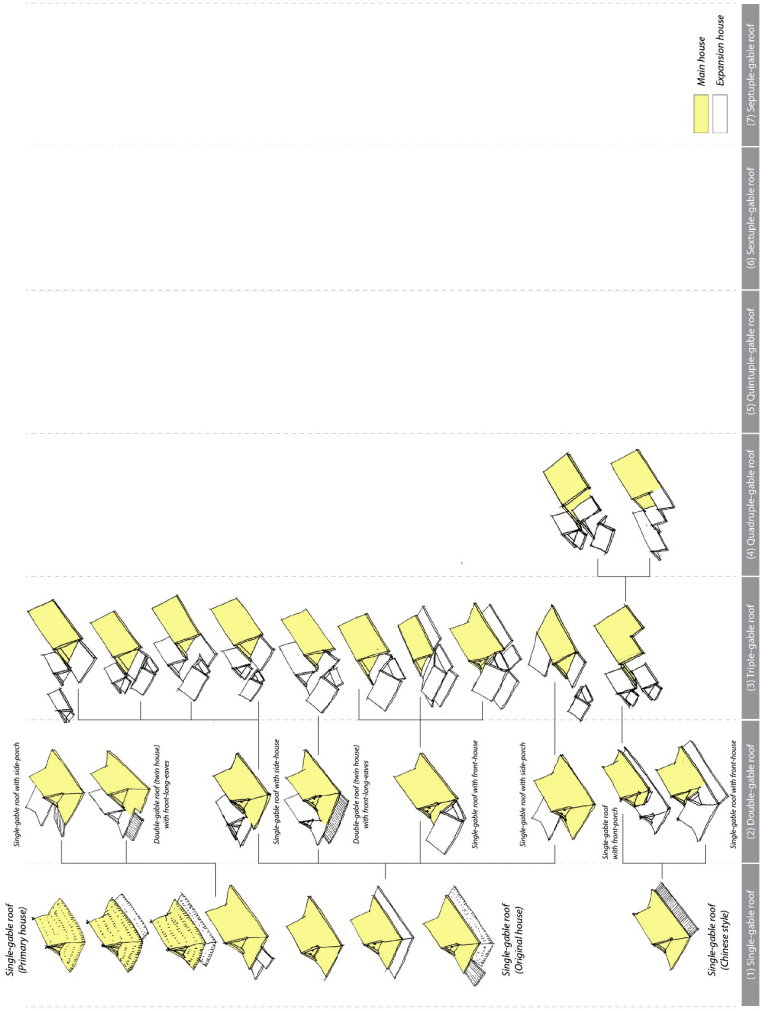


Figure 12 House forms of Dai Lue houses in northern Laos

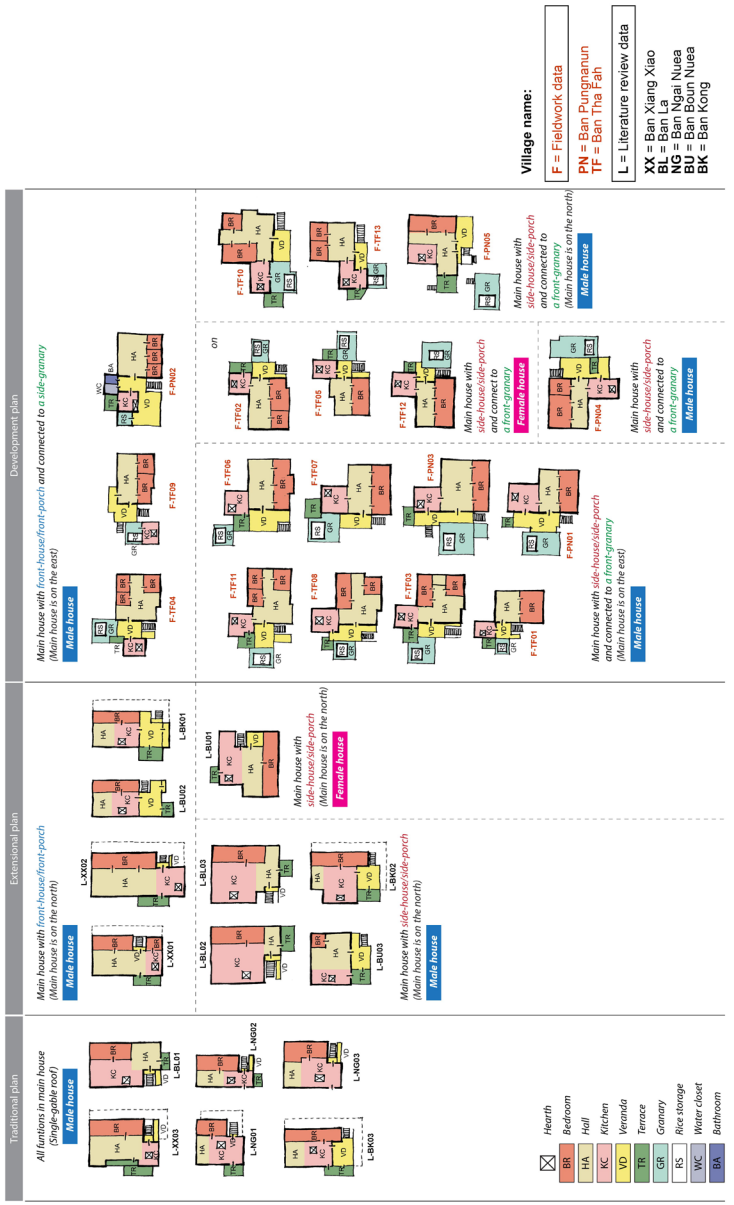


Figure 13 Spatial organization of Dai Lue houses in northern Laos

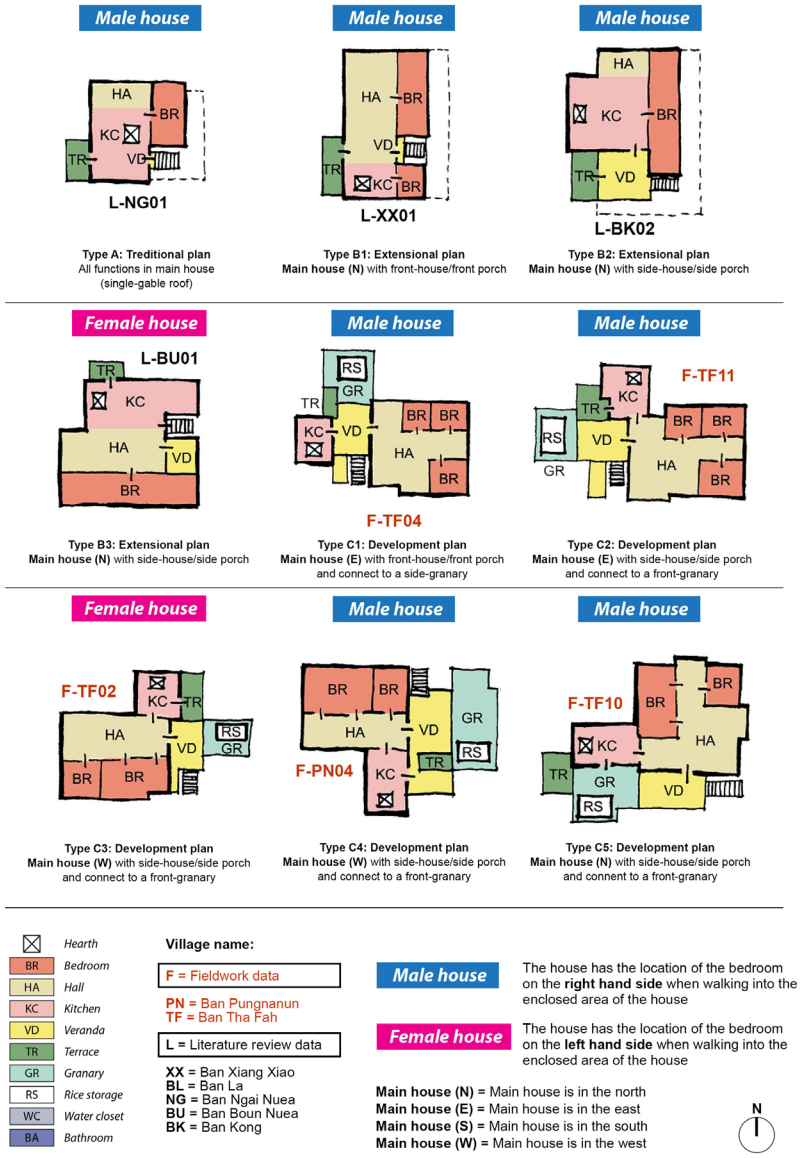


Figure 14 Type of floor plan of Dai Lue houses in northern Laos

A Comparison of Dai Lue Houses in China, Myanmar, and Laos

The study of Dai Lue houses in Xishuangbanna China, Myanmar, and Laos reveals their geographically contiguous land and shared culture. Analysis of information from fieldwork and literature reviews has enabled this study to compare and classify Dai Lue house patterns in the three areas, thus providing an exciting opportunity to see their similarities and differences and to advance understanding of the Dai way of life and culture.

Which areas will remain conservative and which will change? The next section compares Dai Lue vernacular dwellings to find significant factors that cause house patterns to retain their traditions or to change, summarized as the following two results: house forms and spatial organization.

1. House forms

The house and roof forms in China and Myanmar are similar, featuring both slanted and straight walls and hip-and-gable roofs. In Xishuangbanna, however, houses have a *'pa'* (canopy) around the main roof. And in the Shan State, houses often have long eaves on one side, covering only the stairs, similar to houses in Laos that feature the same roof. Indeed, roof forms in Laos include gable and hip-and-gable roofs, and the house shape is usually straight. In addition, gable sizes vary: small in Xishuangbanna, small and medium in the Shan State and the largest with air vents in Laos.

Thus, it can be seen that Dai Lue people demonstrate their understanding of the natural environment very well. In China, they secure themselves from natural disasters by building houses that can withstand cold weather, strong wind, and heavy rain. Shan State and Laos are warmer areas; thus, houses there need to prevent only wind and rain. Thus, the roofs allow for better ventilation by borrowing the technology of local cultures.

The variety of roof designs demonstrates the evolution of house construction design in which the side and front of the main house are expanded to support the increase in the number of family members. The houses in Xishuangbanna have the most complex roofs, with the highest number of septuple-gable roofs. Those in Shan State have the highest number of quintuple-gable roofs, and those Laos have the highest number of quadruple-gable roofs. The houses in Myanmar and in Laos are more traditional than those in Xishuangbanna, because there are still built of bamboo, but wood is used for the main structures. In Myanmar the roof is still thatched with grass and clay tiles, but in Laos galvanized sheets and Chinese tiles are used. Meanwhile, in Xishuangbanna the houses in some areas still use clay tiles, while in other areas fiber cement roofs are used as well (Table 2).

Table 2 Comparison of Dai Lue house forms in China, Myanmar, and Laos

House Form	Area		
	Xishuangbanna, China	Shan State, Myanmar	Northern Laos
Wall shape	Slanted and straight	Slanted and straight	Straight
Roof form	Hip-and-gable	Hip-and-gable	Gable/Hip-and-gable
Eave extension	*Pa* (canopy) surrounding	Long eave covering stairs	Long eave covering stairs
Gable size	Small	Small/Medium	Large
Roof complication	Many	Moderate	Few
House floor material	Wood	Wood	Bamboo/Wood
Terrace floor material	Concrete	Bamboo/Concrete	Bamboo/Concrete
Wall material	Wood	Wood	Bamboo/Wood
Roofing material	Clay/Fiber cement tiles	Grass/Clay tiles	Grass/Clay tiles/ Chinese tiles/ Galvanized sheets

2. Spatial organization

Each area's spatial organization illustrates the traditional function of a high-stilt house. The upper floor is divided into three areas: an enclosed area, a semi-enclosed space, and an open space. In each country the traditional spatial organization is still maintained well. Only the houses in the Xishuangbanna have a less traditional floor plan than

those in other places, but there are many extensional floor plans. In Myanmar and Laos, there are many more additional floor plan houses than in Xishuangbanna. The houses in Xishuangbanna often separate the bedroom location, in the corner of the kitchen, at the veranda near stairs, and at the basement. Terraces in Xishuangbanna and some houses of Myanmar are often converted into shower rooms and toilets; also, some houses include a water tank. However, the houses in Laos rarely have a water tank on the terrace.

The granary is used to store rice for consumption. It is another area that is necessary for the livelihood of Dai Lue people. In the past, it was often built near the house, in order to keep its contents safe from burglary and its basement was used for sheltering animals. Conversely, granaries are rarely found in Xishuangbanna, where the Dai Lue have changed from rice cultivation to rubber plantations. However, the Dai Lue in Myanmar and Laos still practice rice cultivation; thus, in their houses the terrace area is connected to the granary to prevent the rice from being stolen (Table 3).

Table 3 Comparison of Dai Lue houses' spatial organisation in China, Myanmar and Laos

Spatial organization	Area		
	Xishuangbanna, China	Shan State, Myanmar	Northern Laos
Floor plan type	Extensional, Additional	Traditional, Extensional	Traditional, Extensional
Basement functions (Lower floor)	Storage, Stable, Toilet, Bedroom	Storage, Stable, Toilet	Storage, Stable, Toilet
Enclosed space functions	Bedroom, Living, Kitchen, Additional bedroom	Bedroom, Living, Kitchen	Bedroom, Living, Kitchen
Semi-enclosed space functions	Stair, Front veranda, Additional bedroom	Stair, Front veranda	Stair, Front veranda
Open space functions	Terrace, Water tank, Shower room, Toilet	Terrace, Shower room, Toilet	Terrace
Granary	Rarely found	Stand alone near house	Connected to terrace

Conclusion

The Dai Lue people in Xishuangbanna still maintain their ethnic identity, traditions, and way of life within the house, while both the form and spatial organization of the house are continuously evolving. Even though they live in a Chinese society that is constantly trying to play a role and have influence in politics, economy, and socio-culture, and lifestyle. We might already know the factors that cause the architectural formation and transformation from the analysis of this research, but an important question that will be an issue for further thought is: How were the Dai Lue able to maintain the pattern of the house amidst the technological, economic, socio-cultural progress of the Chinese people who come to interact within the area so firmly?

Meanwhile, the Dai Lue people in Southeast Asia have a variety of lifestyles. In Myanmar, the country has blocked relations with neighboring countries, and therefore, traces of the original house style are still maintained in complex ways as in Xishuangbanna. In Laos, there are differences from one area to another. For houses in a warm and humid climate zone, good environmental protection is required. Areas that are in a tropical climate zone must rely on local wisdom for ventilation and protection from wind and rain to be consistent with the area or having close exchanges with the surrounding culture. Thus, we can see that the Dai Lue people in Southeast Asia are resilient when dealing with people whose cultures are different.

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Disclosure Statement

No potential conflicts of interest are reported by the authors.

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