景観保全の視点から見た中国朝鮮族木造民家及び 付属構造物における木材資源の利用状況

The State of Timber Resource Use for Korean-Chinese Traditional Wooden Houses and Accessory Structures, from the Perspective of Landscape Conservation

樊 磊* 今西 純一** 深町加津枝** 柴田 昌三**

Lei FAN Junichi IMANISHI Katsue FUKAMACHI Shozo SHIBATA

Abstract : Korean-Chinese have a thorough knowledge of using timber resources to construct wooden structures (wooden houses and accessory structures). However, the modernization of Korean-Chinese villages leading to these wooden structures disappearing and the traditional landscape changing. This study aims to comprehend the state of timber resource use for wooden structures and to discuss wooden structure conservation. The following methods were employed: 1) analyzing the impact of forestry policies on the forest supply of timber resources through documents and interviews, 2) analyzing the use of substitute material for timber in terms of village reconstruction policies through documents and interviews, 3) analyzing the use of wooden structures by visual inspection, 4) analyzing indigenous knowledge of timber resource use and wooden structures management through an interview survey. The results indicated that forest supply of timber cannot be reconciled with traditional practices of wooden structure construction and the wooden structures utilization has declined since 1980s. These changes are ascribed to the restrictions of timber logging and the use of non-timber materials in village reconstruction. In an effort to conserve Korean-Chinese wooden structures, we suggest that new policy should be set up to satisfy the villagers' demand for timber resources and allow villagers to use and manage the wooden structures.

Keywords : *landscape conservation, Korean-Chinese, wooden house, wooden accessory structures, timber resource*

キーワード : 景観保全, 中国朝鮮族, 木造民家, 木造付属構造物, 木材資源

1. Introduction

The Korean minority is one of 55 ethnic minorities in China. The Korean-Chinese population was 1,830,929 in 2010, which was 0.14% of the total population in China¹⁾. They mainly live in the three provinces of Heilongjiang, Jilin, and Liaoning, which are located in northeastern China. The Yanbian Korean Autonomous Prefecture (Yanbian Area) of Jilin Province is the biggest settlement of Korean-Chinese, with a Korean-Chinese population of 801,088 in 2010. At the same time, this was 43.75% of the total Korean-Chinese population in all of China. Korean-Chinese have a long history of living in China and the last large migration from Korea to China began in the 1860s²⁾. In search of a better life, these Korean immigrants crossed the Tumen River and settled in the Yanbian Area³⁾. Many villages were formed here because of the increase in immigration from Korea. The early villages, located along the Tumen River, fronted the river, and backed onto the mountain, a position that conforms to the Korean *FengshuiTheory*⁴⁾. Korean-Chinese have a close relationship with forest resources; they use timber resources to build wooden houses and accessory structures, and collect non-timber forest products for daily use, such as fuelwood, mushrooms, pine nuts, wild vegetables, and medicinal plants^{5)~9)}. We focus on timber resource use for wooden houses and accessory structures in this study.

Generally, construction materials of Korean-Chinese traditional wooden houses are stone, timber, mud, and straw/tile. Stone is used for the foundation; timber is used for the beams, columns, roof frame, windows, and doors; mud and

straw are used for walls and the ceiling; mud and straw/tile are used for the roof^{5), 10), 11)}. Wooden houses have white-colored walls, narrow doors, and thatched or tile roofs⁵⁾. The clear height of interior wooden houses is 2.2-2.4m and the height ratio of roof and wall are 1:1 viewed from the front elevation (Figure-1). This is because of the living habits of sitting on the *Ondol* and having to deal with the cold climate⁵⁾. The *Ondol* is a Korean form of under floor heating that uses direct heat transfer from fuelwood smoke. The construction technologies of wooden houses are known as post and lintel roof framing (抬梁式 in Chinese)¹⁰⁾ and mortise and tenon (榫卯结构 in Chinese)¹¹⁾; and the mud, in particular, is used for insulation materials to make the walls, ceiling, and roof¹²⁾. Because the immigrants came from Hamgyong of Korea, the Korean-Chinese village of Yanbian Area is also called Hamgyong Village¹⁰⁾ and the wooden houses of Hamgyong Village are named Hamgyong wooden houses¹³⁾. The *Ondol* of the Hamgyong wooden houses is spread out fully underneath the floor, while the *Ondol* of other Korean-Chinese wooden houses

Figure-1 Traditional Korean-Chinese wooden house

* 京都大学農学研究科/延辺大学農学院 ** 京都大学大学院地球環境学堂

are not. In addition to wooden houses, there are many wooden accessory structures in the yard, for instance, a wooden shed. Besides the roof, all parts of the wooden shed are made of timber. The construction technology of the wooden shed is “Ganlan” (干栏式 in Chinese)¹⁰⁾, and this technology is often used in wooden house construction by southern ethnic minorities in China¹⁴⁾. The timber for wooden houses and accessory structures were collected from adjacent forests^{5), 6)}; the style and construction technology was inherited from the wooden structure characteristics of the Hamgyong Province of North Korea^{10), 13)}. Therefore, timber, as the principle material for the Hamgyong wooden houses and accessory structures, not only constitutes the traditional landscape of Korean-Chinese villages in the Yanbian Area, but also reflects the traditional practices of timber resource use of Koreans in the Korean Peninsula^{5), 10)}.

Along with the present socio-economic development in China, the traditional landscapes of ethnic minorities are changing to a new style of landscape. At the same time, the indigenous knowledge of the utilization and management of forest resources is quickly disappearing. In an effort to protect the traditional landscape, researchers have studied the forest resource utilization and management methods of Buyi (布依族 in Chinese)^{15), 16)}, Dong (侗族 in Chinese)¹⁶⁾, Yi (彝族 in Chinese)¹⁷⁾, Miao (苗族 in Chinese)¹⁸⁾, Lahu (拉祜族 in Chinese)¹⁹⁾, and Dai (傣族 in Chinese)²⁰⁾ ethnic minorities. The results indicated that encouraging local villagers to manage forests resource as had been done traditionally was an effective method to protect the traditional landscape.

Traditional Korean-Chinese villages of the Yanbian Area are also under pressure of village reconstruction. Previous studies on the Korean-Chinese villages of Yanbian Area have focused on culture^{21), 22)}, population^{23), 24)}, rural landscape spatial structure^{3), 25)}, village formation and transition^{26), 27)}, and traditional wooden house construction technology^{5), 10), 12), 13), 28)}. These studies indicated that Korean-Chinese traditional landscapes are changing to a new style and the reasons for the decline of traditional wooden houses were the population decrease. However, there was no study that from the view of indigenous knowledge of timber resource use; the state of wooden houses and the influence of reconstruction were only described in short rather than through a detailed analysis in previous research and the wooden accessory structures were ignored. On the other hand, previous studies on the Yanbian Area forestry have focused on the Yanbian Area forestry workers who currently earn less than they did previously because of the limitations placed on timber logging^{29), 30)}. Additionally, the collective forest of the Yanbian Area was contracted to a few villagers and companies that could promote the sustainable development of the forest³¹⁾. However, the restriction of forestry policies on the timber resource use for traditional wooden structures (consisting of wooden houses and wooden accessory structures) was not raised as a concern.

In order to conserve traditional Korean-Chinese wooden structures, the indigenous knowledge of timber resource use, the impact of forestry policies and village reconstruction on the timber resource supply and use, and the state of wooden

structures utilization and management need to be analyzed and discussed. Therefore, this study analyzes the impact of forestry and village reconstruction policies on the timber resource supply and use through documents and interviews, analyzes the state of wooden structures use by visual inspection, analyzes indigenous knowledge of timber resource use and wooden structures management through an interview survey, aims to comprehend the state of timber resource use for wooden structures and to discuss wooden structure conservation. Based on the results, we make a proposal for the conservation of traditional Korean-Chinese wooden structures in the Yanbian Area.

2. Materials and methodologies

(1) Study area

The Jingxin Township (N42°38', E130°28') located in the eastern part of the Yanbian Area in Jilin Province, occupies an area of 342.46 km² (Figure-2). Immigrants of Korean Hamgyong settled here as early as 1862. In 2011, the Korean-Chinese population was 4,024, which was 70.7% of the total population of the township. Jingxin Township borders on Russia to the east and on North Korea to the southwest. The longest river is the Tumen River, flowing through the administrative villages of 1, 2, 3, 4, 5, 6, 7, 8, and 9 (Figure-2). The nine Hamgyong Villages were chosen as the research sites for this study because the villages were formed soon after the start of the last immigration during the 1860s, the villages are located along the Tumen River, and many households here still use traditional wooden structures.

(2) Research method

(i) Analysis of local forest supply of timber

We analyzed forestry policies documents of *Agrarian Reform Law*³²⁾, *Forest Law*³³⁾, *Revised Forest Law*³⁴⁾, *Natural Forest Protection Project*³⁵⁾, and *Decision about Accelerating the Production and Construction of Eastern Mountain Area in Jilin Province*³⁶⁾; and interviewed forestry officials and village leaders to ask them about the information of local forest. The changes of the local forest supply of timber were observed. Local forests are owned by the government and consist of national forests and collective forests. The manager of national forests is the Jingxin Forest Center; while managers of collective forests are village committees. The two kinds of forests were divided according to the different managers. We verified the manager of every forest compartment on the 2007 Jingxin Township Vegetation Map (scale 1:25000), and created a map to show the current conditions of local forests.

(ii) Analysis of use of substitute material for timber

We analyzed village reconstruction policies documents of *Construction of New Socialist Countryside*³⁷⁾, *Wooden House Reconstruction Project*³⁸⁾, and *Development Plan of Tumen River Area Cooperation*³⁹⁾ to find the information related to the use of substitute material for timber, interviewed village leaders and villagers to ask them about the process of village reconstruction, and did field survey about substitute material for timber in the nine villages.

(iii) Analysis of traditional wooden structures utilization

There were 1,513 registered households in the nine villages in 2014; however, approximately half of registered households

Figure-2 Research site location

Figure-3 Traditional wooden structures

lived in the villages only periodically, some of them did not even have houses and yards in villages. Therefore, we selected the indigenous households of Korean-Chinese that have houses and yards in the villages. During an initial survey, we confirmed that pine timber (*Pinus koraiensis* Siebold & Zucc.) was the major component of wooden structures, and oak timber (*Quercus mongolica* Fisch. ext Turcz.) was used for

other components of wooden structures. Therefore, we did not check the timber use of each component of wooden structures, but focused on external appearance to examine whether the house and accessory structures were made of timber. A total of 400 sample households in nine villages were investigated by visual inspection for their wooden structures utilization (Table-1). We took photographs of the wooden structures and divided them into seven types according to different functions. The seven types of wooden structures were house, fence, storehouse, shed, toilet, livestock enclosure, and chimney (Figure-3). We calculated the number of each type and the proportion of each type compared to the total sample households, and analyzed the difference among villages. Additionally, we consulted family members and neighbors on wooden house habitations (inhabited, unoccupied, or abandoned).

(iv) Analysis of traditional wooden structures management

Fifty-five households were selected from 400 sample households for an interview survey about wooden structures management (Table-2). Our sample household selection was based on whether the occupants lived in a wooden house or if the occupant was an elderly person that could explain traditional management methods.

The field survey was done in 2014, with the research site selection taking place in February and March, the interviews in May and June, and the interview survey and mapping work in September and October.

3. Results

(1) Changes of local forest supply of timber resource for villager use between 1950 and 2014

According to the national level forestry policy analysis, the *Agrarian Reform Law (1950)* states that forestland is owned by the government, the national forest was formed and managed by all levels of the forestry departments, and rural residents were therefore not entitled to the resources of the forests. However, then, in order to meet the need of forest resource use by residents who lived in a forested region, partial national forests were amended successively to collective forests in China. Collective forest resource use needs to have usage rights, however, not all households have these rights. Although the fifteenth term of *Forest Law (1984)* allowed for the usage rights of collective forests to be transferred, the usage rights were still not applied equally in some areas. The revised *Forest Law (1998)* continually stated the importance of protecting usage rights of collective forest, however, the eighth term encouraged the use of substitute material for timber. Even more seriously, the *Natural Forest Protection Project (2000)* prohibited the logging and cutting of trees in natural forests of China.

According to the local level forestry policy analysis and interviews, the national forests of Jingxin Township are managed by the Jingxin Forest Center, while the collective forests are managed by village committees. Before the *Natural Forest Protection Project's (2000)* implementation, there was much discarded timber in national forests because the Jingxin Forest Center logged trees in national forests for commercial timber. Therefore, villagers could collect the

Table-1 Number of sample households

Village	Registered households	Sample households (%)
1	29	16 (55%)
2	93	47 (51%)
3	33	22 (67%)
4	61	32 (52%)
5	188	99 (53%)
6	468	60 (13%)
7	323	47 (15%)
8	263	36 (14%)
9	55	41 (75%)
Total	1513	400 (26%)

Table-2 Interview survey about wooden structures management

1. Site	Jingxin Township of Yanbian Area
2. Survey period	2014. 2~2014.10
3. Respondents	Household occupants and elderly persons
4. Sample households	55
5. Methods	Face-to-face interview
6. Main questions	(1) Tree species used as timber resource at present (2) Source of timber (local forests or market) (3) Renewal period and volume of timber use (4) Management practices and the reason for changes

Table-3 Changes of timber resources use in terms of policies

Period	Policy	Timber resources		Non-timber materials
		National forest	Collective forest	
1950–1980	Agrarian Reform Law (1950)	Discarded and logged timber	/	/
1981–1983	Decision about Accelerating the Production and Construction of Eastern Mountain Area in Jilin Province (1981)	Discarded timber	Logged timber	/
1984–1999	Forest Law (1984)	Discarded timber	/	/
2000–2014	Natural Forest Protection Project (2000)	Uprooted trees	Uprooted trees	/
	Construction of New Socialist Countryside (2005)	Uprooted trees	Uprooted trees	Brick, steel, PVC
	Wooden House Reconstruction Project (2006)			
	Development Plan of Tumen River Area Cooperation (2009)			

discarded timber from national forests before 2000. From 1950 to 2014, the transition of local forest supply of timber resources for villager use could be divided into four different periods: 1950-1980, 1981-1983, 1984-1999, and 2000-2014 (Table-3). i) During the period of 1950-1980, a national forest covering 26,032ha existed in Jingxin Township. Villagers could log timber from national forests if they received permission from the Jingxin Forest Center. ii) During the period of 1981-1983, as a result of the *Decision about Accelerating the Production and Construction of Eastern Mountain Area in Jilin Province (1981)*, 6,655ha of national forests were changed to collective forests for local villagers' use (Figure-4). According to the distribution of collective forests on Figure-4, villages 1, 2, 3, 4, 5, 6, and 8 have collective forests, while villages 7 and 9 do not. Villagers could log timber in collective forests if they had usage rights. However, more than ninety percent of households did not have usage rights because the village committees contracted the usage rights of collective forests to individuals or companies. Therefore, villagers who wanted to log timber from collective forests needed to get permission from village committees. iii) During the period of 1984-1999, after the *Forest Law* enforcement, local government restricted the

Figure-4 National forest and collective forest of Jingxin Township (since 1981)

felling of trees for villager use to trees that were more than 5 cm in diameter. Because less than 5 cm in diameter of timber cannot up to the standard of villagers' use, therefore, the main source of the timber was the discard timber in national forests. iv) During the period of 2000-2014, the Jingxin Forest Center did not log trees in national forests as a result of the *Natural Forest Protection Project* culminating in villagers merely collecting the uprooted and dead trees of national forests and collective forests.

(2) Non-timber materials use in village reconstruction

According to the village reconstruction policies analysis, the *Construction of New Socialist Countryside* project, which started in 2005, emphasized the improvement of public facilities and living conditions in rural areas, encouraged the centralization of scattered households, and promoted urban-rural integration. The *Wooden House Reconstruction Project (WHRP)*, which started in 2007 in Jilin Province, supports villagers to convert their wooden houses to brick houses. The *Development Plan of Tumen River Area Cooperation* was put into effect in 2009 and it emphasizes urbanization and agricultural industrialization (Table-3).

According to the interviews and field survey, along with the three policies implemented in the Jingxin Township, since 2007 traditional villages are being changed to new villages due to village reconstruction and the *WHRP*. Village reconstruction emphasized new accessory structure reconstruction and local government provided non-timber accessory structures to villagers for free, or encouraged villagers to buy non-timber accessory structures. The *WHRP* emphasized building new brick houses to replace traditional wooden houses. As part of this project, villagers were required to pay only 10-30% of the construction costs of the new brick houses. The starting and ending times of village

reconstruction and *WHRP* are different in the nine villages. Village reconstruction and *WHRP* commenced in village 9 from 2006 and completed in 2007. Villages 1-8 started the village reconstruction in 2006; villages 3, 4, 6, and 8 commenced the *WHRP* from 2009; villages 1, 2, 5, and 7 commenced the *WHRP* from 2014; both the village reconstruction and *WHRP* have not been completed in villages 1-8 until 2014. Abundant non-timber materials were used for the village reconstruction. As a result, the timber material was replaced with non-timber material for house and accessory structures construction. Moreover, many traditional wooden structures were abandoned. We observed that many kinds of non-timber materials were widely used in the nine villages, for instance, steel and wire netting fence, brick storehouses and houses, steel sheds, brick livestock enclosures, brick toilets, PVC and brick chimneys (Figure-5).

(3) The state of traditional wooden structures utilization

(i) Traditional wooden house utilization

(a) Steel fence & Wire netting fence

(b) Brick storehouse

(c) Brick house

(d) Steel shed

(e) Brick livestock enclosure

(f) Brick toilet

(g) PVC chimney & Brick chimney

Figure-5 New structures with non-timber materials

There are two kinds of houses in the nine villages, namely, traditional wooden houses and new brick houses. Because some households consisted of two houses there were 433 houses in the sample of 400 households. There were 118 traditional wooden houses, 27% of the total number of sample houses (Table-4). Village leaders reported that before the 1980s, all local houses were traditional wooden houses. However, a larger number of wooden houses have been converted to new brick houses. The traditional wooden house percentage was lower than the new brick house percentage in all villages except village 1. We did not find any wooden houses in village 9.

There were three kinds of habitations relevant to the 118 traditional wooden houses: inhabited, unoccupied, and abandoned. Inhabited means that villagers are currently living in the traditional wooden house. Unoccupied means the traditional wooden house is currently empty, but the villagers intend to continue using it in the future. Abandoned means the villagers were not using the traditional wooden house and were not planning to use it again. Inhabited wooden houses accounted for 27% of all wooden houses, while the total of unoccupied and abandoned wooden houses was 73%.

(ii) Traditional wooden accessory structures utilization

We calculated the number and proportion of each type of traditional wooden accessory structures (Table-5). In Table-5, numbers represent the calculated number of households relevant to the wooden accessory structure, and the percentage values mean the proportion of the calculated households.

The proportion of wooden accessory structures utilization of all 400 sample households from the highest to lowest was fence, chimney, storehouse, shed, toilet, and livestock enclosure. The utilization percentage of each type of wooden accessory structure was less than or equal to 53%. However, village leaders reported that approximately 30 years ago nearly all households utilized these six types of wooden accessory structures.

It was discovered that 53% of sample households had wooden fences. Wooden fences are used to delineate the household yard and to prevent disturbances by other livestock and intrusion by wild animals. The diameter of the timber used for wooden fences was approximately 5 cm, which was the thinnest timber of accessory structures. Forty-four percent of the sample households had wooden chimneys, which were usually taller than the house and were channels outside the house to discharge the smoke from the *Ondol*. Fifty-seven out of 315 brick houses still had wooden chimneys. The occupants indicated that they preferred timber material to other material for chimneys, because wooden chimneys did not freeze over in winter and could discharge the smoke smoothly. Thirty-one percent of the sample households had wooden storehouses. A wooden storehouse is usually built alongside the house and is used to store farm tools, sundries, and grain. Twenty percent of the sample households had wooden sheds, which were used especially for storing corn. Less than twenty percent of the sample households had wooden toilets and wooden livestock enclosures. Villagers reported that after the introduction of mechanized farm tools

Table-4 Traditional wooden house utilization of 400 sample households

Village	Sample households	Sample houses	Traditional wooden house	New brick house
1	16	20	11 (55%)	9 (45%)
2	47	57	27 (47%)	30 (53%)
3	22	23	3 (13%)	20 (87%)
4	32	35	2 (6%)	33 (94%)
5	99	109	51 (47%)	58 (53%)
6	60	63	7 (11%)	56 (89%)
7	47	47	14 (30%)	33 (70%)
8	36	38	3 (8%)	35 (92%)
9	41	41	0	41 (100%)
Total	400	433	118 (27%)	315 (73%)

Table-5 Traditional wooden accessory structures utilization of 400 sample households

Village	Sample Households	Fence	Chimney	Storehouse	Shed	Toilet	Livestock enclosure
1	16	7	4	8	3	4	4
		44%	25%	50%	19%	25%	25%
2	47	35	15	18	18	12	4
		74%	32%	38%	38%	26%	9%
3	22	5	15	9	6	5	/
		23%	68%	41%	27%	23%	/
4	32	24	17	3	5	4	2
		75%	53%	9%	16%	13%	7%
5	99	59	57	38	9	18	1
		60%	58%	38%	9%	18%	1%
6	60	35	27	16	4	6	/
		58%	45%	27%	7%	10%	/
7	47	23	17	18	10	1	1
		49%	36%	38%	21%	2%	2%
8	36	22	8	14	24	3	/
		61%	22%	39%	67%	8%	/
9	41	/	15	/	/	/	/
		/	37%	/	/	/	/
Total	400	210	175	124	79	53	12
		53%	44%	31%	20%	13%	3%

Table-6 Tree species used as timber resources by 55 sample households

Local name	Scientific name	Fence	Chimney	Store house	House	Shed	Toilet	Livestock enclosure	Total
蒙古栎	<i>Quercus mongolica</i> Fisch. ext Turcz.	17		19	19	12	9	3	79
红松	<i>Pinus koraiensis</i> Siebold & Zucc.		2	12	14	5		1	34
黄花草	<i>Larix olgensis</i> A. Henry	4	6	6	9	3	2		30
紫椴	<i>Tilia amurensis</i> Rupr.	2		10	3	6	4		25
臭松	<i>Abies nephrolepis</i> Maxim.		21			1			22
樟子松	<i>Pinus sylvestris</i> L. var. <i>mongolica</i> Litv.	3	1	7	4	1			16
杨树	<i>Populus</i> sp.	4				2			6
柳树	<i>Salix</i> sp.	1						1	2
水曲柳	<i>Fraxinus mandshurica</i> Rupr.	1		2	1	1			5
云杉	<i>Picea koraiensis</i> Nakai			2			1		3
胡桃楸	<i>Juglans mandshurica</i> Maxim.			1		1	1		3
白桦	<i>Betula platyphylla</i> Suk.				1			1	2
色木槭	<i>Acer mono</i> Maxim.	1							1

in the 1980s many wooden farm tools were no longer being used.

From the perspective of each village, there was merely one type of wooden accessory structure in village 9, while 5-6 types of wooden accessory structures were observed in each of the other eight villages. In village 9, all wooden fences were changed to steel fences, storehouses and toilets were arranged in new brick houses, and wooden sheds and livestock enclosures were abandoned. In the other eight villages, the wooden accessory structures are being replaced by non-timber structures or are being abandoned altogether.

(4) The state of traditional wooden structures management

Information on traditional wooden structures management was provided by 55 households in response to our interview survey. Responses to the survey indicated that 20 households

(36%) had a wooden fence, 25 households (45%) had a wooden chimney, 19 households (35%) had a wooden storehouse, 23 households (42%) had a wooden house, 12 households (22%) had a wooden shed, and 3 households (5%) had a wooden livestock enclosure.

(i) Tree species used as timber resource

There were 13 tree species that were used as timber resources by the 55 sample households (Table-6). The number in Table-6 indicates the number of times a certain tree species was used by the sample household.

Analysis of the different applications indicated that *Quercus mongolica* Fisch. ext Turcz was used for six types of traditional wooden structures, except chimneys, while *Larix olgensis* A. Henry was used for six types of traditional wooden structures, except livestock enclosures. *Pinus koraiensis* Siebold & Zucc., *Tilia amurensis* Rupr., *Pinus sylvestris* var. *mongolica* Litv., and *Fraxinus mandshurica* Rupr. were used for more than four types of wooden structures. In addition, *Abies nephrolepis* Maxim. was the species used particularly for chimneys. The analysis of the incidences of the use of the particular species, as reported by the households, indicated that *Q. mongolica*, *P. koraiensis*, *L. olgensis*, *T. amurensis*, and *A. nephrolepis* were mentioned more than 20 times. This indicates that *Q. mongolica* is the most popular broad-leaved tree species, while *P. koraiensis* is the most popular conifer species. The villagers reported that they have previously preferred to use *Q. mongolica* and *P. koraiensis* trees as timber resources, however, they currently use any species of uproot and dead trees instead of the preferred *Q. mongolica* and *P. koraiensis*.

(ii) Traditional wooden house management

Twenty-three out of 55 sample households had a wooden house. These 23 wooden houses were built before 1984, and the timber was sourced from local forests. Respondents reported that the renewal period of a wooden house was more than 30 years. However, they also indicated that the permissible quantities of timber resources from local forests were not enough to meet the needs of a traditional wooden house construction at present. Because constructing a traditional wooden house required 15-20 m³ of *P. koraiensis* and *Q. mongolica* timber, the villagers were unable to find such quantities of free timber resources in the forest and the sourcing of timber from the market was expensive. Therefore, at present, the villagers found it impossible to build wooden houses. Villagers reported that the walls of traditional wooden houses needed to be reinforced and painted and the thatched roof had to be renovated every 1~2 years. Additionally, most young villagers had migrated elsewhere; there was not enough labor in the villages to conduct wooden house maintenance. The maintenance of brick houses was simple compared to that of wooden houses. A massive flood destroyed many traditional wooden houses in 1987, after which the villagers began to build brick houses better able to withstand such floods.

It is worth noting that among the 23 sample households that had wooden houses, 16 of them are still living in wooden houses. Twelve of these households indicated that they were used to living in a traditional wooden house and were

unwilling to change. Three households reported that they enjoyed the traditional cultural atmosphere of living in a wooden house. One household reported that they would like to use the *Ondol* in the wooden house to make traditional Korean-Chinese bean sauce. Additionally, they changed the roof materials or covered the roof with a plastic sheet to extend the lifespan of the wooden house.

(iii) Traditional wooden accessory structures management

Wooden fences consist of wooden piles and wooden poles (Figure-6). Every two thick wooden piles, spaced 2-3 m apart, are joined by many thin wooden piles and a wooden pole. Thick wooden piles are made of *P. koraiensis*, while thin wooden piles and wooden poles are traditionally made of *Q. mongolica*. Responders reported the fence extension of each household is approximately 80-120 m. The construction requires of 1400-2100 poles of timber (total volume is 3-4 m³). They repair the damaged parts of wooden fences every year. Because the timber resource diameter of a wooden fence conforms to forestry policies regarding the dimensions, villagers can collect timber resources from both national forest and collective forest for their wooden fences.

They reported that constructing a wooden chimney, traditionally requires 1-2 m³ of *A. nephrolepis* and the renewal period is 10-12 years. Because the timber resources of chimney necessitate wood approximately 40-50 cm in diameter, villagers cannot cut the timber from local forests at present because of the forestry policies. More than half of the respondents reported that the timber was sourced from the market; other respondents reported that they used uprooted and dead trees. However, chimneys made from uprooted or dead trees were not ideal because they often are not of the same quality as standard timber.

They reported that constructing a wooden storehouse requires 8-10 m³ of *Q. mongolica* and *P. koraiensis* timber and constructing a wooden livestock enclosure requires 6-7 m³ of *Q. mongolica* and *P. koraiensis* timber. Wooden storehouses and livestock enclosures were built at the same time as wooden houses, timber was sourced from local forests before 1980s, and the renewal period of wooden store houses and livestock enclosures depend on the renewal of the wooden house. Like the wooden house, villagers also reported that it is difficult to collect enough timber for the construction of wooden storehouses and livestock enclosures at present.

They reported that constructing a wooden shed requires 3-4 m³ of *Q. mongolica* and *P. koraiensis* timber, and the renewal period is 2-5 years. The timber from the wooden shed was constructed with uprooted and dead trees since 2000. Villagers indicated that the government encouraged them to

buy steel sheds rather than wooden sheds in recent years. However, they think the wooden sheds were more durable than the new materials and they preferred using timber to purchasing new materials. Constructing a wooden toilet requires 2-3 m³ of *Q. mongolica* and *P. koraiensis* timber and the renewal period is 8-10 years. Responders reported that they only repair the damaged parts of wooden toilets and there was no new construction.

4. Discussion

(1) Challenges facing traditional Korean-Chinese village landscape conservation

Korean-Chinese of the Yanbian Area traditionally collect *Q. mongolica* and *P. koraiensis* timber from local forests and construct the wooden house and accessory structures. Each type of wooden structure has a role in Korean-Chinese daily life. Wooden structures not only constitute the traditional landscape but also reflect the traditional practices of timber use. Because the Korean-Chinese villages of the Yanbian Area are less influenced by the other cultures, the traditional wooden house has basically retain edits original features^{5), 10)}. However, the sustainable development of Korean-Chinese wooden structure landscapes is influenced by the timber shortage and village reconstruction at present.

In the nine villages of Jingxin Township, the forestry policies are restricting the local forest supply of timber. The available timber for wooden structures use has been influenced by the forestry policies since the 1950s (Table-3). At present, the available sources of timber are merely uprooted and dead trees or tree that less than 5 cm in diameter. In addition to *A. nephrolepis*, *Q. mongolica*, and *P. koraiensis*, other ten tree species are used in 2014 (Table-6). Because the available timber is not the villagers' preferred tree species, and are not up to the standard required for wooden structure construction and renewal, wooden structures management cannot be reconciled with traditional practices. Also, because of this, wooden structure utilization has decreased: wooden houses only accounted for 27% of total houses, and the inhabited wooden house rate is 27%; each type of wooden accessory structure utilization is less than or equal to 53% (Table-4; Table-5). Obviously, the decline of wooden structure utilization leading the traditional Korean-Chinese wooden structure disappearing. In order to conserve the traditional landscapes, policy-makers should pay more attention on the actual demand for timber resource by local villagers.

On the other hand, the local government uses non-timber materials as substitute materials for timber during village reconstruction (Figure-5). The non-timber materials provided by the government resulted in villagers having no chance of choosing to use timber. As a result, villagers passively accepted new materials as wooden structures are abandoned or converted to non-timber material structures. Therefore, the utilization of traditional wooden structures declined and the traditional Korean-Chinese village landscape was changed. According to the results, village 9, which had completed reconstruction in 2007, had no wooden houses and only one type of wooden accessory structure (wooden chimney = 37%) after the reconstruction. Since the village reconstruction in

Figure-6 Elevation view of wooden fence

the other eight villages has not been completed yet, the proportions of various wooden structures were diverse (Table-4; Table-5). For the wooden house, the *WHRP* project commenced from 2009 and did not complete in villages 3, 4, 6, and 8, therefore not all of wooden houses were changed to brick houses. However, the wooden house percentage was less than the average of 27% (Table-4). The *WHRP* project commenced from 2014 and did not complete in villages 1, 2, 5, and 7. Compare with other five villages, less percentage of wooden houses had been changed to brick houses. Therefore, the wooden house percentage was more than the average of 27% (Table-4). The results indicated that earlier the *WHRP* was commenced the less wooden house percentage village has. For the wooden accessory structures, the utilizations were different among the eight villages because they are being changed in terms of village reconstruction. Because the logging is being prohibited, timber shortage is common in these villages. Therefore, wooden accessory structure percentages mostly related to the starting and ending times of village reconstruction. The goal of village reconstruction is using non-timber materials to build new accessory structures. Although many wooden accessory structure percentages of villages 1-8 were more than that of village 9 in 2014, these wooden accessory structures will be replaced by new accessory structures in next few years according to the policies. It will result in the only remaining traditional village landscapes in these villages will soon disappear.

Previous articles indicated that the population decrease caused the decline of wooden houses^{10), 21)}. However, most of the original Korean-Chinese villagers, who have migrated to cities, have kept their houses and yards in the villages and they sometimes return to live in village for a while. Therefore, the population decrease is not the main factor of the decline of wooden houses. This study concluded that the forestry policies limited forest supply of timber for local villagers use; the village reconstruction policies provided non-timber material to villagers led to the decline of villagers' demand for using timber resource. These policies accelerated the decline of wooden structures utilization; at the same time, they are challenges facing traditional village landscape conservation.

(2) Villagers' desires to use forest resources

The results of this study indicated that although impacted by the policies, some Korean-Chinese villagers insist on using timber for wooden structures. The relatively high utilization percentages of the wooden fence indicated that without violating the policies, the villagers still prefer the traditional practices of timber resource use. Wooden chimneys and wooden sheds directly affect the safety and income of villagers and, although source of the timber is different, the villagers still use timber in agreement with their traditional practices. Although the state of the wooden houses is poor, villagers who still inhabit the wooden houses are making an effort to extend the lifespan of these structures. While the government supports villagers to build brick houses if they are willing to relinquish their wooden house, these villagers preferred to continue their traditional style of living. Villagers insist on using timber is the power source of traditional landscape

conservation. Now the problem is that villagers have no rights or opportunities to use the timber.

Local forests consist of national forests and collective forests. Villagers could collect timber from collective forests if they had the usage rights. Although the central government required collective forest usage rights to be distributed to every rural household, the usage rights were still held by local village committees. Village committees leased the collective forests usage rights to individuals and companies, so the villagers could not use the timber from collective forests. On the other hand, the purpose of collective forest is to meet the demand of forest resource by villagers, however, there are no collective forests in villages 7 and 9 according to Figure-4. Moreover, the distance between collective forest locations and residential lands in other seven villages are different; therefore, villagers of each village access to timber resources of collective forest are also different. It indicated that the timber resource use was not raised awareness during the establishment of collective forest distribution. This situation negatively affected timber resource use for traditional wooden structures construction and management since 1981. Moreover, the decline of wooden structures was also since from 1980s. The traditional landscape also disappeared from that time. Not only did village committees, but also previous articles state that the Yanbian Area collective forest was contracted to a few villagers and companies to promote the sustainable development of the forest because of declining population³¹⁾. However, they neglected the actual demand for timber resource by local villages who still living in villages and building wooden structure by timber. It resulted in the logging restriction, the decrease of available timber resource, and the decline of wooden structure utilization. In an effort to conserve the traditional Korean-Chinese village landscape, the villagers' demands for timber resource use need to be satisfied. Therefore, part of collective forests in each village should be managed by villagers who still living in villages; moreover, collective forests should be set up in villages 7 and 9. In doing so, villagers can use timber from collective forests and construct and renew wooden structures in accordance with traditional practices. Construction and maintenance of wooden structures is meaningful for the sustainable development of Korean-Chinese traditional landscape.

5. Conclusion

This study analyzed the indigenous knowledge and the state of timber resource use for Korean-Chinese wooden structures in the Yanbian Area. The results indicated that forest supply of timber cannot be reconciled with traditional practices of wooden structure management in terms of forestry policies; on the other hand, local government supports villagers to build new structures with non-timber materials resulted in the decline of demand for timber resource. In an effort to conserve traditional Korean-Chinese village landscape, we suggest that new policy should be set up to satisfy the villagers' demand for timber resources and allow villagers to use and manage the wooden structures as traditional practices. Traditional Korean-Chinese wooden

structures conservation and socio-economic development should be balanced by improved practices. The changes of the forest landscape in Korean-Chinese villages, which were influenced by the changes of timber resource use and the traditional timber resource management system, need to be studied further.

Acknowledgement

We would like to thank Mr. Luo and Mr. Wang of Yanbian University, China, for their support during the field work. We are also grateful to Professor Zhu of Yanbian University, China, for the helpful comments, and to people of Jinxin Township for offering their useful information.

Reference

- National Bureau of Statistics of China: Tabulation on The 2010 Population Census of The People's Republic of China: Homepage of National Bureau of Statistics of China <<http://www.stats.gov.cn/tjsj/pcsj/rkpc/6rp/indexch.htm>>, 2012.01.01 update, 2014.12.16 reference
- Zhao Ying-lan (2004): A review on Society, Economy and Culture of Korean Immigrant's in Modern Northeast China (1840-1945): Northeast Asia Forum: 13 (5), 48-52 (in Chinese with English abstract)
- Jin Ren-he and Zhang Tai-xian (2004): A Study on the Change of Spatial Structures in the Villages of Korean Nationality in Yanbian: Chinese landscape architecture: 20 (1), 61-64 (in Chinese with English abstract)
- Wei Bao-wei and Xu Wen-fang (2011): On the Environmental Selection of Traditional Korean Villages in Northeast China from the Perspective of Geomantic Omen: Journal of Xi'an University of Architecture & Technology (Social Science Edition): 30 (2), 29-35 (in Chinese with English abstract)
- Hao Zhong-ren (2008): Study on ecological and cultural characteristics of Jilin Korean cottage: Master Dissertation of Beijing University of Technology (in Chinese with English abstract)
- Yang Dan (2009): The sustainable development of northeast dwelling research: Master Dissertation of Northeast Normal University (in Chinese with English abstract)
- Li Chun-jing and Jin Feng-hua (2010): The Features of the Rustic Families' Energy Use of the Minorities in Tumen River Valley: Journal of Agricultural Science Yanbian University: 32 (2), 110~114 (in Chinese with English abstract)
- Zhang De-quan and Piao Lian-xun (2012) Diet and health of the Korean nationality: Chinese Journal of Ethnopharmacology and Ethnopharmacy, 14, 5~6 (in Chinese with English abstract)
- Quan Xin-zi (1993): The diet and customs of Korean nationality: Chinese Journal of Heilongjiang National Series, 35, 117~121 (in Chinese with English abstract)
- Li Bai-shou and Jin Song-hao (2007): Study on the Korean-Chinese Dwelling Houses in Northeast China: Heilongjiang National Series: 101, 139-142 (in Chinese)
- Wang Hao (2007): Research on the ecological architectural experiences for traditional residential buildings of Korean nationality: Master Dissertation of Harbin Institute of Technology, pp42 (in Chinese with English abstract)
- Hwasun YOUNG and Kunihiro ANDO (2008): A Study on Construction and Maintenance of Thatched Roof in Yanji Area of Yanbian Korean Autonomous Region in China: AIJ J. Technol. Des.: 14 (28), 541-544
- Jin Dong-xun (2004): Kan Culture of Korean People and its Passing Down: Journal of Yanbian University (Social Science): 37 (2), 69-73 (in Chinese with English abstract)
- Zhang Xiao-chun (2013): Historical Evolution of Ganlan Architecture: Journal of Guangxi Normal University for Nationalities: 30 (5), 15-20 (in Chinese with English abstract)
- Yuan Juan-wen and Liu Jin-long (2009): Fengshui forest management by the Buyi ethnic minority in China: Forest Ecology and Management: 257, 2002-2009
- Yuan Juan-wen, Wu Quan-xin, and Liu Jin-long (2012): Understanding indigenous knowledge in sustainable management of natural resources in China, Taking two villages from Guizhou Province as a case: Forest Policy and Economics: 22, 47-52
- Liu Jin-long, Zhang Ren-hua, and Zhang Qiao-yun (2012): Traditional forest knowledge of the Yi people confronting policy reform and social changes in Yunnan province of China: Forest Policy and Economics: 22, 9-17
- Cheng Lin-sheng (2011): Research of forest resource use in Xiangxi Miao village in recent 60 years: Master Dissertation of South-Central University for Nationalities (in Chinese with English abstract)
- Li Jin-ming (2013): Research on Indigenous Knowledge about Forest Resource Utilization of Lahu Ethnic Minority: Social Sciences in Yunnan: 2013 (4): 113-116 (in Chinese)
- Cui Ming-kun and Chen Chun (2002): The Dais' Traditional Environmental Knowledge and the Forest Management in Xishuangbanna: Journal of Yunnan Normal University: 34 (5): 123-127 (in Chinese with English abstract)
- Zheng Xi-shu (2012): The Research on Yanbian Korean's Protection of Ecological Culture Resource and Culture Industry: Social Sciences Academic Press (in Chinese)
- Li Hai-ying (2009): Research of Korean national rice culture: Doctoral Dissertation of Minzu University of China (in Chinese with English abstract)
- Wang Hua-bo (2011): Determinants on Population Migration of Yanbian Koreans: Population Journal of China: 2011(2), 69-74 (in Chinese with English abstract)
- Han Song-yu (2010): Study on the Population Aging Problem in Yanbian Prefecture of Jilin Province: Master Dissertation of Jilin University (in Chinese with English abstract)
- Li Jin-hua and Liu Song-fu (2009): Formation and Change of Spatial Structure of the Lishu Village near Tumen River in China: Journal of Harbin Institute of Technology (Social Sciences Edition): 2009 (4), 24-33 (in Chinese with English abstract)
- Lin Jin-hua (2009): Analysis of the current situation of villages along Tumen River in Yanbian Area of Jilin province: Social Sciences Review: 25, 209-212 (in Chinese with English abstract)
- Lin Jin-hua (2009): The investigation method of Tumen riverside village in Jilin Province-Formation and Transformation of Chaoxianzu Settlement in the Tumen Riverside: Academic seminar on evaluation and protection of vernacular architecture and 2009 conference proceedings of architectural history, 61-66 (in Chinese with English abstract)
- Li Xin-ho, Jin Jun-feng, and Li Bai-shou (2002): A study on the Field Survey of the Korean Communities' Dwelling Houses of Rural District in East-Northern China-Longshan Village, Yanbian: Journal of Yanbian University (Natural Science): 200228(3),189-193 (in Chinese with English abstract)
- Lin Lin (2007): Research current situation of Yanbian Area forestry lowest living guarantee policy: Master Dissertation of Changchun University of Technology, pp20-23 (in Chinese with English abstract)
- Su Qing-liang (2007): The construction of Yanbian forestry entrepreneurial culture: Master Dissertation of Yanbian University, pp13-18 (in Chinese with English abstract)
- Chi Mei-zi and Zheng Bo (2010): Issues for non-public forest development in Yanbian Area: Manzu Minority Research: 2010 (2), 85-90 (in Chinese)
- The Central People's Government of the People's Republic of China: Agrarian Reform Law (1950): Homepage of the National People's Congress of China <http://www.npc.gov.cn/wxzl/wxzl/2000-12/10/content_4246.htm>, 2000.12.10 update, 2014.12.16 reference
- National People's Congress of China: The Forest Law of People's Republic of China (1984): Homepage of the Central People's Government of the People's Republic of China <http://www.gov.cn/banshi/2005-09/13/content_68753.htm>, 2005.09.13 update, 2014.12.16 reference
- National People's Congress of China: The Forest Law of People's Republic of China (1998): Homepage of the Central People's Government of the People's Republic of China <http://www.gov.cn/fwxx/content_2265088.htm>, 2012.11.13 update, 2014.12.16 reference
- State Forest Bureau of China: Natural Forest Protection Project: Homepage of State Forest Bureau of China <<http://trlbh.forestry.gov.cn/portal/trlbh/s/1858/Content-148977.html>>, 2007.02.08 update, 2014.12.16 reference
- Hunchun Chorography Compilation Commission (2000): Hunchun City Chorography: Jilin People's Press, pp213-214 (in Chinese)
- Central Committee of The Communist Party of China: The Eleventh Five-Year Plan: Homepage of People Network of China <<http://theory.people.com.cn/GB/40557/54239/54240/3780399.html>>, 2005.10.18 update, 2014.12.16 reference
- The People's Government of Jilin Province: Wooden House Reconstruction Project: Homepage of The People's Government of Jilin Province <http://www.w.jl.gov.cn/xxgk/zc/zffw/szfwj/jzbf/201411/t20141118_1793700.html>, 2007.07. 23 update, 2014.12.16 reference
- State Council of China: Development Plan of Tumen River Area Cooperation: Homepage of People Network of China <http://chinanest.xinhuanet.com/2009-11/17/content_18251163.htm>, 2009.11.17 update, 2014.12.16 reference

(2015.4.28 受付, 2016.11.1 受理)