

**LOCAL KNOWLEDGE OF AGROBIODIVERSITY CONSERVATION  
AMONG THE YAO COMMUNITIES IN SA PA DISTRICT,  
LAO CAI PROVINCE, VIETNAM**

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**1. INTRODUCTION**

Vietnam is an agrarian country, where  $\frac{3}{4}$  of the country area is hilly and mountainous and about 80 percent of the total population is farmers. In the rural areas, the agro-biodiversity conservation has played an important role in ensuring primary food security for the local people. Farmers manage genetic diversity in their own way, which is normally different from that of the scientists, but have low cost and have adapted to their ecosystems.

In recent years, various policies and development projects to eradicate hunger and reduce poverty have been implemented in the rural and mountain regions of Vietnam. Although there were remarkably successful results with some of the development projects, many of them failed or did not achieve the desired results. The macroscopic plan for a nation usually fails in the process of its execution and management at the local level. Sometimes solutions recommended in certain projects do not fit in with the knowledge of the local people, who could possibly suggest better alternatives for development projects. The people who design and implement development projects are not aware of the true value of the local knowledge. Development based on imposing plans without the farmers' participation creates great pressures on land, water, forest and other natural resources. This situation increases poverty and environmental degradation.

Through the above lesson learned, it is essential to recognize the importance of the farmers' knowledge and their experience in socio-economic development, including in agrobiodiversity conservation as the important basis of household food security. Their local knowledge must be considered as a valuable regional and national property as well as the key to development at the local level. This is especially important for Vietnam to rid itself of the threshold of low-income country by 2010.

The research region of this study is Sa Pa district, Lao Cai province. This northern province, bordering on China is one of the seven poorest provinces in Vietnam.<sup>2</sup> Its capital, Lao Cai city, lies some 300 km northwest along the Hong (Red) River from Hanoi. The district includes many different ethnic groups. Among them, the Red Yao ethnic minority was chosen as the subject for this research as this group has extensive experience in producing food and earning a cash income through different livelihoods. Their standard of living is thus relatively higher than that of other ethnic minorities in the same district. The Red Yao are second in population size among the local ethnic minorities, behind the Hmong. They live in three regions: in the highlands, the central area and the lowlands. The research includes all three regions, examining one representative community in each. Tả Phìn commune is in the central lands of Sa Pa district which is strongly influenced by tourism; Bản Khoang commune in the highland of Sa Pa which is possible and potential to develop agro-forestry in combination initiatives with the development of tourism due to an abundance of forests, a very nice mountain landscape and diverse cultures of ethnic groups; and Nậm Càng commune is representative of the lowlands of Sa Pa which is the most remote part of this

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<sup>2</sup> Six other poorest provinces of Vietnam include Ha Giang, Cao Bang, Lai Chau, Son La, Bac Kan, and Kon Tum provinces. See more: Parliament Council of Ethnic Groups. Session X. 2000. *Chinh sach va phap luat cua Dang va Nha nuoc ve dan toc (The policy and law of ethnic groups of the Vietnam Communist Party and the government)*. Hanoi: National Culture Publishing House.

district and have a lot of forest land and good agricultural land that create a good condition for them to grow *thảo quả* (*Amomum tsaoko* Crev. et Lem.) as a cash crop and medicinal herb.

This study aims at learning about traditional practices as a knowledge system of agrobiodiversity conservation of the Yao people. In addition, it also tries to refer to difficulties for the Yao people in conserving agricultural biodiversity in transition. Based on that, I give policymakers and development project planners and practitioners the documentary basis which can help with determining future actions and decisions. In this way, it is hopeful that the local people will have more opportunities to benefit from development projects and ensure their food security in coming years.

This study is analyzed based on the two main following documentary sources: the literature source gathered from the available documentation and the data collected in the research areas. In order to collect the data in the research areas, I applied the following methods: participant observation, in-depth interview, informal interviews, some tools of participatory rural appraisal (PRA), and a set of questionnaire.

## **2. THEREOTICAL FRAMEWORK**

Agrobiodiversity was defined to include all components of biodiversity of relevance of food and agriculture. This includes: genetic resources of harvested crop varieties, livestock breeds, fish species and non-domesticated resources within field, forest, rangeland and aquatic ecosystems; biological diversity that provides ecological services such as nutrient cycling, pest and disease regulation, maintenance of local wildlife, watershed protection, erosion control, climate regulation and carbon sequestration. Farm genetic resources have value both at global level, in terms of agricultural diversity and ecosystem health, and at a highly localized level, in benefiting poor farming communities. Giving attention to conservation of farm genetic diversity, it is primary to understand, collate and make useable all available information on agricultural genetic resources. Therefore, it is first important to know what one has, how it is used, and what functions it has in different communities. My study focuses on the crop and livestock diversity and fish species as the main sources of agriculture of the Yao farmers.

Most anthropological and ethnological studies of traditional knowledge or local knowledge have been conducted within the general frameworks of “human and cultural ecology” and “ethnoecology”. The term “human ecology” has had many meanings when used in different disciplines by different scientists at different points in the history of their disciplines. However, human ecology is normally used to refer to interactions between agroecosystems and human social systems (Bayliss-Smith 1982; Rambo and Sajise (eds.) 1985; Marten and Saltman 1986), or between forestry and social systems (Agrawal and Saigal 1996). It is found that a subset of human ecology refers to the study of the interactions between ecologically economic systems and human social systems. It is not quite different from the term of human ecology, “ethnoecology” as a part of ethnosience, according to Hardesty (1977), is defined as “the study of systems of knowledge developed by a given culture to classify the objectives, activities, and events of its universe” (cited in Brosius et al. 1986: 187). Therefore, ethnoecology refers to the study of how traditional groups organize and classify their knowledge of the environment and environmental processes. It is thus concise that study of ethnoecology has the same meaning with the study of how a particular ethnic group views the world it inhabits and how this helps this group to interact with the environment. Definitions of “human ecology” and “ethnoecology” include the term “cultural ecology” because both of them reflect interactions of the people with the environment and ecosystems. By this way, their culture is exposed. In this study, knowledge of

agrobiodiversity of the Yao farmers is closely linked with their environment and socio-economic circumstances because, as stated by Scoones and Thompson (1994: 25), “no knowledge can exist in a cultural, economic or political vacuum... Knowledge is socially and politically constructed; it requires a socially differentiated, politically astute analysis to comprehend”.

There will be remarkable shortcomings to study local knowledge without “gender studies” because this kind of knowledge is different from women and men. In addition, the contributions of women and men to food production are also different. Yearly data obtained from FAO show that both men and women play critical roles in agriculture throughout the world. However, the rural women in many developing countries play a dominant role in producing food and in supporting labour required for food production. In Sub-Saharan Africa, women contribute 60-80% of the labour required for food production both for household consumption and for sale. In Asia, women make up 50% of food production. The similar situation exists in Pacific, in Latin America. In a study by Shiva (2001), to answer a question of who feeds the world, she enumerates contributions of small farmers in the Third World, particularly of women farmers, to food production, to the maintenance of local crops contributing to ensuring the agro-biodiversity (2001: 57-58). Many other researchers also highlight the key role of women farmers in biodiversity conservation is as the important basis of household food security (Watson and Eyzaguirre (eds.) 2002).

### **3. YAO COMMUNITIES IN SA PA DISTRICT, LAO CAI PROVINCE: POPULATION AND NATURAL CONDITIONS**

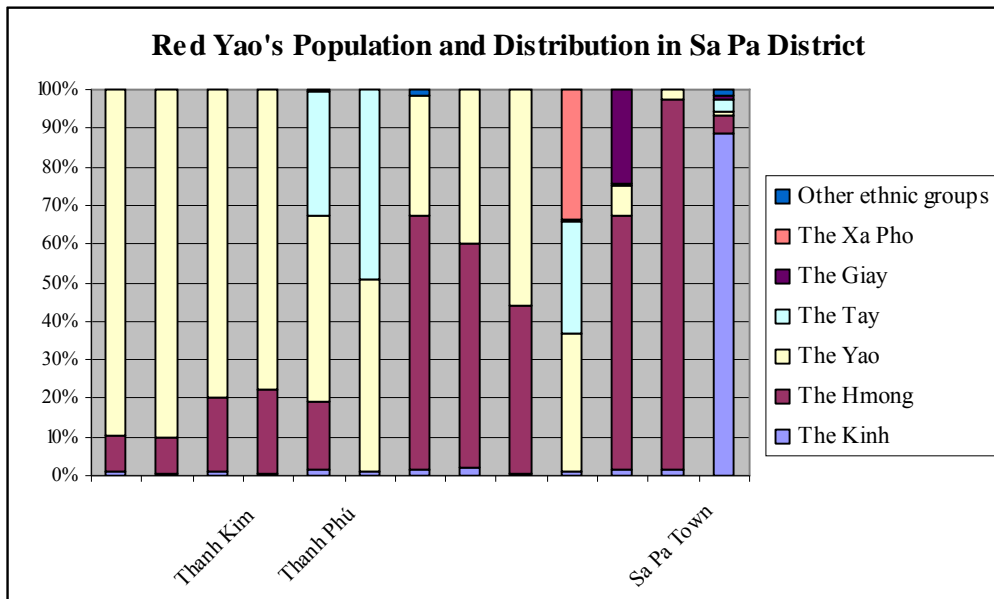
#### ***Population and distribution of the Yao:***

According to the general population census of Lao Cai province dated on 1<sup>st</sup> April 1999, the Yao people make up 12.49% of the whole provincial population, ranking third among the ethnic minorities and making up a relatively high population rate in this region (after the Hmong people of 20.83% and the Tay of 13.74%). Therefore, compared to the general population survey of Lao Cai province dated on 1<sup>st</sup> April 1989, the Yao population had increased by 0.17% (Lao Cai Statistic Office 2001: 22).

The Yao people here are categorized into three different sub-ethnic groups: the Red Yao, the Yao Ho and the Yao Tuyen. Among those, the Red Yao account for 66.7% of the total Yao population in Lao Cai province. They reside mainly in the highland communes of Sa Pa, Bat Xat, Van Ban, Than Uyen, Bao Yen, Bac Ha, and Bao Thang districts. The Yao communes have gradually increased in number, from 72 communes (in 1960) up to 110 communes (in 1979) and to 114 communes (in 1989) (Dien 1995: 191).

Sa Pa is one of Vietnam’s major tourist resorts thanks to its natural beauty and the vivid presence of ethnic groups. The total area of Sa Pa consists of 678.64 km<sup>2</sup> (Lao Cai Statistic Office 2001: 7). Besides the Sa Pa town, there are 17 communes, 86 villages and 14 residential groups. Nine ethnic groups live in this district. Among them, the Yao people account for 25.5% of the total population, ranking 2<sup>nd</sup> after the Hmong. They live in the township and 12 communes of Sa Pa district (Figure 1).

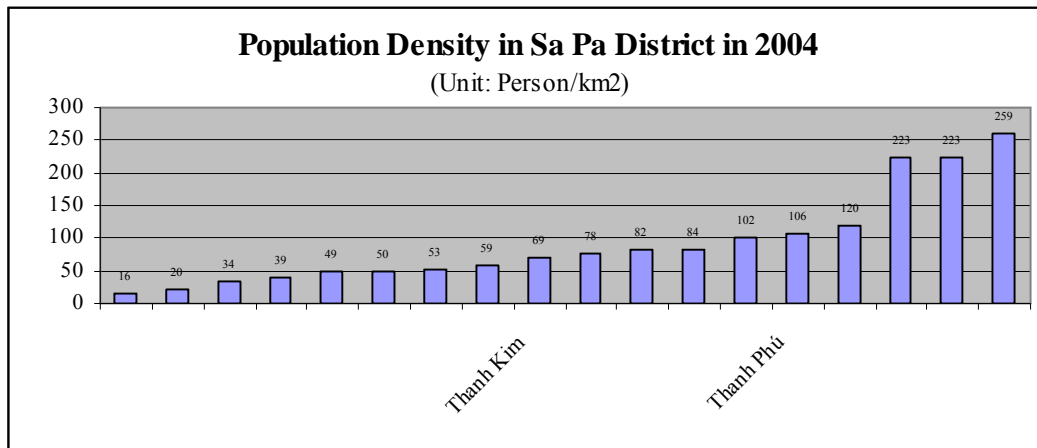
Figure 1. Population and distribution of the Yao in some communes of Sa Pa district in comparison to other ethnic groups.<sup>3</sup>



Sources: 1) Report on initial results of the 1999 census in Sa Pa district; 2) Initial results of Sa Pa population census dated 1.4.1999.

It is found that the population of the Yao, like those of other ethnic groups in Sa Pa district, increases gradually through both the natural population growth and immigration. In addition, population density in this district is also different from commune to commune (Figure 2).

Figure 2. Population density in Sa Pa district in 2004.<sup>4</sup>



Source: Sa Pa District People's Committee. 2004

The massive birth rate decreases shown above compared remarkably with the natal proportion of all of Northern Vietnam in 1936 (48‰) and in 1960 (46‰), but is still much higher than the average natal rate of developed countries in the period of 1980 - 1985 (15.5‰) (Dien 1995: 230, 285). Belief that “the more children we have, the more fortune we own”, “God generates elephant, afterwards certainly grass as well”, and “the more children we have, the more labour we have” make the natural growth rate of the mountain people

<sup>3</sup> To facilitate the observation of Yao population and their distribution, I classified this list in ascending number of Yao population in communes of Sa Pa district.

<sup>4</sup> The population density of communes in this figure has been arranged in ascending order.

higher than that of the lowlanders. This increasing population growth of the Yao people and that of other groups puts strong pressure on the natural resources in their regions, particularly on their productive sources (land, water source, and biodiversity, etc.) as one of their important livelihoods. However, this situation differs from commune to commune, depending on the number of inhabitants there.

### *Natural conditions*

**Terrain:** A typical physical characteristic of this region is that its terrain is strongly partitioned resulted by only a part of its alternation of high mountains and hills. This partition generates various big and small valleys along the Red River. Lao Cai's topography has sharp slope. The lowest area is 80m above sea level. The highest peak in this province, also in Vietnam, is Fansipan (3,143m in height) belonging to the Hoang Lien Son chain, composed largely of fine crystallized rocks such as rhyolite. Those areas are characterized by high mountains with a distinctive conical form and steep slopes (Michael and Andreas (eds.) 2004: 40). Mountain Ta Giang Phinh is 3,090m in height, and Mountain Pu Luong is 2,938m, respectively. Based on its height, Lao Cai's topography is divided into 7 main steps: 100-150m; 300-500m; 600-1000m; 1,300-1,400m; 1,700-1,800m; 2,100-2,200m and 2,800-2,900m. The area with greater than 25-degree slopes in this region accounts for 80% of the total area of this province (Lao Cai People's Committee 2003: 3). The partition of the terrain makes the cultivable land disperse, formless and uneven.

### *Climate:*

**Temperature:** As in other districts of Lao Cai province, Sa Pa district has a tropical climate, with an average temperature from 15<sup>0</sup>C-16<sup>0</sup>C. Especially, in winter, Sa Pa's temperature is sometimes below 0<sup>0</sup>C. In a study by Thao (2002), he shows that it is colder in the high mountain range of Fansipan than in other mountainous areas of Trung Khanh (-3<sup>0</sup>C), Lang Son (-2,1<sup>0</sup>C), Cao Bang, Dien Bien and Lai Chau (-0,8<sup>0</sup>C). Snow exists in Sa Pa at the altitude of 1,571m (Thao 2002: 71). Thus, in winter, people cannot cultivate rice and other staple food crops, except some kinds of vegetable and spices.

**Rainfall:** The average rainfall is 2000-2500 mm/year, which is much higher than that of the other northern provinces of Vietnam (about 1.700mm/year). However, the rainfall is different from month to month. The rainy season lasts from April to September. Therefore, this period is favourable for cultivation because the people have enough water for their rice fields and some soil plots of vegetables. However, in years, there have been floods in the rainy season, especially from June to the beginning of September, because the total water quantity in this period accounts for from 70% to 80% of the total yearly water quantities.

The dry season starts in October and continues through March of the next year. In this time, the land is hard and dry. In some months, rainfall is only between 16mm to 40 mm. The dry season, therefore, is called the mild season. The yearly rainfall in this season makes up only from 20% to 30% of the total yearly water occurrences. Therefore, the local people practise only single-crop of rice in the rainy season.

**Water sources:** In Sa Pa district, there are two tributaries of the Red River, the Ngoi Bo and Ngoi Dum. Their water comprises about 9.5 billion m<sup>3</sup>; however, only 2.25% of this potential is developed and used. The water content is unequal in terms of both place and time. Although the underground water content consists of 30 million m<sup>3</sup>, it is very rare in the rocky mountains, especially in the dry season (Lao Cai People's Committee 2003: 5). The quantity of water in all rivers and springs depends mainly on the rainfall and strongly influences local cultivation. Therefore, in addition to the coldness, lack of water in the dry season makes it impossible for the people to cultivate rice in this period.

### ***Soils and forests***

***Soils:*** The total area of this province consists of 8,057.08 km<sup>2</sup>. The agricultural area includes 920 km<sup>2</sup> (accounting for 11.5% of the total provincial areas); the forest land makes up 2,886.78 km<sup>2</sup> (35.8%); and the unutilized area comprises 4,043.7 km<sup>2</sup> (50.6%). The soil in Lao Cai province is relatively fertile including 10 groups with 30 main kinds of soil favourable for various crops (Lao Cai People's Committee 2003: 3). However, soils differ from district to district.

In Sa Pa district, there are 4 major types of soil. They are high mountain alit humus soils, high mountain yellow-red humus soils, feralitic soils developed on sandstone and feralitic soils formed by cultivation of wet rice (Table 1).

Table 1. Soil types in Sa Pa district

<b>Name of soil</b>	<b>Nature of soil and appropriate plants</b>	<b>Elevation (m)</b>	<b>Distribution in communes</b>	<b>%</b>
High mountain alit humus soils	Litter layer is not completely decomposed, sometimes up to 80 cm thick; low potential for cultivated crops, but some medicinal herbs	Over 1,700	Bản Khoang, Tả Giàng Phình, San Sả Hồ, Lao Chải, Tả Van	18.0
High mountain yellow-red humus soils	Soil stratum is medium, with light sandy clay loam; appropriate for many forest trees, industrial trees, fruit trees and medicinal herbs	700-1,700	Tả Phìn, Bản Khoang, Hâu Thào, Tả Van, Lao Chải, Trung Chải, Sa Pa, San Sả Hồ, Tả Giàng Phình, Sa Pa town	65.3
Feralitic soils developed on sandstone	Soil contains less protoplasmic minerals, much ferric sesquioxide and aluminium, titanium oxide and manganese; favourable to different crops	400-700	Nậm Cang, Nậm Sải, Bản Hồ, Sủ Pán, Thanh Kim, Bản Phùng, Thanh Phú, Suối Thầu	5.2
Feralitic soils formed by cultivation of wet rice	The soil is acid, but still rich; favourable for wet-rice crops		Most communes, except Sa Pa town	2.0
Others				9.5

***Forests:*** Sa Pa district has a total area of 678.64 km<sup>2</sup> (Lao Cai Statistic Office 2001: 7). Among those, the forest area of the whole district makes up about 75% of the total areas of the province. However, the forest cover of this district accounts for 48.5%. This district includes two kinds of forestland: that covered by trees (encompassing both natural and planted forests) and the bare land. Of those, the forestland covered by trees consists of 64.6% of the total forest land of this district whereas the bare land comprises 35.4%. Below is a list of classification of the land and the forest cover in Sa Pa district in 2003 (Table 2).

Table 2. Current use of the land and the forest cover in 2003 in Sa Pa district, Lao Cai province (Unit: ha).<sup>5</sup>

No.	Communes	Total area	Forest land area	Of which				Other lands	Forest cover (%)
				Forest land covered by trees			Bare land		
				Total	Natural forest	Reforestation			
1	Bản Hồ	11 439	6 443.9	4 667.8	4 439.7	228.1	1 776.1	4 995.1	40.8
2	Nậm Cang	7 068	5 423.8	4 697.1	4 697.1	0	726.7	1 644.2	66.5
3	Tả Van	6 759	5 101.6	4 680.9	4 519.3	161.6	420.7	1 657.4	69.3
4	San Sả Hồ	5 763	4 808.5	4 547.3	4 163.3	384.0	261.2	954.5	78.9
5	Bản Khoang	5 663	4 111.1	1 784.2	1 519.4	264.8	2 326.9	1 551.9	31.5
6	Trung Chải	4 000	3 526.5	2 340.4	1 363.5	976.9	1 186.1	473.5	58.5
7	Bản Phùng	3 017	2 694.1	932.9	932.9	0	1 761.2	322.9	30.9
8	Suối Thầu	2 992	2 532.6	1 052.7	924.2	128.5	1 479.9	459.4	35.2
9	Lao Chải	2 828	2 302.5	1 741.9	1 520.8	221.1	560.6	525.5	61.6
10	Tả Phìn	2 725	1 865.7	1 044.1	939.2	104.9	821.6	859.3	38.3
11	Nậm Sài	2 470	2 093.3	786.7	634.8	151.9	1 306.6	376.7	31.9
12	Tả Giàng Phình	2 423	2 129.9	1 001.2	894.1	107.1	1 128.7	293.1	41.3
13	Sa Pa Town	2 409	1 929.4	1 050.0	96.2	953.8	879.4	479.6	43.6
14	Sa Pả	2 334	1 809.9	1 079.7	289.7	790.0	730.2	524.1	46.3
15	Thanh Kim	2 071	1 600.5	508.4	472.2	36.2	1 092.1	470.5	24.5
16	Thanh Phú	2 063	1 613.6	491.7	265.5	226.2	1 121.9	449.4	23.8
17	Sử Pán	933	365.4	192.4	177.8	14.6	173.0	567.6	20.6
18	Hầu Thào	907	531.9	285.8	260.6	25.2	246.1	375.1	31.5
	<b>Total</b>	<b>67 864</b>	<b>50 884.2</b>	<b>32 885.2</b>	<b>28 110.3</b>	<b>4 774.9</b>	<b>17 999.0</b>	<b>16 979.8</b>	<b>48.5</b>

Based on this table, the forest cover of this district is relatively high. However, this forest cover is very different from commune to commune. Communes with abundant forest cover include San Sả Hồ, Tạ Van, Nậm Cang and Lao Chải communes (occupying more than 60% of the forest cover). The least forest cover exists in the communes of Sử Pán, Thanh Phú, and Thanh Kim (fewer than 25%). Therefore, there is a big disproportion in forest cover in different communes. Inhabitants in the communes with more forest area have more opportunities to benefit from the forest than do people in the other communes with less forest land. Additionally, in many cases, the more forest land the people have, the more income they earn in these areas of forest by planting *thảo quả* (*Amomum tsaoko* Crev. et Lem.). However, this seems more appropriate to the Red Yao people because they work much harder and are better educated than other ethnic minorities in the same region. It is found that the people and the forest have a close relation with each other. The Yao names of *Dìu miền*, *Kiềm miền*, and *Kìm mùn* themselves express their close relationship with the forest and the environment, as the people who live in the forest or near the forest.

The terrain of highland mountains, the impacts of tropical climate and the different kinds of soil create an extremely diverse natural environment in this region. This leads to an abundant fauna and flora with many valuable and rare genes favourable for the development of agro-forestry and tourism. However, the strongly partitioned terrain with high sloping land and the some complicated aspects of the climate accompanied sometimes by the hoarfrost and long cold periods are some of main challenges for the inhabitants to expand their agriculture on a larger-scale.

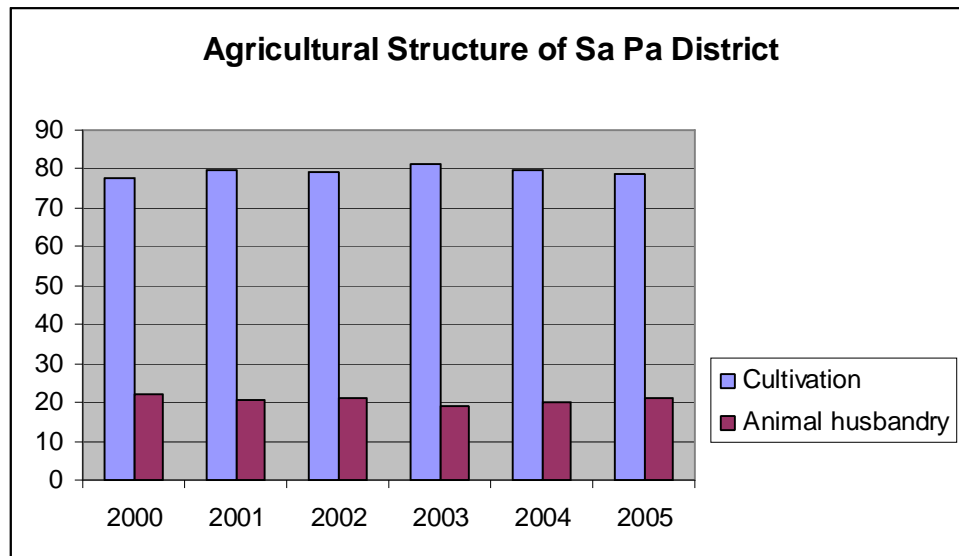
<sup>5</sup> Villages are listed by the author in the ascending order of the total area.

#### 4. LOCAL KNOWLEDGE OF CROP DIVERSITY CONSERVATION

##### *Varied types of cultivation*

Like other ethnic minorities living in an agrarian country, the Yao people have a traditional agriculture. In a study by Dixon, Gulliver, and Gibbon (2001), the extensive mixed farming system of highland farmers in eastern Asia and the Pacific region also describes the farming system of the Red Yao in northern Vietnam. This system can be subdivided into permanent and shifting cultivation subtypes. In Sa Pa district, cultivation makes up a large proportion of the local economy (Figure 3). The Red Yao engage in the following cultivation types: shifting cultivation, wet-land agriculture and gardening.

Figure 3. Agricultural Structure of Sa Pa District



Source: Sa Pa District People's Committee 2004.

*Shifting cultivation* is an indigenous form of cultivation of many ethnic minorities in the highland of Vietnam, including the Yao people. It is the most complicated cultivation type in the world. It includes diverse cultivation systems. It exists in various ecological conditions, from the upland to the plain, from the forest region to the grassland and in many countries around the world in the last thousand years (Spencer 1966; Howard 1996: 85). This is a slash-and-burn and rotational cultivation system. Planting periods are normally shorter than fallow periods (Conklin 1957; Clammer 1993: 159). Traditionally, in the Yao communities in Sa Pa district, the length of fallow periods for forest is 10-15 years and for bush it is 5-7 years. In the five recent years, however, many people have mainly spent 1-3 years for their fallow period because of lack of cultivated land resulting from increasing population growth and high population density. Therefore, their traditional shifting cultivation is no longer an ideal solution for agriculture if they do not apply some new techniques to their cultivation.

Despite different performances, shifting cultivators still observe a close productive cycle: choosing cultivable land, slashing and burning, cropping, harvesting and fallowing. The Yao people in Sa Pa district have accumulated much experience in cultivation on their sloping land, from the choice of cultivable land to the harvest. In principle, their shifting cultivation has two basic stages: removing the old vegetation and managing the new vegetation. This type of cultivation is similar to those of many other uplanders in the Southeast Asia (Conklin 1957; Watters 1960: 59-99; Marten 1986).

Wet-land agriculture: The terrain of Sa Pa district is relatively high and sloping. Thus, the terraced field is a common kind of wet-rice cultivation in this region. Before the 1980s, terraced and swamped fields occupied a small proportion of the total Yao people's cultivated land (Institute of Ethnology 1978: 314). Currently, they make up a large proportion of the completely cultivated land, much larger than the area of the burnt land in the Red Yao community in Sa Pa district.

The farmers have terraced fields in the relatively flat plots and near sources of water. The area of wet-rice fields is different from commune to commune. A fact is that areas of new rice fields are gradually increasing in number in all communes, whereas those of local rice are gradually decreasing. In addition, farmers still reclaim virgin land for cultivation. However, this area is not large.

Gardening: Compared with other Yao farming systems, gardening plays a minor role, making up about 5-12% of the farming systems. However, the crops in their home gardens are very diverse and differ from commune to commune. It is found that there are between 1-25 varieties in Tả Phìn communes, 1-29 varieties in Bản Khoang commune and 1-46 in Nậm Cang commune. It is found that their gardening and the biodiversity in the garden are essential to supply them with supplementary food and foodstuff. However, home gardens in Tả Phìn communes are less important than those of the two other research communes because the area of their gardens is very small and they are normally damaged by domestic animals.

### ***Traditional classification of cultivated land***

The Yao's knowledge of land classification is diverse and different from those of land surveyors (Table 3). Therefore, it is difficult for surveyors to assess current land use and to map a land-use system in this region without reference to farmers' viewpoint.

Table 3. Yao's traditional classification of cultivated land

<b>Criteria for land classification</b>	<b>Swidden milpa</b>	<b>Wet-rice field</b>	<b>Garden</b>
Terrain	Upper milpa ( <i>nậm hang đẫy</i> ), low milpa ( <i>ay đẫy</i> ), inner milpa ( <i>ua nhùa đẫy</i> ), outer milpa ( <i>ua khu đẫy</i> ), high sloping milpa ( <i>ua chia đẫy</i> ), low sloping milpa ( <i>đia đẫy</i> )	Fields at the back of village ( <i>lạ ay linh</i> ), fields at the head of village ( <i>nậm hang linh</i> ), earth fields ( <i>đào tấy linh</i> ), fields with many rocks ( <i>pì doòng linh</i> ), fields nearby streams, terraced fields ( <i>linh chàng hang</i> ), relatively flat fields ( <i>linh chàng ay</i> )	
Forest-based	Secondary milpa ( <i>đẫy hu</i> ), primary milpa ( <i>kìm đẫy</i> ).		
Varieties of crops	Maize milpa ( <i>cà mẹ đẫy</i> ), cassava milpa ( <i>kinh đòi đẫy</i> ), rice milpa ( <i>bèo đẫy</i> ), "thảo quả" milpa ( <i>la hảo đẫy</i> ), sweet potato milpa ( <i>phần đòi đẫy</i> ), peanut milpa ( <i>pìu sán đẫy</i> ), arrowroot milpa ( <i>quy hậu đẫy</i> ), taro milpa ( <i>hầu đang đẫy</i> )	Glutinous rice fields ( <i>bèo bụt linh</i> ), ordinary rice fields ( <i>bèo chí linh</i> ), new-rice fields ( <i>Xang bèo nghim linh</i> ), local rice fields ( <i>Lở bèo nghim linh</i> )	Vegetable garden ( <i>lay hun</i> ), cassava garden ( <i>kinh đòi hun</i> ), arrowroot garden ( <i>quy hậu hun</i> ), thảo quả garden ( <i>la hảo hun</i> ), sugar-cane garden ( <i>cà chua hun</i> ), maize garden ( <i>cà mẹ hun</i> )

Fertility of soil		Good fields ( <i>lình chim</i> ), bad fields ( <i>lình chẻ</i> )	
Others			Mixed garden ( <i>hun</i> )

In addition, the peasants traditionally choose varieties appropriate to cultivable land in their own ways (Table 4).

Table 4. Criteria for choosing crops appropriate to every plot

Criteria for land classification		Appropriate crop	Inappropriate crop
Nature of land	Wild vegetation		
Umber, less loose and relatively flat plots		Rice	
White soil			Rice
Salty and a little bit austere soil		Rice	
Too austere soil			Rice
Black, humus and thick soil		Maize, sweet potato, soy-bean	
	<i>ghim</i> plants, mugwort ( <i>lay ngoã</i> ) and <i>nhà uôm luôm</i> plants	Maize	
	<i>Nhài uôm luôm</i> plants	Taro	
	Alang grass ( <i>Imperata Cylindrica</i> )	Soy-bean	

The Yao's systems of land classification and their selection of cultivated crops appropriate for and compatible with the land and the weather help them to recognize the land's potentials. Based on that, they work out a plan of evaluating the soil for their production.

#### ***Diversity of cultivated crops and their planting methods***

*Diversity of cultivated crops:* The Yao cultivate different kinds of crops: food crops, vegetables, spices, fruit trees and other plants. Most of these are their own local varieties. Additionally, there are some new and cross-bred crops, mostly staple food crops (Table 5).

Table 5. Diversity of staple food crops

Staple food crops = 43 varieties					
Rice = 32 varieties				Maize = 11 varieties	
Local = 29			New = 3		New = 2
Ordinary = 15		Glutinous = 14		Ordinary	Ordinary
Wet-rice	Dry-rice	Wet-rice	Dry-rice	Wet-rice	Glutinous
40%	60%	64.3%	35.7%	3	2
				7	2

Table 5 shows that the local farmers use rice and maize as their staple food crops. Compared to maize, rice is much more diverse. Taking into account the quantity of land used for rice growth and the number of rice cultivators, rice (*Oryza* spp.) is considered the most important cereal in the world (FAO 1997, cited in Ooynu 2003: 105). In the Red Yao communities, there are various kinds of rice (*bèo*). Based on the nature of rice, there are two kinds of rice: sticky rice (*bèo bứt*) and ordinary rice (*bèo chí*). Based on the origin of rice varieties, rice is also divided into two kinds: local rice (*lò bèo nghim*) and new rice (*xang bèo nghim*). Based on the types of plots where the rice is grown, there is dry rice (*đầy bèo chí*) and wet rice (*lình bèo chí*).

The Red Yao people plant local dry-rice varieties on the milpas. Contrarily, local wet-rice varieties and all hybrid rice varieties are grown in the swamped fields. Glutinous rice varieties are normally planted on the better land than the dry rice because they are very selective about the soil and are less productive. The dry rice grows on the higher sloping plots. This kind of rice is popular in many upland areas of Asian countries: in the Hmong communities in southern China, in northern Vietnam, Laos and Thailand; in the Yao communities in northern Vietnam, in China, Laos and Thailand; and in the Akha and Karen communities in Thailand (Dang et al. 1971; Gaddes 1976; Lewis 1984; Cooper 1984; Howard 1996; Pourret 2002).

It is evident that the introduction of new varieties into the Yao communities and their application to production has diminished many local varieties. Although local rice varieties are more flavourful and delicious than the new varieties, they are less productive (26.3cwt/ ha compared with 40.4cwt/ha) and more time-consuming. Therefore, to have enough rice to eat, local farmers mainly plant the new varieties. As a result, their local varieties have decreased from some 40 to 29 kinds of rice.

The preservation of local varieties differs from commune to commune and from household to household. This depends on the quantity of cultivable land (mostly) and their awareness of preserving their own flavourful varieties for their spiritual purposes and their eating demands. Comparing all research areas, the people in the two communes of Nậm Cang and Bản Khoang preserve more local rice varieties than the people in Tả Phìn commune because they have more cultivated land. Currently, the local people keep to their local sticky rice because there is not a new one. This variety is round, short, very glutinous and flavoured. In the New Year and in the traditional festivals, the Yao people regularly use the glutinous rice as an offering to their ancestors and other spirits. They want to give their ancestors their traditional food as a valuable offering to thank them for their supports. This is another reason for the maintenance of this kind of rice in their community. In addition, their traditional rice needs less manure and fertilizer than do the new ones. Most farmers are poor and cannot afford to buy enough fertilizer for all their new rice fields, if they sow all of their swamped land with the cross-bred rice. A similar situation also exists in the case of maize and taro.

It is found that the local farmers sow and plant the local rice mostly in their traditional way. However, they intensify fertilizers for their crops. Nevertheless, they limit the use of nitrate for the local rice fields because it can make the rice short and poor. It is evident that the local people have applied some modern technologies in cultivation, mostly in getting chemical fertilizers for their rice crops. However, based on the lessons learnt, they get to know the way of choosing and applying them to the next crop in order to achieve a better harvest.

Although the people have grown some new rice varieties for six years, they could not preserve or keep them for seeds. In fact, many households tried to keep these seeds by their traditional way. Unfortunately, most the seeds were mildewy. Therefore, the farmers had to buy the new-rice seeds from the local administrators when their season came. That is why these varieties are still *xang bèo nghim* (“new” rice) for them, although these kinds of rice have been introduced to them for a relatively long time. Moreover, many households still reserve some fields for their local rice varieties to keep their seeds in order to protect themselves from hunger, when the local administrators are supplying them late in the new rice seeds.

Previously, in addition to rice and maize, other food crops, mostly the numerous taro varieties, played an important role in providing a considerable amount of food for the local

farmers. Nowadays they are a supplemental food because of the abundant and good rice harvests of the six recent years.

The Yao people plant various kinds of vegetables and spices. All these plants are their own local varieties, except chayote (*quýt qua*). Compared to the past, they currently pay much more attention to an extension of the gardening and more investment in this work. Vegetables were previously planted on sloping land, intercropped with other crops, especially with the maize. Nowadays, vegetable gardens around and nearby the inhabitants' residences have become common. In these circumstances, farmers have more opportunity to care for crops in their garden than before. As a result, their gardens are increasingly verdant and lush. Their gardening meets farmers' demands for vegetables in summer. Additionally, many plants can be used as food for domestic animals and thus contribute to the development of local stock-breeding.

In previous times, the Yao farmers planted only a few fruit trees: lemon trees (*piu suy*), plum and persimmon trees. Their fruit were only used for domestic purposes. Nowadays, however, many imported fruit trees exist in their communities. They are “*tam hoa*” plum trees, peach trees, pear trees, and new persimmon trees. Some of their fruit are used for both domestic and commercial purposes.

The Yao people practice of traditional disease prevention and treatment by using domestic herbal plants. Most of these plants naturally grow in the forest, along streams, in the paths, in the fields and in home gardens. In addition, the local farmers also grow some kinds of medicinal plants such as *thảo quả* (*Amomum tsaoko* Crev. et Lem.), “*conioselinum univittatum*” (*Ligusticum wallichii* Franch.), *cây chân chim*, and *cây đở trọng* (*Eucommia ulmoides* Oliv.). Among these, the *thảo quả* and the “*conioselinum univittatum*” are used as cash crops. Many Yao households dispel hunger and poverty by selling *thảo quả*.

Seasonal calendars: Through their lives and production, the Yao have gradually fixed and settled seasonal calendars appropriate for crops. In addition, they now base agricultural practices on the government's calendar year as well. However, in some cases, this calendar is only suitable for the lowlands, rather for the warmer region than for their locality. Therefore, in the first two years when the local people applied imported crops to their cultivated land, their harvest was even poorer than the harvest of their local crops. As an example, the new rice of C70 is very suitable and favourable for the fields in the lowlands and in the delta with the warmer temperature, but not adaptable to a cold region as Sa Pa district. Therefore, in despite of their application of many modern techniques of sowing and planting to this variety, the local farmers still achieve a poor harvest. In some fields, its productiveness is even lower than those of their local variety which needs less fertilizers and labour. In another instance, if the local people apply the seasonal calendar of rice practiced in Tả Phìn commune to Bản Khoang commune, where is colder and drier than Tả Phìn, their paddies will be husky and then very poor. Therefore, in combination with the available experience in production and the new knowledge, the local farmers have gradually built for them themselves a seasonal calendar favourable to their environment. It reflects the typical characters of the locally and ethnically seasonal calendars in the ethnic communities in different regions.

In a previous era, farmers harvested their rice crop in the beginning of September (Dang et al. 1971: 76). Now, their harvest comes sooner than before due to the cultivation of the new rice in addition to that of the local one. Additionally, other factors of their earlier harvests are the increasing warming of the earth and the intensification of the use of manure and fertilizers for the rice. Moreover, the harvesting time, especially for *thảo quả*, is shorter than before, about one and a half month which helps to protect their crops from theft or harm by animals (such as by buffaloes, pigs, mice, etc.).

The season of most vegetables lasts some months. In addition, some cultivated crops grow all year round. They are normally the spices. Particularly, some certain kinds of crops have two seasons a year. They are green beans and soybeans. Most green vegetables grow well in summer. They are mainly harvested in the end of summer. Therefore, the local farmers still have a shortage of different kinds of vegetables in winter. This shortage leads them to gather wild vegetables in the forest.

Different planting methods: The Yao's planting methods are various and diverse. They include monoculture, intercropping and mixed-cropping.

Monoculture is popular in the sowing and planting of rice, taro and some kinds of maize. The local farmers want to maintain the flavours of each rice variety; therefore, they grow them in separate fields. Sometimes, they intercrop one rice variety with another kind of rice, but only if these rice crops have similar biological characteristics and growing periods. In the case of taro, monoculture is the only planting method because this crop is very selective about the land; and it only grows well in its own plots without any other cultivated crops. Farmers who have a lot of cultivable land normally apply monoculture to their maize crops. They usually grow the ordinary maize and the glutinous maize in different soil plots because they are afraid that pollens of these maize varieties will cross, leading to a negative impact on their qualities.

A fact is that intercropping has long been a common planting technique among the Yao in Vietnam. Few soil plots have a monoculture (Dang et al. 1971: 77). Therefore, cultivable plots are places where the farmers not only produce food, but also where they maintain, protect and develop several varieties of indigenous plants. Green beans are popularly intercropped with maize. Traditionally, after farmers have sowed the land with maize seeds, they evenly distribute bean seeds over the surface of the maize plots. The bean plants themselves grow naturally. In addition, casaba melons, lettuces, pumpkins, and sweet potatoes are also intercropped with maize. This creates the milpa, with a combination of three crops of maize-casaba melons-green bean, of two crops of maize-lettuce, maize-pumpkin, and maize-sweet potatoes or the soil plots of a mixed-cropping between all of them except sweet potatoes. The intercropping is also applied to some dry-rice fields. Some upland milpas include three different crops of dry-rice, sesame and *chi san* (which is similar to the sesame with black seeds and green seeds' nuclei). Additionally, many vegetables are normally intercropped with each other in the home gardens and in the sloping milpa.

In the case of the mixed-cropping, as mentioned above, seeds of five crops of maize, casaba melon, green bean, pumpkin and lettuce are sometimes mixed with each other and then sown in the same plots. The farmers mix all these seeds with the ashes and the phosphate or NPK. After that, they sow this mixture in the bottom of dug holes reserved for the maize. As soon as they sow such holes with the maize seeds, they cover it with earth. These seeds germinate simultaneously with the maize. Mixed-cropping is also very popular in the case of planting of different kinds of vegetables. The farmers normally mix some kinds of vegetable seeds with each other, and then they scatter these seeds on the surface of certain soil plots.

The Yao's care of the cultivated crops by increasing fertilizers has tended to develop over the past decade. However, in some certain steps of the growing process of some varieties, rice seedlings for instance, muck is indispensable for them. In addition, the local farmers gradually get some vegetable manure and chemical fertilizers for their milpas, their fields and gardens. On the one hand, the chemical fertilizers make some cultivated crops develop well with a high productivity. On the other hand, they contribute to erosion. For example, the new rice varieties grow very well in the fields where the local rice varieties grew. In contrast, local rice varieties do not grow well in the fields where the new rice

varieties have been grown. One of the main reasons for this is that the local farmers normally added organic fertilizers to the local rice fields; therefore, the process of land erosion occurred slowly. Meanwhile, the new rice varieties require more water and more fertilizers than the local ones.

Nowadays, to protect cultivated crops from the damage caused by pests, the staffs of Sa Pa station of plant protection give farmers specific instructions for spraying pesticide for 8 ha of rice fields that are suffering from a disease of pirculariose, for 1ha of atractylis fields and for some artichoke fields suffering from damage by termites. In 1999, the staffs of this station supplied the local people with 54 kg of powdered pesticides, 580 bottles of liquid pesticides, 50 packets of termite killers and 20 bottles of weed killers (Department of Agriculture and Rural Development of Sa Pa district 2000: 8).

In general, it is found that, by monoculture, the farmers can keep the special flavours of some cultivated crops. By intercropping and mixed-cropping, they can protect their soil plots from erosion and diversify their crops for their demands for food and foodstuffs all year along. In addition, fertilizers (both organic and chemical fertilizers) and different kinds of modern medication for plant protection have been gradually applied to agriculture in the Yao communities. These help them to increase the productivity of their crops and protect their crops from damages by harmful pests and insects. However, these modern chemical fertilizers contribute to more rapid soil erosion.

#### *Varied irrigation systems*

Like many other minority uplanders in Vietnam, the Yao's agriculture is mainly rainfed. Water sources for their fields depend mainly on rainwater. Therefore, the local people only grow rice in the rainy season of a year.

To irrigate their fields, the Yao people traditionally construct a primary irrigation system based on their experience accumulated from one generation to another. According to their own regulations, representatives of every household who profit from water are responsible for digging ditches. They trench different fields to catch water from the head of the water source or from the ground water and to drain off water from their fields. To bring water into their fields, in some areas, they use bamboo trees as water pipes. Depending on each terrain of fields, this system is set tortuously around their villages.

The Yao people also make instruments of wood and other raw materials available in the wild to control the water level for their rice fields. They are used as governor valves to keep the water level in their fields not so high as to erode the land and not so low as to stunt their crops. In addition, this helps the fields located at the back of the watershed to have enough water during their season because water normally flows from the fields at the head of the water sources to the fields at the back of these sources.

Currently, besides their traditional irrigation system, they also have modern small-scale irrigation systems in some places where the fields are concentrated. A general guideline of the construction of some parts of the communal infrastructure, including the local irrigation system, is that "*state and people will do it together*". The government provides the people with a fund to buy raw materials and a labour free for the construction. The people carry these materials to places for construction. However, these systems only help them to lead water into the areas near their fields. In order to lead water right into their rice fields, their traditional instruments are indispensable. With this combination, complete irrigation systems for the concentrated fields have been much improved.

In many other fields, farmers use only their traditional irrigation systems because of the partitioned and complicated terrain. In addition, most farmers still use their own

instruments to control the water level in their rice fields. These instruments are made of locally available raw materials, such as wood and different kinds of bamboo. Therefore, the traditional irrigation is still optimal and effective in these areas.

#### ***Division of labour and gender roles in crop diversity conservation***

The division of labour in cultivation among the Red Yao is relatively clear and similar to that many other ethnic groups in Vietnam studied by Linde-Rahr. This division is based on a combination of traditional norms and comparative advantages (Linde-Rahr 2002: 1). In Red Yao communities men are responsible for the heavy work that requires their good health and physical well-being: slashing, burning, clearing, ploughing and raking the land; digging a hole to sow maize seeds; spraying chemical pesticide; building storehouses; producing and repairing tools for production. Women bear the responsibility for clearing the ground, sowing seeds, transplanting rice seedlings into the fields, putting maize seeds into fixed holes dug by their husbands, weeding, clearing pests, harvesting, selecting and keeping varieties for seed. Their keeping of varieties for seed has many similarities to that of many other women in Vietnam and in other countries (Helliwell 1993: 261). This work contributes to preserving agro-biodiversity as one of the main sources for household food security (Shiva 2001: 59). It also reflects their profound knowledge of preservation of seeds and plants, especially of rice. Additionally, they are very knowledgeable about food processing.

Besides the major labour force of the family, additional labour is also involved in production. The old healthy people and the children are responsible for the easy work. They share the work of land clearing, weeding, and picking up of pests with the major labourers of the family.

Nowadays, the Yao's household economy is primarily market-oriented. Some farmers need more labour-force to plant out their rice seedlings and weed their *thảo quả* plots due to their agricultural expansion and lack of labour. The hired people include the Yao and the Hmong from the same commune, Tay and Kinh workers from other areas. The value of their working days is paid in cash or in food, mainly in rice. In this case, the cooperation is seasonal, purposeful and regular.

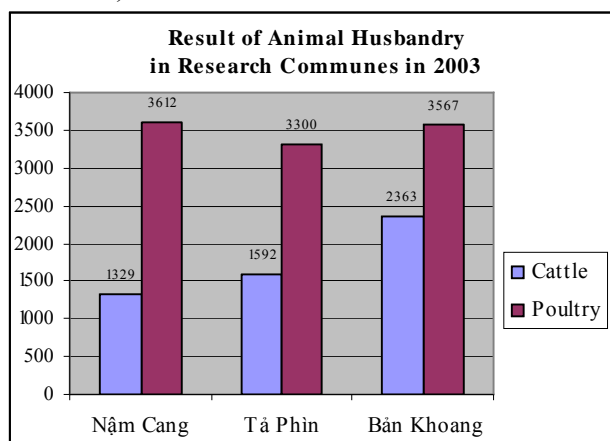
#### **5. LOCAL KNOWLEDGE OF CONSERVATION OF ANIMAL AND AQUATIC VARIETIES**

In the Yao communities, the animal husbandry plays a supplementary role in the development of cultivation, supplying cultivation with a source of muck and dung. Therefore, it contributes to improving land fertility and increasing crop productivity. In this way, the people have more opportunities to achieve good harvests. In this case, successful harvests meet the demands for food of both the people and their domestic animal. Therefore, the animal husbandry and the cultivation in their communities are closely related. This seems to support an assertion by Shiva. According to Shiva, an awareness that the people feed and nourish themselves by nourishing other beings is the basis of the sustainability (Shiva. 1998, 2001: 57-66). Similarly, in farming societies, the raising of animals is considered an adjunct to peasant farming. This situation gradually became common in these societies (Clammer. 1993: 165).

Like cultivation, the development of animal husbandry differs from commune to commune (Figure 4). In the three research communes, Bản Khoang commune ranks first in the development of animal husbandry; the second rank belongs to Nậm Cang commune, then to Tả Phìn commune. Bản Khoang commune is one of the remote areas of Sa Pa district. The people here reside in more dispersed places than those in other communes so that their domestic animals are rarely affected by epidemic diseases. Moreover, in case they fall sick,

they are kept in check isolated from all healthy domestic animals. The diseased and ill animals are moved to the burnt land or kept them in a fixed house, a traditional method of disease prevention of the local people in this commune. A similar situation is the case with the people in Nậm Cang commune. Although the people in this commune live closely together in the valley, many of them raise and keep their domestic animals distant from their own dwellings. Therefore, they remarkably protect their animals from diseases.

Figure 4. Result of animal husbandry in the research communes in 2003  
(Unit: head of animals)



Source: 1) Sa Pa District People's Committee. 2003, *Statistic Yearbook*; 2) Data collected by the author in research communes.

Livestock breeding of the Red Yao people is more expansive than that of the Hmong and of other ethnic minorities in the same commune. For instance, the domestic animals raised by the Yao are regularly more numerous than those raised by the Hmong, except the hybrid cow.

#### *Various domestic animals and aquatic products*

The Yao ethnic group raise both cattle and poultry. Their cattle consists of water buffaloes, cows, pigs, goats, horses, dogs and cats. Their poultry includes chickens, ducks and white-winged ducks. The raising of cattle is much more dominant than that of poultry. However, the number of their animals is different from one commune to another.

In addition, the farmers also practise fish-farming and raise other animals. Fish-farming of the Red Yao has been considered an additional income. This activity has only met their domestic demands. The Yao people raise both local fish and new ones that they buy in the market from the Kinh. The farmers in Tả Phìn commune normally buy the fish from the same ethnic group in Bản Khoang commune. Many households have a long-term tradition of raising fishes in the wet-rice fields. Therefore, the season of raising fish goes together with the wet-rice crops and the fish are normally small. Over the past 10 years, some households in different villages have raised them in small ponds they have dug with an area of 25 m<sup>2</sup> to 150 m<sup>2</sup> near the dwelling-house or in the area of the garden. Particularly, some households in Nậm Cang commune have several small fish and shellfish ponds with an area of 3-200 m<sup>2</sup>. Their fishes include crucian carps, carps and cirrhina molitorella. Usually, when the fish are as big as two fingers, they are gradually harvested. Nowadays, by raising fish in the ponds and feeding them with ground offal rice, they are bigger than before, even with a weight of 0.3-0.4 kg. The local farmers regularly keep the biggest fishes for breeding purposes.

Overall, compared to the past, the domestic animals, especially pigs and chickens, grow more rapidly due to the abundance of food. For example, in the past, farmers had to spend one year to breed a local pig of 8 kg in weight to a weight of 40 kg. Now, they achieve

the same result in 8 months. Similarly, a breeder spent 4 months to raise a newborn chick to reach a weight of 1kg. Now, the breeding time is shortened to just 3 months. In the case of buffaloes and horses, their growing time has not remarkably changed because their main food is the grass. In the past, in the period of October-February, they were hungry due to lack of grass and fodder. Currently, in this period, many people feed them with maize and rice soup.

### *Various modes of breeding*

Their mode of animal breeding is half-domestic and half-free-range. Before 1990, the mode of the free-range was most significant and dominant. In that period, they kept their animals, except the ducks, in the burnt land and they fed these animals every two or three days. In reality, in the past, their chickens mainly grew up wild and lived off the farmyard refuse. The farmers practised their cultivation there in combination with the feeding of the animals. However, their animals still grew up more rapidly than now because they found food for themselves in the forest and around the fields.

In the case of some cattle raised on grass, the people in every village reserve some grazing areas (*ngùng seng* in Yao language) for them. In principle, these areas depend on the total area of each village and there are at least two different grass plots. In the total research areas, the people in Nậm Cang commune reserve the largest grass plots for their cattle. The grass plots for the cattle in Bản Khoang commune rank second in area, and last are the grass plots for the cattle of the people in Tả Phìn commune. Normally, some households share grass plots of about 0.5-1 ha in area. For the larger areas, for example, an area of 2-3 ha is shared by about 30-40 households for their animals. In the case of buffalo breeding, the farmers themselves take turns caring for their animals and for the grass plots. In the case of goats, they only select grass plots with small rock caves for these animals because the goats can seek shelter from the wind and the rain in the caves.

When the grass is eroded, the Yao people move their animal herds to another grass plot, because their herds cannot find food in one location all year around. However, their way of moving the animal herds is different from those of other pastoralists in the world. Because the Yao people are not pastoralists but farmers, they do not move their homes from one grazing area to another, but only move their animal herds according to the season. This situation differs from that of many pastoralists in the world who practice transhumance which is a pastoral way of life in which people move with their herds from one grazing area to another according to the seasons (Hicks and Gwynne 1996: 135).

In many cases, Yao farmers keep some of their cattle, mainly the buffaloes, the horses and the goats in the area of their grass plots. However, in this case, they have to fence these plots with small trees, bamboo trees or with stone. In addition, the people never fence the grass plots for their goats with the stone, but with other materials, as the goats can easily go over stone fences.

Apart from their traditional protection of domestic animals from diseases as mentioned about, since May 2003, the new method of animal raising and protection has been introduced into some villages. Pigs and chickens are injected with particular medicines made by the village veterinarians to prevent them from some common diseases. As a result, they die of diseases more rarely than before. However, the local people irregularly maintain these injections for some animals because of the lack of money to buy medicines. Therefore, in some cases, they only give their animals medicine when these animals catch a disease. As a result, the injection is not very effective.

### ***Different utilizations of domestic animal products***

In the past, the Red Yao people used all domestic animals for their domestic purposes. They used the buffaloes and the horses for transport and pulling forces in cultivation. The other animals, except dogs, provide different kinds of meat for the yearly traditional ritual ceremonies, and nutritious meals for unhealthy persons. Traditionally, the Yao people do not eat horses and dogs, although they are aware that these animals are edible and used as a source of food by other ethnic groups. These avoidances derive from their beliefs and values which they choose to exploit the resources. In other words, their dietary habits are often closely associated with religious beliefs. Apart from transportation purpose, buffaloes are used by the Red Yao farmers as a source of meat for the communal and large feasts.

Some animals are also used for other purposes. It is important that the ducks and the chickens support the people not only as a source of meat but also by providing eggs for the farmers' food and for breeders. Apart from this, domestic animals also supply the farmers with different kinds of dung for cultivation. The Yao people normally fertilize their fields, mainly fields of their staple food crops, with dung from their animals. This also exists in many other farming communities based on non-mechanized agriculture (Hicks and Gwynne 1996: 137-138). In the case of fish-farming, products of this Yao's activity only meet the farmers' demand because of their low quantity and their small scale. This situation is similar to those of some other uplanders in the north of Vietnam.

During the past 10 years, with tourism as one of the main sectors of the regional economy, the farmers' animal husbandry has expanded to meet both their domestic demands and their requirements for additional cash income. The tourists' enjoyment of some local agricultural products, including local domestic animals, creates a great opportunity for the farmers and encourages them to expand their animal husbandry and preserve their local flavourful and valuable varieties.

The Yao sell their domestic animals (such as pigs, chickens, ducks, dogs, etc.) to their neighbours and to the Kinh people. Regularly, they sell them after their traditional New Year, in summer (or in the tourist season) and at Christmas. The money earned is used to buy different new seeds, fertilizers, gasoline, salt, clothes, cloth and other essential items. However, in this case, they still give their priority to the purchase of some important materials for their cultivation. In this way, their cultivation had gradually developed. In general, the animal husbandry of the Red Yao farmers is still a self-sufficient economic activity, but it also has become one of the primarily market-oriented economic activities in some farm households in this region.

### ***Division of labour and gender roles in animal diversity conservation***

Knowledge and experience of breeding animals differs from commune to commune and between genders. In general, the people in the two communes of Nậm Cang and Bản Khoang are more knowledgeable about raising horses and goats than the people in Tả Phìn commune because there are more grass and grazing plots in these two communes. However, the farmers in Tả Phìn commune have more knowledge and experience in raising the new animals, mainly hybrid pigs and chickens as well as cows, than the people in Nậm Cang and Bản Khoang communes because these new races are first introduced into Tả Phìn commune.

In terms of gender, the knowledge and the labour division is also different between men and women. Men are mainly responsible for grazing the cattle, selecting good days for building their animal houses, buying the breeding animals and building their houses. In comparison, women mainly take responsibility for planting and gathering the vegetable plants for their domestic animals, processing food for these animals and feeding them. However, in

recent years, there is a labour exchange between men and women, mainly in the families of young people and of local cadres.

## **6. DIFFERENT BELIEFS AND CEREMONIES RELATING TO AGROBIODIVERSITY CONSERVATION**

The Red Yao people have a long-term hierolatroly of many spirits. According to them, “everything is sacred” and spirits exist everywhere. The Yao adopted Taoism as a religion. It superseded their own earlier tribal religion which centred on three main deities: one in charge of natural waters, mountains, thunder, rain, etc; one in charge of living beings and another in charge of the dead (Pourret 2002: 47).

They classify the spirits into two different kinds: benign and maleficent spirits. The benign spirits regularly support and bless the people. However, it sometimes makes these spirits angry if the people worship them carelessly. In this case, these spirits will do the people harm. The maleficent spirits are considered to damage and harm the people, crops, and animals. The belief in the spirits exists not only in the Yao community in Vietnam, but also in other countries in Asia, such as China, Burma, Thailand, Laos, and Cambodia, etc. It is perceived to be one of the popular religions in Asia conforming closely to Edward Taylor’s original model of animism (1871) (Cited in Tapp 1993: 301).

The relationship between human and plants is demonstrated not only in the techniques of planting crops, but also in the ritual ceremonies regarding cultivation, the reciting of spells and incantation to wish a good harvest. This relationship was very clear in the previous time, when the local people lived mainly on the shifting cultivation. Until now, the people still maintain many taboos and ceremonies relating to production to wish good harvests and good health.

Similar to some cultivated crops, in the case of animal husbandry, there is a spirit who manages and supports the souls of domestic animals. In addition, in some important steps of the livestock breeding, they will receive much support from the animal spirits and achieve an auspicious result if they select a right day for these steps and vice versa. When we look at the Chinese religion, it is important to refer to one of the main structures of this religion, which is a system of geomancy or so-called *feng-shui* practised by the Chinese and some Chinese minorities. This is a system of divination for the location of homes and graves, residences of the living and those of the dead. It is based on a complicated system of correspondences between time and space, the seasons and years, animal categories, colours and directions. Durkheim and Mauss (1970) examined this system as an example of “primitive classification” (Tapp 1993: 295). It is reasonable to link the system of geomancy by the Red Yao people in Vietnam with the *feng-shui* system by the Chinese and Chinese minority people for two reasons.

Firstly, the Red Yao people originate from China, which is referred to in their system of myths. Secondly, the shaman’s fortune-writings are written in Chinese and the Yao shaman prays and recites incantations in local Chinese as well. Thus, it is essential to say that the Red Yao’s system of geomancy originates from the Chinese *feng-shui* system. In addition, it is impossible to separate the Yao’s beliefs in the system of geomancy from their beliefs in supernatural forces. A case of the selection of auspicious days for building chicken coops is an example of this assertion.

It is essential to refer to the role of shamans and village magicians because they are considered able to contact another world and negotiate with supernatural forces, including the spirits (Hanh 2000: 52-74). Pourret also mentions their important role in worship in China, Vietnam, Laos and Thailand (2002: 63). An indispensable thing that a shaman has to do is to

pass the ceremony of “*cấp sắc*”- a social and religious ceremony which determines a very important turning-point in the life of a man. This is also a popular rule and ceremony applied to all Yao men. After passing this ceremony, they are recognized as adults. This is especially important for the shamans. They accumulate a lot of experience not only in the ritual ceremony and in the magic act, but also through the “*cấp sắc*”, they can receive the support, the blessing and the supply of “the force of the other world,” of various spirits to help them to complete their worships successfully. Like the head of the village and the village elders, the shaman’s voice and sayings are very prestigious and influence some of the villagers’ behaviour.

## **7. IMPACTS OF GOVERNMENTAL POLICIES AND CUSTOMARY LAWS ON AGROBIODIVERSITY MANAGEMENT**

Although French colonialists invaded Vietnam in 1859, the French established their control over the northern mountain of this country very late in the colonial era. They achieved relatively full “pacification” of this region only after the turn of the century. However, even before the French conquest the highlands had been in continuous turmoil for several generations, as Vietnamese rebel forces, Chinese armies and paramilitary forces (the infamous “Black Flags” and “Yellow Flags”) and ordinary bandit gangs contested with the colonial forces and each other for control of territory, people and trade, especially that of opium. Lao Cai province, as an important point for cross-border trade with China, was the major base for the Black Flag paramilitary forces of Liu Yung-fu, until they were recalled to China in 1885 (McAleavy 1968, cited in Rambo 1997: 11).

Before the Vietnamese August Revolution, the Yao society was colonial and semi-feudal as was characteristic of Vietnamese society as a whole. The ethnic minorities in northern Vietnam, including the Yao community, were governed by two different social systems. The first was a colonial and semi-feudal relation, which dominated the whole country. The second was an internal relation of each location and each ethnic group depending on their range of social progress (Institute of Ethnology 1978: 46). To better control the ethnic minorities, French governors divided Vietnam into three separate parts: the North, the Middle and the South. Among those, residences of the Yao ethnic group belong to the North. Each section was considered to be a part of Indo-China. In the Yao habitats, there were administrative systems of mandarins, ruling classes, “*lang đao*”, governors and land proprietors. Most of the staff in the French Colonial Office was the upper class of the community, the head of the clan, or the locally prestigious head of the commune (Dang et al. 1971: 180-181).

During this period, most farmland in Vietnam was owned either by French plantation owners or by large Vietnamese landlords: 52% of the land was owned by only 3% of the indigenous population and more than 60% of farmers across the country were landless in the mid-1940s (Quy -Toan and Iyer 2003: 4). The French colonists established their monopoly of natural resource management and of the uplands. They were considered the paramount land proprietors. If the grassroots population wanted to exploit soils for cultivation, they had to beg the land proprietors and give these proprietors aid. The various forms of aid were their heavy burden. The proprietors possessed some forest lands that were rich in precious trees, some rivers that were abundant with fish, and beehives. The proprietors even possessed some forests and land demesne in the name of the whole commune, and then gave them to the new inhabitants in order to make these people dependent on them as “dependent peasants” (Institute of Ethnology 1978: 48).

In addition to the economically hard policies of exploitation, the French colonists paid attention to the implementation of “divide and conquer” in the mountainous areas. However,

the Yao and Hmong shifting cultivators of the higher elevations remained largely outside the reach of the French administration except through its collection of head taxes and enforced purchase of their opium by the colonial monopoly (Rambo 1997: 11). Bonifazi, a French military officer, stated that the multi-ethnic abundance in the Yao habitats made the functions of ruling lieges complicated, but facilitated French domination because it was very hard for these people to cooperate with each other to turn against the French “divide and conquer” dominion (Dang et al. 1971: 182).

Since 1954, after the capitulation of the French colonial army at Dien Bien Phu, the northern provinces of Vietnam have started a new phase of their development. In addition, from this period, the history of Vietnam is punctuated by two other key dates: 1) the so-called Vietnam War against the American Army ended in 1975 with the reunification of the country; 2) since 1986, many incremental economic reforms towards a market-oriented economy, primarily the “Doi Moi” policy of the central government, have been implemented in Vietnam. Since 1954, the government rapidly attempted to introduce many socio-economic changes in the mountainous regions. Although, the war of the Vietnamese against Chinese army occurred in 1979 in some frontier provinces of the Northern Vietnam, including Lao Cai province, the government’s policies continued to be implemented in the mountains to try to achieve their objectives.

#### ***Land reforms and management:***

Land began to be collectivized in the late 1950s. As a result, according to Quy -Toan Do and Lakshmi Iyer (2003), 86% of all peasant households and 68% of total farmland, were brought into cooperatives by 1960, and 90% of all peasant households in the north of Vietnam in the mid-1960s. In this period, while individual rural households were privately allocated 5% of farmland, they derived 60 to 70% of their earnings from this small plot (Quy -Toan and Iyer 2003: 4). In general, this was the difficult period of the agriculture in Vietnam because agricultural output declined significantly. The agricultural co-operatives held back and restricted forces of the peasants in production because they were only interested in the working point; and, therefore, they ignored the quality of production. However, in this period, according to Sikor and Truong, in some areas of the Northern Mountains, the cooperative movement contributed to the intensive farming. The arrangement of cooperatives for working promoted the cooperation in managing water sources and reclaiming wet fields as well as in changing the management of the wet fields in reality (2001: 44).

The economic crisis in the early 1980s led to a major policy reform by the mid-1980s. In the period of 1981-1995, there were many economic reforms, mainly concerning agro-forestry. In 1986, Vietnam struck out in a new direction towards a market economy. Since the late 1980s, this direction has intensified the fact that the household was determined as the basic economic unit. In the case of an agricultural country, this is a very important factor for its development. Agriculture has been decollectivised. According to some researchers, the innovation progress of Vietnam has been a breakthrough made by land reforms, especially manifested themselves by the Land Law in 1988 (the so-called Resolution 10) and Land Law in 1993 (Ungar 1994: 61-72; Donovan et al. 1997). In general, Resolution 10 granted land rights to individual households, while the 1993 Land Law made these rights pledgeable and tradable.

Since 1988, the shift away from cooperatives to decollectivisation has resulted in a marked increase in agricultural production, mostly in rice (Ungar 1994: 61). The new agricultural policy launched in 1988 made the household the key unit of agricultural production. By Resolution 10, the government allocated the wet fields to the farmers from the fields of the former cooperative for their long-term use. According to Esta Ungar (1994), this

resolution called for dismantling the collective system of agriculture which had been the cornerstone of economic policy for the previous thirty years. Through this, the property relations between the agricultural household and the state were changed, giving farmers control over allotted agricultural and forestland for varying periods. It further opened the way for peasants and urban households to receive some forms of title to land-use rights and to habitation sites (ibid. 1994: 67). In the Sa Pa district, Red Yao people were allocated new wet-rice fields from the wet-rice fields of the agricultural cooperatives based on a principle of allocation that each household received an amount of good and bad land which were located distant from and nearby their residences. Therefore, their allocated new land was normally dispersed and quite small-scale. In comparison, their milpas were available and inherited from their parents and the ancestors. In this period, the Yao individual households had rights to use allocated lands and cultivate in these plots. However, they were not allowed to exchange or mortgage them.

In 1993, a new Land Law was issued to make up for the transaction of land in order to promote the farmers to invest and put their efforts for further economic efficiency. According to this law, the government allocates land to organizations, households and individuals for their long-term use. In principle, land is given to households or individuals as users for annual cropping for 20 years and for perennial cropping for 50 years without a fee. The users have rights to exchange, transfer, rent, inherit and mortgage their allocated land. In addition, they are allowed to receive the Land Use Certificates (LUCs). However, there are some limitations of agricultural land use for individual households as users as follows: 1) Agricultural land area for planting annual crops allocated to users in provinces in the Mekong Delta is less than 3ha; and allocated to users in provinces and cities in the central regions is less than 2ha. 2) Agricultural land area for planting perennial crops allocated to users in the delta is less than 10ha; and allocated to users in the midland and in the highland is less than 30ha. 3) The committees of the local governments or the local administration manages bare land, denuded hills, wasteland and coastal land depending on the land-fund of the respective region and the production capacity. 4) The village committees manage public land in the villages. However, this area must be less than 5-percent farmland of that village (*Land Law* 1993).

As a result, the LUCs given to the individual households gradually increase in number. Data obtained from different sources show that there is a difference between the urban and rural households in the granting at LUCs. By the end of 1994, about 24% of households on average in a province had been issued LUCs. In 1997, 44% of land users received LUCs, but the LUCs given to urban households only reached 3%. At the end of 2000, LUCs in the rural areas made up 90% of the land users while the figure was only 16% in urban areas (Quy -Toan and Iyer 2003: 8). In the Red Yao communities in Sa Pa district, the 1993 Land Law had no remarkably strong impact on the land allocation to the local farmers because they still use and manage their land which is allocated by Resolution 10. A remarkable difference is that, by this law, they legally receive the LUCs for their long-term uses based on the quantity of their current land. About more than 70% of the Yao individual households received LUCs in 1997. This figure gradually increases in their communities. In Yao society, most heads of households are men. Therefore, they normally undersign to receive the LUCs for their households. As apposed to the case of some ethnic minorities in the Central Highland of Vietnam whose extensive lands were sold to some Kinh immigrants in the mid- and the end-1990s, the Yao farmers mainly keep their allocated land for their cultivation because of the importance of the land for their food production. A similar situation exists in many Hmong households. As evidence, some Red Yao people have rented some milpas and sloping soils of the Hmong yearly to cultivate because they have had a

shortage of milpas. The payment for their rent is from 200,000VND to 500,000VND/year depending on the quantity of their rented land. However, they cannot persuade the Hmong people to transfer this amount of land to them for their further use. Despite of unremarkable impacts on the Yao households, the 1993 Land Law creates and ensures a more secure feeling of the farmers to continue to invest more capital, labour and intellectuals in production.

In reality, in addition to the land management by the individual households, at the community level, the community still plays a particular role in using and managing the land, mostly the forestland. According to the data obtained from the Bureau of Forest Management, up to June 2001, villages, kinships and social organizations are managing 2,348,295 ha of forest and forestland of the whole country. This area belongs to 1,203 communes or 146 districts of 24 provinces and cities directly under the central government. According to Tuan (2002: 9-10), in the Northeast and Northwest of Vietnam, this kind of forest includes 1,529,961 ha. Forests managed by the communities mostly comprise the poor secondary forests and the forests which are reforested from the farmers' previous milpas. However, according to Phuong (2002: 91), in some areas, some communities are managing medium forests (80-120m<sup>3</sup>) and rich forests (over 120m<sup>3</sup>) (Cited in Tinh 2004: 23-34). In the Red Yao communities, forests managed by their communities normally include sacred and holy forests and secondary forests which are reforested from their previous milpas. In addition, there is a system of customary law referring to different regulations of the community in order to protect these forests for their ritual purpose and for livelihoods. However, the 1993 Land Law did not legalize the land-use right of these communities. Therefore, a new Land Law issued in 2003 is an additional step towards this end.

Compared with previous Land Laws, the most remarkable point of the 2003 Land Law is to refer to the land-use rights of communities and kinships to the land, particularly the agricultural and forestland (belonging to the agricultural land, in the new classification of land by the government (Article 13 and 71 of *Land Law 2003*). Article 9 of this law points out that the community includes the Vietnamese people who live in the same hamlet, in the same lowland village, in the same communal subdivisions, in the same highland village, and in similar residences sharing the same habits and customs or belonging to the same lineage. The government allocates land to all these people or legally recognizes their land-use rights (Land Law 2003, Article 9). The community as the legal land user also receives LUC which is kept by the legal representative of that community. The redistribution of forestland and forest sources in the local communities has not ensured the eradication of poverty, but it has indeed created opportunities for the people to improve their situation.

In the Yao communities, their customary laws still play an important role in the natural resource management, particularly in land and water use. In the past decade, many increasingly conflicts relating to land and water for cultivation have occurred in Yao communities because of their rapid population growth and shortage of these productive materials. To solve these conflicts, their customary laws have played an important role. However, it is found that if the farmers have an increasing shortage of productive materials, it is very hard to prevent them from conflicts concerning them. In this case, their customary law cannot solve these problems completely. Alternatively, the government's law has more advantages.

Apart from some above advantages of the Yao's customary laws, in some cases, their laws are quite complex where the land laws of the central government have been implemented at the local level. In some areas of Red Yao communities, there is a history of land disputes, particularly in the period of implementing "Resolution 10" and the 1993 Land Law. A reason for this is that many households asked for their ancestral land back. According

to their traditional regulations, a farmer who first reclaimed virgin land has rights to use this land forever and nobody offends against this rule. However, this rule is opposite to the government's laws which regularly refer to the land reallocation to the people.

### ***Management of water resources***

Management of water resources is also indispensable because this is the second important productive source for the Red Yao. In combination with governmental campaigns for sedentarization and fixed cultivation, the government has supplied the households who fixed their residences with some constructions to help them with their living and production. These constructions include seven running water systems and three irrigation systems (Sa Pa District People's Committee 2005: 4). Additionally, the central government also issues different regulations for watershed protection in relation with its laws and documents of forest protection and development.

Apart from the government's laws, Yao customary laws still play an essential role in protecting their holy forest and water sources, particularly the watershed. Based on this law, the people are not allowed to make a mess, to graze cattle and to build their houses nearby the watershed. In previous times, their customary law punished an offender. In some cases, depending on the seriousness of his offence, he had to pay a fine, such as paying for a community ceremony. However, nowadays, only a few young people do not observe their laws despite criticism from their co-villagers. This is a problem in some Yao villages when few young people have chances to go out of their communities to earn money from non-farming activities. However, all Yao still observe their rule of protection of the holy forest where they normally organize their community worships. In this case, this means that they can protect their watershed through protection of their holy forests.

In addition, Yao farmers also fix a set of community rules to protect and improve their traditional irrigation system for their long-term use. Based on these rules, those who profited from water sources take turns maintaining their irrigation system periodically by picking up leaves out of their drainage ditches and gutters and dredging their beds. In principle, they do this work whenever the water in their ditches is running slowly or is filled up with leaves. So far, they have strictly observed these rules. This contributes to strengthening the solidarity of the Yao communities and to their awareness of the importance of natural resource management for their cultivation.

### ***Management of crop diversity***

Compared with the land and water, control of crop management by the central government is less of a focus. However, this has some impacts on the increase of high agricultural productivity. In this case, the government has not obliged local farmers to plant the new varieties introduced by some programmes of agricultural extension at the local level. Alternatively, staffs of the local departments of agricultural extension mainly encourage the farmers to apply new varieties, mostly rice and maize, in their cultivation practices.

Particularly, in the case of planting opium poppies, the government required local farmers to give up this crop because of its disadvantage as a drug. Prior to 1994, many Yao and Hmong households grew opium poppies on their high sloping land. However, since 1994, they have stopped growing these plants for two reasons. Firstly, they have recognized its disadvantages as introduced by the local administrators. Secondly, they have completely performed the Decision 24-CP dated on 22/1/1979 and the Instruction 99-CT dated on 8/4/1991 of the government (Cabinet Council 1979: 500-502; Chairman of the Council of Ministers 1991: 761-762). Since that time, all poppy fields have been replaced by fields with food crops (such as maize, potatoes, etc.) and of other plants. In this case, the obligation of

the central government played a dominant role in halting planting of this crop in the mountain areas.

## 8. FOOD SECURITY AS A RESULT OF AGROBIODIVERSITY

The local farmers usually give priority to growing food crops, particularly staple food such as rice and maize. In the past six years, their wet-rice productivity gradually has increased in quantity because the peasants have enlarged the area of their terraced fields and applied the hybrid rice to their cultivation. The total area of the rice terraced fields of the whole district increases, from 1,769ha in 2000 to 2,335ha in 2005. The other grainy cereal crops also increase in output (Figure 5). Therefore, the average cereal output per capita of this district is also increased, from 190.9 kg/person in 2000 to 277.5 kg/person in 2005 (Figure 6). As a result of this cereal growth, many people use rice not only for themselves but also for their domestic animals.

Figure 5. Cereal output of Sa Pa district (Unit: ton)

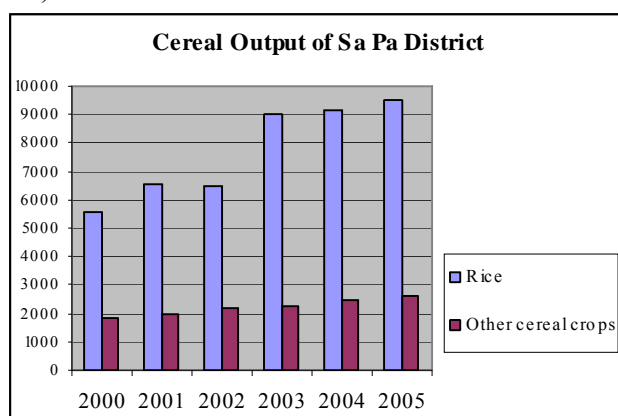
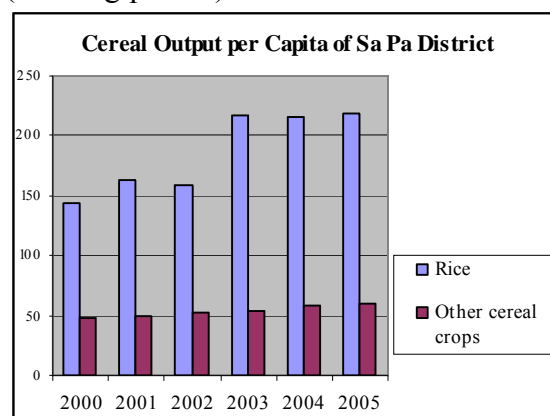


Figure 6. Cereal output per capita of Sa Pa (Unit: kg/person)



Source: Sa Pa District People's Committee 2004. *ibid*.

There has been a real change for the better in the Yao's life since one of their traditional agricultural products, *thảo quả*, a plant that is maintained in semi-cultivated condition in the forest, has achieved a high monetary value. According to On (2003), the output of this plant in the whole Sa Pa district reached 330 tons in 2002. Each household in the Yao communities had an average income of 8,350,000 VND/year from selling this plant. In comparison, each Hmong household earned 8,800,000 VND/year from this source. In both the communities of the Yao and the Hmong, many households earned up to 100 million VND/household/year by selling this plant (Cited in On 2005: 36-37).

However, this income is unstable due to the *thảo quả*'s dependence on the weather and market. In rainy years, especially when it rains in the blossom season of this plant, the rain makes the *thảo quả* blossoms die and then the crop is very poor. In windy years, the wind makes the *thảo quả* blossom dry and then there is a very poor harvest. Additionally, this crop cannot grow in very cold soil plots. Thus, farmers rarely grow it in plots located in the primary forest.

In addition, prices of this crop are also unstable. For example, before 1996 local farmers had to carry products of this crop to the Sa Pa market and then sold them to the Sa Pa General Store. At that time, their prices were very low. Since 1996, private traders have come into Yao communities to buy these products directly at much higher cost than before. However, the prices of this agricultural product still go up and down without a rule. For instance, prices of products of this crop suddenly rose in 2002. This made the traders pay a

certain deposit to local farmers even when the farmers had not yet harvested their crop. In some cases, some traders coaxed the local farmers into selling their young crop to them. However, their prices were still high. At that time, prices of this crop were 140,000 VND/kg of the dry product and 80,000 VND/kg of the fresh product. As a result of this high value, many Yao households had enough money to buy televisions and motorbikes. Particularly, three households in Bản Khoang commune even bought cars by money from selling this product. In the five recent years, the price of the *thảo quả* has stopped going up; it even has gone down. For example, a kilogram of dry *thảo quả* costs 38,000 VND in 2002. In 2003, its price went up; then they were 60,000 VND per kilogram for the dry product and 14,000 VND per kilogram for the fresh product.

Apart from the *thảo quả*, the local farmers can earn money from selling some other agricultural products such as “conioselinum univitatim”, peaches and plums and some indigenous animals. However, these incomes are unremarkable because these plants have limited outputs and are not very marketable.

Overall, environmental and social conditions influence the economic structure of the Red Yao people in different communes. Therefore, poverty differs from commune to commune. Poverty is concentrated in the rural areas and mainly in the communities of the Hmong and of the Xa Pho. In the three research areas, income from tourism is much higher for the Red Yao people in Tả Phìn commune than in the two communes of Bản Khoang and Nậm Càng because the former community has been more strongly influenced by the development of tourism. However, their living standard is still worse than that of the people in the two other research areas because this income is unstable and they have a shortage of cultivated land. In comparison, the Red Yao people in Bản Khoang and Nậm Càng have a more stable income from their development of a farming system and through forestry in which they have more opportunities to conserve their own harvested crop varieties and livestock breeds. Their living standard is thus much higher than that of the Red Yao in Tả Phìn commune.

## 9. CONCLUSION

Despite the difference in income sources, all Red Yao communities live mainly on agroforestry. It is a fact that nowadays, the Yao's agriculture meets not only their domestic demands but also commercial requirements. Some of their traditional valuable agricultural products, particularly *thảo quả* that is normally planted in the forest, have become main sources of cash income for their households. However, the conservation and maintenance of agrobiodiversity differs from community to community. The community with many cultivated land and forest land have kept much more traditional crop varieties than the others with fewer land. As a result of this maintenance, their living standard is improving.

Under the pressures of population growth, increasing shortage of land and environmental degradation, some of the Yao's traditional ways of cultivation are no longer appropriate for the changing environment. In order to meet the increasing demand of food, in addition to traditional varieties, the local farmers have planted some new varieties with higher productivity. This leads to diminished amounts of some local varieties, mainly rice. Although these local varieties have a lower productivity than the new ones, they need less water and fertilizer and adapt well to the high sloping land. In addition, they provide more delicious and flavourful meals for the people. In this case, most threats to traditional agrobiodiversity result from the Yao's activities which, in turn, depend on their social and economic factors.

Knowledge and experience of agricultural practices, including agrobiodiversity conservation, are different from gender to gender, from profession to profession and from

commune to commune. This manifests itself in the labour division in the Yao households and communities. Their division is based on the traditional norms and on the existence of comparative advantages. Normally, men are mainly responsible for the heavy works or for making decisions in their families. Women mainly take responsibility for domestic work, for planting and taking care of the crops and animals, and particularly for selection of crops for seeds. It is found that women play a dominant role in producing and processing food for their households because they spend much more time for their cultivation and they are knowledgeable about keeping crops for seed. Therefore, female farmers should be involved in the projects of conservation of farm genetic resources because they have lots of experience in this sector. In terms of religious aspect, male shamans play an indispensable role in performing ceremonies and acts of worship which are key cultural and religious aspects of their communities.

Each mode of production has its own direct and long-term influence on the possibility of production and of the protection of natural resources and the environment. Therefore, an investment in rehabilitating the forest, managing the land, developing agro-forestry and ecological tourism in these areas is socially, economically and environmentally significant. In the Yao community, on-farm conservation is optimal for a genetic conservation strategy. In this way, farmers have more opportunities to maintain and reserve their own valuable agrobiodiversity leading to sustainable agriculture and then food security at the local level.

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