The utilization to non-timber forest products in Daweishan Nature Reserve

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Background

Daweishan Nature Reserve is a provincial nature reserve in Yunnan. Its establishment was approved by Yunnan Provincial Government in March 20, 1986. The main goals of the tropical forest ecosystem type nature reserve are to protect the tropical mountain evergreen broad-leaved forest, and some rare and endangered animals. Daweishan is located along the border of Pingbian and Hekou counties, between 103°39' - 103°51'E and 22°28' - 22°45'N, near the boundary of China and Vietnam. Its total area is 18365 square meter with about 30 kilometers from south to north, and 6 kilometers from east to west.

This region is the transition area from Tibet Plateau (Qinghai and Tibet Provinces, Hengduai Mountain) towards Yunnan Plateau, finally to Southeast Asia and Southern China. On the other hand, Daweishan is also the double-crossing site between China-Japan and China-Himalayas, which is located in the ancient biological district and North Pole biological district, which leads to a high concentration of flora and fauna. The geographical position of the reserve belongs to Northern tropic of Southeast Asia, which connects with the West part of Guangxi Province and the Southeast part of Yunnan Province. The climate of Daweishan is influenced by Southeast tropical monsoon. Due to the great deal of vapor from Pacific Northern gulf. The conservation area reached high temperatures. Heavy moisture and plenty rainfall. The annual average temperature is between 16°C and 22.6°C and the average precipitation is 1621 to 1777 mm. The relative humidity is up to 85%. This condition is one of the best natural conditions of Yunnan Province. As a result of the high mountains, the lowest part where the Honghe River and Nanxi River converge together is only 76.4 m elevation, which is the lowest point of the whole province. The highest elevation of the nature reserve is the top of the core zone at 2363m. Large differences in elevation cause very clear vertical biological climate regions and diversified habitats. From valleys to high peaks, vegetation types vary from tropical rainforest to wet rainforest, seasonal rainforest, mountane rainforest, southern sub-tropical monsoon evergreen broad-leaf forest, mossy evergreen broad-leaf forest, mountaintop mossy coppice forest, tropical bamboo forest, warm bamboo forest, and warm shrub.

There are 5 towns, 11 administrative villages, and 59 natural villages with a total 12934 population around the reserve. Inside the reserve, there are 3 villages with 113 households and about 600 individuals. The local Miao, Yi and Yao ethnic minorities live in lower elevation mountain. Many villages are located at about 1000 meter elevation. Most people live and work below 1300 meters. According to the 1997 survey, the income of local-people comes mainly from grain production, husbandry, forestry, and other plantation. Approximately 60% of household income is generated from agriculture. The annual average income per capita is 384 Yuan and ranges from 220 to 800 Yuan. The detailed incomes are presented in table 1.

<table>
<thead>
<tr>
<th>Income (Yuan)</th>
<th>The number of households</th>
<th>The number of people</th>
<th>Percentage of the total households</th>
<th>Percentage of the total population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 300</td>
<td>364</td>
<td>1554</td>
<td>21.8%</td>
<td>19.9%</td>
</tr>
<tr>
<td>300 - 400</td>
<td>655</td>
<td>3037</td>
<td>39.2%</td>
<td>39.1%</td>
</tr>
<tr>
<td>400 - 500</td>
<td>522</td>
<td>2580</td>
<td>31.2%</td>
<td>32.8%</td>
</tr>
<tr>
<td>More than 500</td>
<td>1130</td>
<td>1652</td>
<td>17.8%</td>
<td>8.2%</td>
</tr>
</tbody>
</table>

Therefore, many local people in Daweishan still live in poverty. Few villages have 1 - 3 months out of grain.

2. Methodology of the survey
The utilization of non-timber forest products is one key part in the special survey of community forestry in the area around the Daweishan. Through consulting the staff of the reserve and a reconnaissance survey, we investigated the distribution of villages, the component of ethnic minorities, the distance to the reserve, the utilization and management of forest resources and the relationship of the stakeholders. Based on this survey, we selected 110 households belonging to 5 administrative villages and 8 natural villages, of which 3 villages adjacent to the reserve and 1 village in the core area as main targets for further study survey. The major methodologies are Rural Rapid Appraisal (RRA) Field Observation and Secondary Information Collection.

3. Land-use in the area

Based on the results of the survey, there are agriculture lands (including paddy field, non-irrigated farmland, and fallow land), forestry lands (such as natural forest, plantation forest and cash trees) and grazing lands.

3.1 Agricultural lands

3.1.1 Paddy field (rain-fed field)

The result of the survey shows that rice has been commonly cultivated in villages around the reserve. The cultivated area varies from 0.5 to 1.3 mu\(^3\) per capita due to conditions such as land area, geographic position, population density, and water supply. Due to the economic constraints of local farmers, different varieties of rice have been cultivated in the villages. Some farmers with good income cultivate hybrid rice, and also use fertilizers and chemicals. On the other hand, the hybrid and some old varieties are simultaneously cultivated by poor households, but they mainly use farmyard manure. The land of many of the villages located far away from the town that have a cold climate and that are nearby the nature reserve will be fallowed after the yearly rice harvest. However, those villages that have adequate supplies of water, and are closer to the town may plant vegetables to later sell in the market.

3.1.2 Non-irrigated farmland

There are few non-irrigated fields in the area, with an average of 1 mu per capita. In spring, the local old varieties of corn produce between 200 and 250 kg per mu. After harvest, this type of corn land is fallowed. During the next spring, the corn is planted again.

3.1.3 Fallow land

Commonly, this type of land appears in remote villages, which are far from the city or town and have a low average income. The farmers use their own private forest land or slope collective hill as fallow land. In general, according to the fertility of soil, households continue to plant crop on the same land for 2 to 3 years, and then burn for cultivation again after waiting 3 to 5 years. As the fallow time decrease, dm annual yield of crops decreases also. During the full year of planting, the output of corn is harvested 150 to 200 kg per mu, then gradually reduces to 100 kg or less. Sometimes the plantation is bigger dm the harvest.

3.1.4 Vegetable gardens

Around the village or farmers' house, there are lots of vegetable gardens of different sizes. With seasonal changes, the variety of vegetables for cultivation also changes to meet the varied needs of the families. A majority of farmers also plant some scattered cash crops nearby their own house. A lot of farmers who live in the towns of Ajiju and Waga in Pingbian county even plant vegetables on the paddy field and non-irrigated land to sell in the market.

3.2 Forestry lands

According to the methodology of the State Forestry Administration, forestry lands should be divided into forestland, scattered woodland, shrub land, forest suitable land etc. However, due to the characteristics of the community forests around the reserve, the forestry lands are only categorized into collective forest land and private-utilization forestland in terms of forest functions and management ways.

3.2.1 Collective forest land
Collective forest land is mainly owned and managed at the township and cooperative level such as village or subdivided even further. Among the investigated villages, most have collective forestland, while some, such as Adakou's two villages in Pingbian county, have little or no collective forest land because some lands became part of the nature reserve. In the Hekou County, some villages have collective forestland owned by various townships with different areas ranging from several hundreds to more than three thousand mu.

### 3.2.2 Household forest

The villages involved in the survey have some arm of mountain forest allocated as household form, winch is locally called fuel wood forest. After the interviewing the local people, it was discovered that almost all of the household forest had been allocated to farmers from 1983. During that stage, every household could get household forest from one mu to several mu from the local government because of implement the policy of 'Forest Land Ownership Change' which meant allocating hillside to some households and farmers for their private use from the state-owned forest. The area allocated to farmers depended on the population of each family and the number of households in the village. Many new families don't have this type of land. Since the middle of the 1980s, the Chinese fir has been planted on the household forest. At the period of the survey, many forests of Chinese fir have grown into mature forest.

### 3.2.3 Cash tree lands

This type of land is the major source of non-timber forest products (NTFP) These cash sees mainly include Amomum tsao-ko, tea, pineapple, banana, anise, Chinese cassia tree, peach, plum, Chinese chestnut, orange, papaya, and mango etc. The main issues concerning utilization of non-timber forest product are related to these lands.

### 3.3 Grazing land

The main domestic animals raised by local farmers are ox, horse and pig. These livestock are always driven to the wild to search for forage such as grasses, shrubs and some trees. Through the investigation we found that there are not many grazing lands available for herding around the nature reserve. The grazing activities merely occur on the barren hills, new follow land, shrub forest and scattered forestland.

### 4. Utilization of non-timber forest products

#### 4.1 Main non timber forest products in the reserve

##### 4.1.1 Amomum tsao-ko

This is a spice plant with high economic value, and which is suitable for the natural condition of the nature reserve of Daweishan. During 1983 to 1985, local people began to plant it under the encouragement and support of the government of Pingbian County. Each household planted some area from several mu even to 30 - 50 mu. Soon, Amomum tsao-ko had become the main sources of household income. According to the report from local people, the total area of Amomum tsao-ko planted by people within the nature reserve has reached 20000 mus. Actually, after measurements, there were as much as 94200 mu of amomum in Pingbian County.

The annual income per household that some farmers generated from Amomum tsao-ko has reached 10000 Yuan. Since 1997, Pingbian County has taken measures to stop Amomum tsao-ko plantation and management. Hekou County has not taken any measures yet.

##### 4.1.2 Wild bamboo resources

There are many bamboo species in the reserve. The bamboo shoots are available all year around and are crispy and tasty. Some farmers, especially those near cities or township often enter the reserve to collect bamboo shoots for sale and for their own consumption. According to the survey, about 100 tons are sent to the market every year. Sometimes, individual farmers earn 2000 to 3000 Yuan from their annual sales of bamboo shoots.

##### 4.1.3 Edible ferns
A wild fem is a special non-timber forest product. Many different species which are sold at the local market come from this protected area.

4.1.4 Wild mushrooms

During the rainy season some mushrooms are harvested. Farmers used to earn 400 to 500 Yuan per year from collected mushrooms. In 1997 mushrooms gradually decreased in number. Therefore, mushrooms collected from the reserve were only enough for self-consumption.

4.1.5 Fodder resources

Collecting wild fodder such as leaves, flowers and fruits mainly was conducted to raise pigs. Particularly in the dry season, household farmers strongly rely on wild fodder from the forest, such as, wild banana, wild potato, and the leaves of fig, wild sweet potato, the leaves of mulberry, and the stem of wild ginger. On the other hand, ox and goat in the field also graze the wild fodder.

4.1.6 Wild medicinal herbs

More than 400 species of medicinal herbs grow naturally in the reserve. Due to the long-term experience of local farmers, many diseases of the livestock and people have been cured using medicinal herbs.

4.2 Characteristics of NTFP utilization

During the farming-off season (from November to February), most of the labor force goes to the nature reserve to collect NTFPs. The grass and shrubs are cut to plant *Amomum tsao-ko*. When harvesting time comes, the major labor force of all families enter the protected area to harvest. Due to transportation conditions, those villages near cities or towns have more opportunities to sell their products in the market and gain more income. In comparison with the remote villages, the villages around the city rely heavily on the NTFPs of the nature reserve. Due to limitation in transportation and information, many remote villages are restricted in NTFP utilization and development.

According to the gender analysis for utilization of NTFPs, there is no clear work division among men and women. However, men usually do collection and carrying while women also do storage, processing and marketing apart from collection.

4.3 Main issues about NTFP cultivation

4.3.1 Policy

Since 1994, the local government of Pingbian county has issued a ban on planting *Amomum tsao-ko* in the nature reserve due to its influence upon the diversity. The local people could not manage and collect *Amomum tsao-ko* anymore. Therefore the income of village farmers reduced sharply. Some of the main growers have developed negative attitudes and opinions. The local habitants stressed that they live in remote hillside and rely heavily on natural resources. After establishment of the protected area, all activities including fuel wood collecting, grazing and telling have been banned. Now even planting of *Amomum tsao-ko* in their own hill is not allowed. But meanwhile the government still constructs new road in the reserve for tourism.

4.3.2 Technology and financial resources

Adjacent communities around the nature reserve are very poor in education and knowledge. They still use NTFPs in a traditional way and they only practice raw processing. The development is very low. They don't have funds to introduce higher processing technology and equipment. Therefore, NTFP generate little profit, meanwhile the resources are being wasted.

4.3.3 Conflict between conservation and development

On one hand, the goal of the nature reserve is to conserve biodiversity. Frequent activities of the local communities and destructive utilization of NTFPs have great impact on wildlife and plants, vegetation and the ecological environment in the nature reserve. On the other hand, the annual economic value of NTFPs reaches more dm several hundred thousands RMB Yuan. If they are left to decay in the nature reserve, this would mean wasting valuable resources, missing an opportunity for rural economic development.
So, the utilization of NTFPs in Daweishan has met several problems. For example, who has rights to access non-timber forest products? How to collect or plant NTFPs, including when, how many, what method, and where? How to practice sustainable collection and management of NTFPs? How to formulate a series of indicators including ecological, social and economic aspects for different NTFP? What is the carrying capacity of resources?

5. Suggestions and conclusions

NTFPs play an important role in the life of communities adjacent to the nature reserve. Management can not be done with the present policy only. Practical needs of local communities should be considered. Conflict between conservation and utilization should be handled carefully. If proper and scientific solutions can not be found, nature conservation can not be put into practice. In Daweishan, NTFP utilization should be done with the followed consideration:

1. The management and development of NTFPs should get much attention, particular concerning the vulnerable environment, high demand, and over-exploitation. For main NTFPs such as *Amomum tsao-ko*, sustainable use regimes should be drafted. Planting NTFPs in the buffer zone and experimental area of the nature reserve should be allowed, but totally banned from the core zone. For villages with a better income, cultivation activity would only be allowed in the experimental area.

2. The government should encourage local people to introduce high value varieties with less impact on the environment. Government and scientific research institutes should provide funds and technologies. Local communities should contribute labor force to develop other alternative cash fruit trees.

3. To introduce high quality processing technology to avoid the waste of resources in order to improve utilization rate of products.

4. The local communities should be involved in eco-tourism activities, by developing small products to increase income of local people and meanwhile decreasing the pressure on the nature reserve.

Finally, the conservation and development of NTFPs in the nature reserves of Yunnan, where there are more than one hundred protected areas, is imperative especially after the logging ban in natural forests. For the government at different levels, some policies on utilization, processing and marketing could be taken into consideration, to combine the development of NTFPs with poverty alleviation.

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2 one US$ equal about 8.2 RMB Yuan

3 1ha = 15 mu