SETTLEMENT OF NOMADIC DZAO TRIBESMEN AT BAVI NATIONAL PARK, HA NOI

by

Tran Thi Lanh
Institute of Forestry Planning and Inventory, Ministry of Forestry
I. INTRODUCTION

Shifting cultivation and settlement are old-time modes of production and living of the tribesmen still prevailing in some area as a historical heritage. It has a harmful impact on forest and natural resources and on the quality of the environment. The problem is closely related to the hill tribes and to the existence and development of forest resources.

At Bavi National Park-Hanoi, shifting cultivation and nomadic mode of living as practised by the Dzao tribe are a matter of concern for many people (most of them are forest officers, ecologists and environmental activists).

A study of the social and economic aspects involved in the living conditions of the Dzao tribe therein will be of much scientifically and practically interest, because the findings may find larger application at other National Parks to be established.

Success in establishing social forestry in the area for the Dzao tribe will attract more foreign visitors and scientists to come to Vietnam for further studies of the problem.
II. THE STUDY

2.1. Shifting cultivation and settlement and its history (in Vietnam and over the world)

* The state of shifting cultivation and settlement over the world and in Vietnam

There is no consensus on the terminology used, because of various form being used for that practice.

In Africa and Latin America, shifting cultivation and settlement are closely related to wild fires with its severe consequences on desertification.

In Europe (Central Europe, Czechoslovakia, etc) shifting cultivation and nomadic mode of living were related to ambulant singers. In Mongolia and other countries, they are related to a nomadic pastoral way of life.

In Vietnam, shifting cultivation is linked with a method of land farming called "slash-and-burn" method. This practice is well known in South East Asia and Pacific Region, especially in Indonesia, Malaysia, Thailand, the Philippines, ... under the name of swiddening.

In Vietnam, although a permanent cultivation and settlement campaign has been implemented for over 20 years (since 1968) there are nearly 2 million tribesmen who are still practicing shifting cultivation from North to South. The consequences of it
are larger and larger forest are being degraded and destroyed (mainly in the northern provinces, the 4th zone, at Cathoa in the high plateaus it has led to changes in the local climates with more severe drought, flooding and other natural calamities that follow deforestation.

Shifting cultivation are brings immediate consequences to the people who practice it, causing them to move many times in their lifetime and thus leading them to poverty, underdeveloped and uncivilized way of life (not to tell anything about its impacts on forest resources and on deterioration of environment quality).
TABLE 1. Area and people involved in shifting cultivation and settlement over the world and in Vietnam

<table>
<thead>
<tr>
<th>No</th>
<th>Name of region</th>
<th>Area involved (1000 ha)</th>
<th>People involved (million person)</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>World-wide</td>
<td>360,000</td>
<td>250</td>
<td>1974</td>
</tr>
<tr>
<td>2</td>
<td>Southeast Asia and Pacific</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Indonesia</td>
<td>500</td>
<td></td>
<td>1988</td>
</tr>
<tr>
<td></td>
<td>- Thailand</td>
<td>400</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>- Malaysia</td>
<td>230</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>- India</td>
<td>150</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>- Laos</td>
<td>125</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>- Burma</td>
<td>100</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>- Nepal</td>
<td>80</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>- Vietnam</td>
<td>650</td>
<td>2</td>
<td>1988</td>
</tr>
</tbody>
</table>

Campaigns and programmes for fixed cultivation and settlement have been organized in many countries. However, there have been differences in the implementation of these projects and schedules in various countries and regions. Fund might be allocated directly to shifting cultivators and/or to specialized state bodies in charge of the implementation (as is done in Vietnam); only some first results been recorded (table 4).
TABLE 4. People and area involved in shifting cultivation settlement in 1982 and in 1989 (source: UNO)

<table>
<thead>
<tr>
<th>Name of region and country</th>
<th>Area involved (million ha)</th>
<th>People involved (million persons)</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. World-wide</td>
<td>360</td>
<td>250</td>
<td>1974</td>
</tr>
<tr>
<td>2. Southeast Asia and Pacific</td>
<td>120</td>
<td>80</td>
<td>1989</td>
</tr>
<tr>
<td>3. Vietnam</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Shifting cultivation and settlement as practised by Dzao tribe in Vietnam

Chái Duong and Chau Kinh, in the South of China have been the native places of the Dzao tribe. Due to social pressures from the oppression of the Han and Wu, feudal regime, continuous wars, drought, harvest losses, the Dzao tribe (at least a part of it) has left their native places, migrating from East to West and from North to South following various groups and itineraries. A small part of the migrants have come to Vietnam. The migration movement has continued from the Rui-Tang through the Ming-Sing dynasties and down to the beginning of the XX century.

According to the latest statistics, about 400,000 Dzao tribesmen are now living in Vietnam. They are living in mixed group with other uplanders such as: Mios, Thai, Tay, Muong, and with Vietnamese Lowlanders. They live in an extensive area, in
the mountains and along the Chinese and Laotian borders and may come to the Midlands and to the Northern coastal provinces. One may find Dzao tribe in the mountain area (above 1,000 metres above the sea level), in the midlands (600-1,000 metres elevation) and even in flat lands (below 600 m a.s.l).

Following the familial genealogical trees now available (vernacularly named as "gia pha"), the origin of Dzao tribe in Vietnam may be traced back as follows:
TABLE 5. Origin of Dzao tribe in Vietnam

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>KWANG</td>
<td>XVth century</td>
<td>Vinhphu, Hasonbinh, Hoanglienson, Laocai</td>
<td>Tight-trousers and &quot;money&quot;</td>
<td>Dzao</td>
<td></td>
</tr>
<tr>
<td>TONG</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>KWANG</td>
<td>XIIIth century</td>
<td>Langson, Caobang, Thainguyen down to Doanhung then up the Red river to Yenbai</td>
<td>&quot;White-trousers&quot; Dzao Hoers</td>
<td>Dzao</td>
<td></td>
</tr>
<tr>
<td>FOU-CHEN</td>
<td>XVIIth century</td>
<td>Mongcui, Lucngan, down to song Duong, then up to Tuyen quang.</td>
<td>&quot;blue-coat Dzao tien&quot;</td>
<td>Dzao</td>
<td></td>
</tr>
<tr>
<td>KWANG</td>
<td>XVIIIth,</td>
<td>Caobang, Bacthai, Hatuyen south of Thanhhoa</td>
<td>Red Dzao</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TSI</td>
<td>XIXth, XXth century</td>
<td></td>
<td>&quot;Iron furnace&quot;</td>
<td>Dzao</td>
<td></td>
</tr>
<tr>
<td>XIVth, XVth century</td>
<td>Langson, Caobang down to Hoanhbo, Quangninh</td>
<td>Bavi Dzao (white-trousers son and tight-trousers)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Following the data available, there may be something wrong especially in terms of geographical locations.

Due to historical events, the Dzao tribe as a whole has been divided and has migrated from their native places to some other provinces. During their migration, many new sequisitions in terms of culture development and habits and cultures, have dropped some been acquainted with new habits and cultures, have dropped some of their old-time traditions during this process,... Gradually, a new spirit and concepts have gained currency and the Dzao tribe in Vietnam has its own package of habits and traditions well adapted to their new life. However, they keep on using their own language.

Base on their language, the Dzao tribe living in Vietnam can be divided into the following subgroups.

b, Origin of Dzao tribesmen living at Bavi

The history committee of the Bavi district when dealing with the Dzao tribe has not mentioned anything on their origin, and on their native places. However, referring to the migration itineraries as set out in table 5, and based on interviews at the Dzao settlement (interviews with Mr Trieu Tien Hung- head of the cooperative Dzao Bavi), it may be inferred that the Dzao tribe now living at Bavi may come from the sub-groups of "white-trousers Dzao" and "tight-trousers Dzao" migrating from KWANG TSI and KWANG AN (China) and following the itinerary from West Langson-Caobang...
to go to Hoanhbo- Quangninh then trekking to Bavi mountains at the
teginning of XIVth century.

The Dzao tribe now living at Bavi did not come from Tamdao. The main groups found at Bavi are: white-trousers Dzao, tight-
trousers Dzao, Man Nga Hoang, Dzao sondau (table 5)

Some authors are of the opinions that the Dzao tribe now living at Bavi is what is called in Vietnamese Dantrai; (but that vernacular name is only a pejorative appellation and has no historical meaning).

Thus, the Dzao tribe now living at Bavi has its origin from KWANG TSI, KWANG AN (china), having migrated to Vietnam some 600 years ago (in the XIV-XVth centuries).

The Bavi dzao tribe belongs to 6 big families with such surnames as Trieu, Lang, Phung, Duong, Ban, Ly.

The big family having the surname of Trieu has 5 branches quite removed from each other to permit legal marriages between them.

c, History of Dzao tribe settlement of Bavi.

In the 40’s and during the 60’s, Dzao tribe living at Bavi still occupied the high mountains (800-1,000m above sea level). However, its population size remained very low (only 100 persons in all the area). They moved from place to place at the Bavi mountain area. At night they were gathering at a point (at 800m above the sea level) called "goc vai" or the hamlet of tri-tai.
Following the campaign organized in 1959, Dzao tribesmen living at goc vai were going down to the foot of the hills. The process however has lasted 5 years, then up to only 1962, everything seemed to be settled. They went down to work at the foot hills, but still at night they came back to goc vai to relax. Only in 1964, have they fixed up their abode at the foot of the hills (on 70 - 100 m above the sea level). At that time, "goc vai" changed its name into "Anson" to memorize their descent down to lower lands by itself means going down to lower lands.

Sticking to their traditional methods of land farming, and though living in the lowlands, Dzao tribesmen are still practising shifting cultivation, destroying the forests at the elevation of 800-1,000 m above the sea level to carry out their slash-and-burn cultivation method to live on. Till now, half of their incomes has come from resources of swiddeing.

One thing however should be made clear. Due to social pressures from the fewdal authorities of the Han and Wu dynasties in China at their native places, and from natural calamities, severe drought, Dzao tribesmen have pushed to migrate and carry a nomadic way of life. When coming to Bavi, all the flat and fertile lands had been occupied by either the lowlanders of Muong tribe. The only thing available for Dzao tribe was high, unfertile, sloping lands very difficult to farm. Thus, the slash and burn method and the nomadic way of life were the only ways opened to them to earn their living and maintain their culture.
Farming on sloping lands with such primitive implements as the machete and the hoe, and with an underdeveloped technology, Dzao tribesmen have to work very hard to earn something to live on. More and more, they have to clear larger area of forests as their population is growing. The consequences of these are many: deforestation going on thousands of hectares of forests leading to extensive denuded hills area, destruction of hundreds of precious tree species, destruction of habitats of wildlife, some of which are recorded in the Red Data Book.

The mountain area of Bavi (at the beginning of this century) was all covered with forests, which were built up as recreation resorts by the French. By now, forests have been shrunk to the elevation over 800 m above the sea level. Precious wildlife such as tiger, leopard, spotted deer by now have disappeared. This is not to tell any thing on the impacts of wild fires that destroyed and vegetal resources and medicinal plants resourcesm of which it is not possible now to get ever an idea of their wealth, For Bavi National Park to exist and work, the settlement of Dzao tribe therein should be addressed in the most appropriate way, because a new factor is being involved role on the successful establishment of the the Park itself.

3. OVERALL VIEWS ON BAVI NATIONAL PARK AND THE DZAO TRIBESMEN SETTLEMENT THEREIN.

a, Bavi National Park

Bavi is a big mass of mountains (over 1,200 m above sea
Bản đồ quy hoạch vườn quốc gia Ba Vì
(MAP OF BA VĪ NATIONAL PARK)

LEGEND

Province Boundaries
Park Boundaries
Zone Boundaries
Forest Block Boundaries
Integral Protection Zone
Special Use Zone
Buffer Zone

---

Park Office
Zone Office
Forest Block Office
Look-out Station
Scenecies and Recreation Sites
Main Road
Rivers and Lakes
level) located next door to the Delta and surrounded on its northern side by the Da river, on the South by the red river delta, on the West by the mountain area of Hoabinh and on the East by the Red river itself. It has now the status of a National park, thus forming with other 8 national Parks and 87 forest areas a network of what is called the "system of special-used forest" (the terminology used "special-used forests", a Vietnamese equivalent for "reserves", has not received general agreement. Other scientific terms used for 87 forest areas which may be referred as Natural Preservation Area or reserves are loosely connected to the terminology used by IUCN). Following are some features of the Park.

1. Bavi is a beautiful and imposing group of mountains, about 50 km west of Hanoi, at the beginning of this century, the French have it into a health resort.

2. Bavi is a collective name of a triad of mountain summits, the names of which are: King Peak = 1,296 m high, Tan Vien = 1,226 m high, and Ngoc Hoa = 1,120 m high; sceneries therein are very beautiful (with the perfume waterfall, Dachong pine forests and other lakes and springs such as Aovua and Soui Oi...)

3. There are at Bavi two artificial lakes of fresh water for tourism and recreation: they are Soui Hai lake (900 ha) and lake of Dong Mo Ngai Son (1,300 ha). The sceneries therein with mountain peaks, watercourses around are inspiring and attractive to visitors.
4. At Bavi, there still exist some well preserved natural forests (covering about 1,540 ha). Wildlife and vegetal resources are abundant, many of which are mentioned in the animal and botanical archives of Vietnam.

Some of the precious tree species found there are: green cedar Calocedrus macrolepsis, Talauma Gioi, Aglaia gigantia, Phyllostachys spp, Chukrasie tabularis. Wildlife abound therein with: leopard, flying squirrel, civet, pheasant,... especially many species of mountain crabs can be found there.

5. Bavi is well known with its historical vestiges such as the shrines DEN THUONG, DEN TRUNG (at the western Exposure contiguous to the mountain area of Hoabinh), which are closely linked with the folk-tale about Sontinh (the mountain genie), and Thuytinh (the water genie).

6. At Bavi there is a zone called zone 9, in which Late President Ho was living and working in his lifetime, and which is the place where his remains was deposited before their removal to the present mausoleum.

7. At Bavi, there exist more than 200 villas and an access road from the foot of the hills up to the elevation of 400 m a.s.l all these can be restored as they were somewhat destroyed by war.

8. Its network of springs and watercourses is the source of fresh and drinking water supply to seven (7) neighbouring communes and to other villages for daily life consumption and pro-
duction.

9. Bavi is of easy access; from Hanoi one can go straight to the site, up to its foothills.

These features may make Bavi famous and it is worth preserving it (a status of National Park has been in force therein).

b. Dzao tribesmen living at Bavi

b.1. Basic production systems of Dzao tribe at Bavi National Park.

TABLE 7. Land area, population size related to Dzao tribe at Bavi

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-----</td>
<td>------</td>
<td>-----</td>
<td>-----</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>----</td>
</tr>
<tr>
<td>1. The commune</td>
<td>80</td>
<td>1,270</td>
<td>165</td>
<td>350</td>
<td>898</td>
<td>748</td>
<td>15</td>
<td>5ha</td>
<td>2.3</td>
<td>ha</td>
</tr>
<tr>
<td>2. Yenson Coo.</td>
<td>50</td>
<td>603</td>
<td>80</td>
<td>190</td>
<td>457</td>
<td>407</td>
<td>per labourer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Unifield Coo.</td>
<td>30</td>
<td>667</td>
<td>85</td>
<td>160</td>
<td>441</td>
<td>411</td>
<td>household</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: 1. Bavi commune; 2. Area planted with trees (ha); 2. Population size; 3. Number of households; 4. Total land area (ha) 5. Area to be planted with trees (ha); 5. Area occupied by homes; 6. Land area per labourers.
TABLE 8. Yield from basic production systems in household (Yenson Coop, 1988)

<table>
<thead>
<tr>
<th>Crops and activities</th>
<th>Land area and households involved</th>
<th>Yield 100kg/y household</th>
<th>Percentage of household incomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Lowland rice</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- one rice</td>
<td>7.50ha/80houses</td>
<td>1.10</td>
<td>50% of annual household incomes</td>
</tr>
<tr>
<td>- two courses</td>
<td>1 ha/80houses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>per year</td>
<td>6 ha/80houses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Upland rice from</td>
<td>3.6ha/household</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>&quot;slash-and-burn&quot; cultivation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Dry land farming</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- cassava</td>
<td>0.72ha/household</td>
<td>2</td>
<td>30% of household incomes</td>
</tr>
<tr>
<td>- tea</td>
<td>0.36ha/household</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- puloes, groundnut corn</td>
<td>not available</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Animal husbandry</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- buffalo and or cow</td>
<td>1 head/household</td>
<td></td>
<td>Mainly for the observanuy of ritual ceremonies not for market</td>
</tr>
<tr>
<td>- swine and pig</td>
<td>3 head/household</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- poultry</td>
<td>30-4/household</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Fish farming pond</td>
<td>20 ponds for 80 household</td>
<td></td>
<td>to meet household need in fish</td>
</tr>
</tbody>
</table>

15
6. Medicinal plants

cinnamon bark

10 ha for 80 household young plantations
only, not yet producing cinnamon bark

7. Others medicinal plants collected from forests

each household revenues from drug
has account specialty plant collection 7%
collecting drug hold incomes
plants for:
tonic + rheumations,
digestive + headache
antimalarial + wound cure. Anthelmintic purpose.

Population size in 1930: 100 persons
of the commune in 1985: 1,103 persons
in 1989: 1,270 persons.

From the above, it is clear that:
+ The cropping of upland rice produced with primitive implements such as machetes and hoes and the method of "slash-and-burn" remains one of the basic production system, yielding 500 kg of rice/year with on the average 3.6 ha of forest land being cleared by each household.

- This is our main subject under study
For Bavi National Park, it is the root cause, producing the following consequences which impede its existence:

+ Forest land area shrinking at an alarming rate; precious trees species such as green cefar, Bhyllostachys, Chukrasiatabuloris,.. will be extinct.

+ Habitats for precious wildlife such as tiger, leopand, spotted deer,.. being destroyed.

+ Depletion of medicinal plants resources

+ Severe soil degradation and erosion on the sloping lands of Bavi.

+ Depletion of fresh water resources in spring and water courses of the area...

+ Finally, decrease of soil quality, with soil productivity becoming lesser and lesser (especially the yields from shifting cultivation... become beer.

Up land rice yield (date collected in 1985)

First year: 200-300 kg / ha

Second year: 100-180 kg / ha

Third year: 80-120 kg / ha

The soil productivity is too low and is decreasing with every year, and coming to only one-third (in the third year) as compared to that of the first year.

Soil degradation, low productivity are factors that have forced Dzao tribesmen to move to other places and practise their "slash-and-burn" cultivation, then to return to the same piece
of land for farming. Then the soil productivity for the next rotation after 3-4 year of fallow will be not the same.

Soil productivity (in terms of upland rice) on forest fallows at the 2nd rotation (data collected in 1989)

First year: 140-200 kg / ha
Second year: 80-120 kg / ha
Third year: 50-100 kg / ha

Compared to the average yield of upland rice nation-wide (source: Le Van Khoa)

1st year: 300-800 kg / ha
2nd year: 200-500 kg / ha
3rd year: 100-200 kg / ha

It can be said that the yield of upland rice cultivated by Dzao tribesmen at Bavi area is too low.

Parallel with this alarming situation, many other questions may arise.

Question 1. If the shifting cultivation does not come to an end, whether at the 5th and 6th rotation and towards the year 2000, shall the Bavi area be covered with tree vegetation or not?

Question 2. How shall be the living conditions of the rural population therein?

Question 3. Shall the resources of wildlife, vegetation Kingdom and medicinal plants still exist or be entirely swept away?

Question 4. What will happen to such scencries and landscapes
Fig. 2. Developed Home Garden

Bamboos + Phyllostachys + Rattan

Jackfruit + Tea
Tungoil tree + Tea
Canarium + Tea

+ Tephrosia candida
(Cover crops)

Cassava or Tea

Melia azedarach + Pine
Apple

Jackfruit + Tea

Cinnamon + Ginger
Pine + Apple

Orange + pomelo + lemon
+ papaya

Cinnamon + Ginger

Pine + Apple

Spring
such as: perfume waterfall, the pine forest of Dachong, the Aovua lake, the spring of suoi Oi,... and shall they be able to attract tourists and visitors as they do it today?

**Question 5.** Finally, it is doubtful that the National Park of Bavi as it will be, will be of any interest as a National Park or it will be only a name.

These questions may be posed to any specialists and agencies concerned with the natural resources of environment and the quality of life, and they all require urgent actions, especially in the Bavi area. It is necessary to grasp the situation therein especially that related to the natural, economic and social conditions and the aspirations and wishes of Dzao tribesmen living in the buffer zone of Bavi National Park, as well as the natural laws regulating the rehabilitation of the vegetation cover and the environment. With these in mind, one has to deal first with the production of food, feed and fuelwood.

A second basic production system prevailing there is the home garden. The home garden economy although ancillary under the present setting among Dzao tribe account for almost 43% of their household income.

Observation in the area have revealed that many forms of home-gardeners have been established by Dzao tribesmen.

1. **Undeveloped gardens**

They are a mixture more or less complex of fruit trees
intercropped with forest trees, cinnamon, cassava, ginger, green vegetables, as well as with chrysanthemum, morning-glory. (it is worth mentioning here that Dzao tribesmen like flowers).

2. **SUnderdeveloped gardens** Some what better developed with:
   - Bamboos and Phyllostachys planted around the gardens
   - Parcels of land in the middle planted with jack fruit tree, banana, papaya + ginger + cinnamon
   - Parcels planted with cassava for food production
   - Parcels planted with teas as cash crop.

3. **Developed gardens**
   There are only 3 ha of "developed home gardens" established in the area meant for the Dzao tribe settlement (at Ao Vua). There is intensive cultivation of cash crops and medicinal plants:
   - Cinnamon + ginger + Pine apple + tea
   - Forest trees + jack fruit trees + Canarium + banana

4. **Tree nursery established for the whole community covering 0.33 ha with 10,000 cinnamon and eucalyptus seedlings.**

An interview with Mr. Trieu Tien Hung made it clear that home gardens are only contributing to improve household diets. The main income is coming from tea production (15 p.c.t of household income during the year).

+ Animal husbandry and fish farming are not yet developed. Only 20 fish farming ponds are found in the cooperative. Every
household practises pig reasing, poultry raising but the produces are meant for the observancy of ritual ceremonies of the community and ancestor altar cleaning office. On the day of observancy, all people have to kill pigs to celibrate it. On the altar cleaning office, buffalos should be killed.

Home garden economy is the second research I tem I want to dig in (after the subject matter on shifting cultivation).

Through observations made in the home gardens at Vinh Phu, High plateaus, Daclac and following today state of knowledge. I am of the opinion that:

Under the present setting at Bavi, and for impoving the living conditions of Dzao tribesmen.

Investment to develop home garden economy will be the key to find outlets of the present restraints, for removing the vicious curcle in which Dzao tribesmen have been involved for years (of course, incentive policies from the State are needed to support the production of food and feed by the tribe involved)

The reasons for this are many, some of these follow:

First, by now and as shown in table 8 the home garden plays a very important in the household economy, contributing almost onehalf of the total income to the tribesmen households (not less than 43%).

Second, Dzao tribesmen are hardworking people, very much acquainted with the living conditions in mountein areas (espe-
dreds of years.

Third, their experiences in tree plantation, cultivation of medicinal plants (such as cinnamon, ginger, ...) make them fit for a new reorientation in developing home gardens.

Fourth, accessibility plays a very important role in business; proximity to big markets may improve very soon the trading of produces.

Fifth, the location of Bavi next door to Hanoi. If the home garden economy is developed at Bavi, the produces such as fruits, fish, chicken, green vegetables, fresh tea and even flowers and medicinal plants and herbs may provide not only to the inhabitants therein better conditions for their diets but also to visitors and tourists many other useful services.

Should the home garden economy be developed as planned, a system of social forestry will be established in the area for both environment protection and in-place production of food, feed and fuelwood.

Another interesting issue is that home garden is closely related to forest plantation and forestry, which is the "right-hand-occupation" of Dzao tribesmen. But one question may be asked why so far they did not succeed in tree planting successful plantation established by Dzao tribesmen (1985-1989).

<table>
<thead>
<tr>
<th>Species involved</th>
<th>Area planted (ha)</th>
<th>Established plantations (ha)</th>
<th>Unsuccessful plantations (ha)</th>
<th>Rate of success (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pines</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eucalyptus</td>
<td>80</td>
<td>20</td>
<td>60</td>
<td>33</td>
</tr>
<tr>
<td>Acacia auriculi-formis</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The rate of success in forest plantation as reported above for the period 1985-1989 is very low (only 33%), while the tree species used are quite resistant to drought.

We have found that the main causes for this are: the Dzao tribesmen did not know how to maintain and protect these plantations after their establishment, or they did not want to do so as land had been allotted to the cooperative as a whole.

Dzao tribesmen are hardworking and paintaking people. When knowing that land being allotted to the people, the whole village has hit their traditional gongs and participated in forest establishment on allocated land as they wished to get some personal benefits from the lands (as set out by district fixed settlement committee in its incentive policies).

As it is, the policy on forests and forest lands allotment has a positive impact on the Dzao tribe at Bavi. But what they are needing more is investment in terms of technologies and
financial assistance from the government and international agencies... to be able to fix up their abode and contribute to forest protection the failures they have recorded in their first steps in forest plantation are only one thing, the other thing is their willingness to receive the lands, to accept new technologies and learn.

During an interview, I come to know that the aspirations of the Dzao tribesmen is to send their children to a forestry school to learn the technique then to disseminate it among their own community.

By now economic policies and incentives to raise the educational and cultural standards of the Dzao tribe remain inadequate.

- With a population size of nearly 1,279 persons, there is only a poor and small school at the site with only 200 children going to school.

- Within the community, there are no graduated professionals.

- For decades, there are only 4 children (in 1987) and 2 children (in 1988) attending secondary schools.

These facts are evidences that the Dzao tribe living next door to the Bavi National Prk needs urgent assistance and support. Coming very late in Vietnam, they are very much attached to this country and become parts of its population stock but living in the most remote areas of the city.
One of the potential of the Dzao tribesmen, not much observed in other tribes, is their knowledge in drug plants, and they are continuously developing it through continuous contact with natural resources. Old people and even children in the village can tell the differences between various medicinal herbs. This knowledge is not available among the lowlanders that pretend to be more advanced. Based on their own knowledge, Dzao tribesmen can cure various diseases among themselves and make some trading on the drug plants they get from the forest. Working together with Dzao tribesmen may create better opportunities to develop our knowledge on medicinal plants and to propagate precious species for the production of same in the lowlands.

This may also help us to create better opportunities for food supply to Dzao tribesmen.

C. From the above, it is found that the Dzao tribesmen may play a very important role in the protection and rehabilitation of forest resources, in the development of tourism facilities and services at the Bavi National Park; helping the Dzao tribesmen in this role is of high significance.

4. *Measures to overcome the situation*

For the Bavi National Park to exist and work, the Dzao tribe therein must be settled. The strategies deployed will be to use the human resources available therein to carry out forest resources protection and rehabilitation. They will include:
a). A development plan for the co-operative in the long as well in the short-terms, based on a comprehensive assessment of natural, human and social conditions and resources; especially a rational land use planning is urgently needed.

b). The co-operative development plan should form part of the working plan of the National Park; these plans should not be dealt with separatively. Part of the investment for the park should be reserved for economic development of the co-operative. Thus the effectiveness of our measures will be ensured and be actively increased.

c). For immediate actions, it is necessary to base on the most efficient practises now available, and within the present context it is vital to extend financial assistances to carry out.

+ Establishment of forest stands intercropped with plants to produce special (non-wood) forest products (e.g. to produce cinnamon bark, tung-oil, ...).

It is possible to extend loans with low rate of interest (even grants) to the villagers for them seeds, seedlings, and plantation techniques (services from technicians are needed first).

+ Home garden economy

Plans to be elaborated for the establishment of home gardens which can provide produces and services to tourists and visitors from other provinces and/or countries.
- Plans to improve land use
- Cropping patterns designed to suit to physical and economic
- Home gardens to support villagers' living conditions and meet the market demands within the park (and without it if possible).

Home garden economy plays a very important role in the Dzao tribe (see above). Fruit trees and plants such as jackfruit, banana, guava, pineapple, papaya ... may produce natural bounties (even not processed) that are attractive to tourists and visitors due to their flavour and freshness.

In fact, investment to set up home garden economy has been proved to be very effective elsewhere (in the High Plateaus, in Daclac as well as in Vinh Phu ...) SIDA organization of Sweden eagerly recommended this form of land farming in its Forest-Tree-and-people (F.T.P.) project.

It is advisable to carry out research for the application and extension of the following model.

Farming model to be established on 1 hectare of land:
- Around the garden: planted with bamboos, *Phyllostachys* and rattan;
- Upper slope: divided into 2 parcels:
  - Planted with: + jackfruit + tea + *T. candida* or + Tungoil tree + tea + ginger or + Canarium + tea + pine apple
In between the two parcels: rows of jack fruit trees or Canarium.

- Middle of the slope: planted with cinnamon + ginger + pine apple, and housing facilities.

The upper slope down to its middle is to be planted with pine apple and T. candida to prevent soil erosion. At the middle of the slope, the following arrangement can be designed.

At the two sides: planted with cinnamon + ginger + pine apple.

In the middle: housing facilities.

A pond system is arranged next to the house following the slope, rows of T. candida and pine apple are planted at the upper margin of the pond to prevent soil erosion.

- Lower slope: rice fields

An idea of these is shown in fig.2

On the field survey may provide opportunities to improve this theoretical model to make it more appropriate to local conditions.

The system as proposed will take advantage of the cycling of nutrients and the natural flow of energy within it, it may be named as a "forest VAC" system applied to upland conditions.

(VAC is a Vietnamese abbreviation which stands for an integrated system of garden, pond and animal rearing; V: stands for garden, A: for pond, and C: for animal rearing).
Collection, plantation and preparation of medicinal herbs

As mentioned earlier, Dzao tribesmen have good experiences in the collection and preparation of medicinal herbs. At least 20% of households therein have good receipts to cure tropical diseases, and their incomes are quite high comparatively.

So it is necessary to have better instruction for the collection of medicinal plants within the Bavi National Park to maintain, these resources therein. Otherwise they will be lost for good. At the same time, investment should be made to cultivate these plants for markets, and at the same time to introduce wild plant species now thriving under forest cover into regular production.

d. To bring all these measures into practice, the most important item of research is to find out the best ways to apply policies on land and tree Tenure, on the rights to hand down the fruit of the beneficiaries work to their children. Based on what is set out in the policy on forest and forest land allotment, on defined rights on land tenure, the recommended regulations will attract more people into the work of building up the cooperative and the national Park as well, with better and more active participation of the people, using all the human and physical resources available therein (including the people own funds) to address the problem of food, feed, and fuelwood production.

5. Follow up research programme
As understood and within the framework of this training course, it is advisable to have a further in-depth research supported by international assistance to deal with the following:

a. Land survey and elaboration of a land use plan for Dzao tribesmen following various steps:
   - Land survey, soil mapping (scale 1/5000) using an multidisciplinary approach for assessment and classification.
   - Assessment of the impacts of the existing production systems on physical and economic conditions.

b. Development of an ecological farming model (integrating agriculture, forestry, fish farming and cattle grazing).
   - Investigation and summing up of popular experiences.
   - Selection of some representative models
   - Establishment of recommended farming models.

Five households will be selected (2 well off households, 2 poor households, and 1 household with average income) with 10 adult labourers in these households practising land farming following the recommended models on 5 ha at the new economic area meant for the settlement of Dzao tribe at Ao Vua.

By now, there are some models of land farming producing forest and special forest products (timber + cinnamon bark + ginger) and pine apple established by Trieu Tien Hung. The cinnamon trees (2,000 saplings) are growing well there, being now 2 year old).
The work will be designed as follows:
- One ha of forest land will be allotted to each household
- Investment to supply seeds, seedlings and technical assistance from the project (estimated cost for each ha: USD 500 or dongs: 2,000,000/ha)

- Planting operations carried out by beneficiaries.
- Protection and maintenance by the beneficiaries through contracts
- Tree tenure by the beneficiaries.

The advantages of the modus operandi are many:
First: villagers' households have access to land (they are better motivated to farm the land as they like).
Second: Each household is held responsible for carrying out land farming activities on the land allotted with however support from the project under the forms of seeds, seedlings, technical assistance which can be considered as government investment.
Third: The household being the direct recipient of all benefits gained (not depending on anyone).
Fourth: Final outputs are closely to the labour inputs made by beneficiaries.

Experiences are available to show that forest land and forest allotment to the cooperative is not effective (only 33% : see success in forest plantations establishment by Dzao tribesmen, 1985-1989).

C. Research on social and economic structures of Dzao tribesmen now living in Yenson cooperative.

Emphasis will be laid down upon the social and economic
structures and conditions that may have their impacts on the protection and maintenance of the forest resources, on the people's participation for resource development, and for environment preservation at Bavi National Park.

6. Environmental impact assessment

As mentioned earlier, in a preliminary study I have compared the effects of two alternative measures:

1. Allotment of forests and forest lands to households.
2. Allotment of forests and forest lands to the cooperative as a whole.

The results showed that the first alternative is more effective.

In the research to be done later following the implementation of this follow-up project, two other alternatives shall be compared using, the environment matrix (table 11,12)

First alternative: stabilizing the local rural population for the protection and regeneration of forests.

Second alternative: removal of the local rural population now living in the National Park to another area.
TABLE 11. Environmental impacts assessment (E.I.A) based on environment matrix.

(First alternative: Stabilizing the local rural population for the protection and regeneration of forests).

<table>
<thead>
<tr>
<th>Impacts on</th>
<th>Human activities and their impacts on environment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Production restructuring</td>
</tr>
<tr>
<td>1. Physical conditions</td>
<td></td>
</tr>
<tr>
<td>i. Geology-soil</td>
<td>++</td>
</tr>
<tr>
<td>ii. Animal resources</td>
<td>++</td>
</tr>
<tr>
<td>iii. Vegetation resources</td>
<td>++</td>
</tr>
<tr>
<td>2. Social conditions</td>
<td></td>
</tr>
<tr>
<td>i. Health-psychology</td>
<td>++</td>
</tr>
<tr>
<td>ii. Customs and habits</td>
<td>++</td>
</tr>
<tr>
<td>iii. Social infrastructure</td>
<td>++</td>
</tr>
</tbody>
</table>

Schools, dispensaries

3. Landscapes

|                | Productions restructuring | Establishment of home gardens | Motivation | Elaboration of incentive policies |
|----------------|---------------------------|-----------------------------|------------|
| i. Sceneries   | ++ | ++ | NK | NK |
| ii. Tourism    | ++ | ++ | NK | NK |

Notes: ++ very positive; + positive; NK not known.
TABLE 12. Environmental impacts assessment (E.I.A) based on environment matrix

(second alternative: removal of the local rural population now living in the National Park to another place)

<table>
<thead>
<tr>
<th>Impacts on Human activities and their impacts on environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disloging</td>
</tr>
<tr>
<td>1. Physical conditions</td>
</tr>
<tr>
<td>i. Geology-soil</td>
</tr>
<tr>
<td>ii. Animal resources</td>
</tr>
<tr>
<td>iii. Vegetation resources</td>
</tr>
<tr>
<td>2. Social conditions</td>
</tr>
<tr>
<td>i. Psychology-Health</td>
</tr>
<tr>
<td>ii. Customs and habits</td>
</tr>
<tr>
<td>iii. Schools, dispensaries</td>
</tr>
<tr>
<td>3. Landscapes and sceneries</td>
</tr>
</tbody>
</table>

Notes: NK not known; - negative; -- very negative.

It is too early to have a definitive assessment on the two proposed alternatives; but some first contacts with the Dzao tribesmen have allowed us to advance the following anticipations.

The removal of the local rural population now living in the National Park may remove pressure on forests in the short term. But in the long term, the results may be: doubtful because:

- Dzao tribesmen have their cradle in the forests, they used...
to farm forests and forest lands to support their subsistence life.

- They may be incited to exploit forest and wildlife resources by richer lowlanders and even citymen living in Hanoi, that may find big profits in the trading of wood and wildlife products.

- The stress caused by dislodging, trekking and resettlement on the Dzao community as a whole will be so strong that it might have negative impacts on the natural and what is more important on human resources.

The first alternative-stabilizing the local rural population for the protection and regeneration of forests through production systems improvement and establishment of home garden may be slow to produce its positive impacts on forest resources development; but in any case it is more rational and sounder ecologically and socially.
III. CONCLUSION

The problem of shifting cultivation and settlement as now practised in developing countries is quite difficult to solve, because as a rule minority people and uplanders with their increasing population growth are involved in it for food production to support their subsistence life.

To deal with this, it is necessary:
1. To pay more attention and concern to the establishment of social forestry in the area they are living.
2. To strengthen the cooperation between two disciplines: forestry and tribal research and study.
3. To elaborate better policies for economic and educational development of the tribesmen, especially the Dzao tribesmen living in the Bavi area.
4. To add a new dimension in various forest projects: that of living conditions of the uplanders and minority people.
5. To develop the strengths of the uplanders (especially of the tribesmen) in their work and activities for the protection and development of forest resources...

Thus, the problem of forest and environment protection and conservation is closely related to others which are briefly described above.

It is hoped that comments from other scientists especially from my professors may help me to improve the contents and presentation of this document.
IV. INPUT FOR FOLLOW-UP RESEARCH PROGRAMME

The information so far collected may serve as a baseline for and provide a re-orientation in a further research item as proposed earlier. Assistance from various agencies—within and without the country—in charge of natural resources and environment protection is sought.

The cost for the study is estimated at about: dong: 20 million or USD: 5,000, the details of which follow:

- Cost for field survey and investigations (including social surveys): salaries, travel allowances, field visits, data collection: 1,500 USD.

- Cost for reporting (data processing, analysis, summing up reports and recommendations: 1,000 USD.

- Cost for farming model establishment (5 ha: with the labour inputs from the households and assistance from the project. These models will serve as demonstration sites, presenting a "basket of choices" to the tribesmen...): 2,500 USD

TOTAL: 5,000 USD.
REFERENCES

In foreign languages

1. Tribesmen problems in today tropical Africa. ISMOCILOVE, PN
2. Composition of tribes—their history, repartition and settlement (UNESCO).
3. Living and cultural conditions improvement in Peniur tribe (MONOGALOVE, LF)
4. Unjust societies (TARONILA.E)
5. Tribesmen and their territory (KOZLOVE.V.I)
6. African tribes (AZXIKI)
7. Socio-economic composition and traditions of tribesmen in agricultural ethnography (CHESNOV.JAV)

In Vietnamese languages

8. Some models for fixed cultivation and settlement (Ethnography Institute).
9. Seminar on fixed cultivation and settlement (forest technology science and economy Information Centre Ministry of Forests).
10. Experiences on how to organise labour force from shifting cultivators (Giang A Tang).
11. Shifting cultivation in mountain area and its relationship with the campaign for fixed cultivation and settlement (Nguyen Anh Ngoc)
12. Tribesmen problem and their leaders in activities for fixed cultivation and settlement (Hoang Viet).
13. Experiences gained in Nghe Tinh in the campaign for fixed cultivation and settlement (Dang Duc Khu).

14. Basic problems in the campaign for fixed cultivation and settlement in mountain areas of Vietnam (Pham Van Vang).

15. First successes recorded in the campaign for fixed cultivation and settlement in Caobang (Hoang Hong Cao).

16. First results in the campaign for fixed cultivation and settlement in Daclac.
THE CONTINUING PROBLEM OF
SHIFTING CULTIVATION IN THE PHILIPPINES

by

Virginia Cuevas
Assistant Professor
IBS and IESAM, CAS, UPLP,
College, Laguna
THE CONTINUING PROBLEM OF SHIFTING CULTIVATION IN THE PHILIPPINES
A Human Ecology Analysis*

VIRGINIA C. CUEVAS, Asst. Prof., IBS and IESAM, CAS, UPLB,
College, Laguna, Philippines

INTRODUCTION

Shifting cultivation, which is known by a variety of names, is a system of upland farming that has been practiced in the Philippines for several centuries. No one knows exactly how and when it first started. The first written description of cultivation of this type was recorded by a Spanish friar in 1640 (Bennagen 1983). Colonial rulers of the country came and went, post-Philippine independence government changed. Shifting cultivation was banned in the late 19th century by the Spanish rulers, by the American masters in the early 20th century and by the different administrations from 1946 to the 1960's. Numerous policies and programs were promulgated from 1965 to the present to contain or improve on it (Aquino, et al. 1987). But the system has persisted. Shifting cultivation has been described as a way of life (Bennagen 1978; Maturan 1976). At present, it is perhaps the only way of life for the 17 million Filipinos living in 55% of the total land area of the Philippines.

This paper is essentially a literature review of this system of farming as it is practiced in the Philippines. It tries to present the various ways the cultural minorities practice it, how the lowlanders who migrated to the uplands adopted it, and the transformation of the system as it is integrated into the cash economy of urban centers. The effects of this system of farming on the environment is also

*Paper written while at the Workshop on Rural Systems Sustainability - sponsored by SUAN and EAPI, East-West Center, Honolulu, Hawaii, Jan. 10 - April 6, 1990.
considered. The different policies and programs of the government regarding this system of farming are summarized from the working paper by Aquino et al. 1987. Information on population dynamics in the uplands is derived from the research results of M.C. Cruz 1986a. Using the human ecology perspective, this paper tries to elucidate the many reasons why this system of farming has persisted despite efforts to ban it. My goal is to make a positive contribution to the study of the problem of shifting cultivation in the Philippines in the context of the present sociopolitical and economic difficulties of the country.

The present literature review will concentrate on reports and published papers from 1980 to 1990. In this sense, this review supplements and updates an earlier review of the literature of shifting cultivation by Dr. Bennagen, an anthropologist (1983). His review covered books, monographs, M.A. and Ph. D. dissertations, research journals, research reports and published official reports from 1904 to 1980.

A comprehensive analysis of the ethnographic contributions to upland development is presented by Russell (1986). This article deals with the study of the cultural minorities who largely engage in shifting cultivation. The anthropological perspectives of Russell show clearly how the tribal people are affected by and the variety of responses they have to the dynamic forces of the present socioeconomic conditions of the country. No similar analysis of the lowland migrants to the uplands has been done. This paper will then try to study the lowland migrants and the factors that lead them to practice their present kaingin system.
HUMAN ECOLOGY PERSPECTIVE

Marten and Saltman (1986, p.20) have defined human ecology in agroecosystems as an approach that looks at the whole agricultural system - agricultural fields and the people who farm them. Rambo (1984) compares the agricultural farm and the farmers to two tennis balls mutually interacting and affecting each other. Agricultural fields are agroecosystems whose functions (production of necessary outputs, i.e. yields of crops or heads of animals) are results of the interactions of the physical (soil, water, climate) and the biological (plants, animals, microorganisms) components of the environment. One has to analyze the various ecological processes, i.e. manufacture of food by plants, herbivory of animals, decay of remains of plants and animals, that take place in the farm in order to comprehend the variety of responses that result from the interactions of the physical and biological components.

Furthermore, these interactions are affected by the cultivation practices of the farmers. The farmers who manage the farm operate according to different rules and processes; their actions and management decisions are determined by the various economic, social and political factors and not just the biological and physical factors. Thus, it is essential to learn how the market, new technologies, extension activities of government agencies and private companies supplying agricultural inputs, population pressures, and other such factors affect the farmers' cropping patterns and cultivation practices. Conceptually, we designate this as the social system.
The human ecology perspective provides a way of integrating the study of the natural components of the agroecosystem with that of the social system such that the researcher can view the totality of the interactions that lead to decisions of the farmers during farming. This perspective also helps to explain the forces that lead to the transformations of the traditional shifting cultivation system into one that, in terms of its effects on other ecosystems, many people view unfavorably.

DEFINITIONS AND TYPES OF SHIFTING CULTIVATION

Shifting cultivation is widespread not only in the Philippines but also in most countries of the humid tropics. There are several universal features in how this system is practiced around the world. Annuals and short term crops are cultured alternately with perennials during periods of fallow. Fire is used to clear vegetation as part of land preparation. Abandonment of field after several years of cropping is universal among practitioners. However, crops grown and length of fallow vary from place to place. There are many definitions of this system but the most acceptable is that of Pelzer (1947; as cited by Chin 1985). "It is a system of agriculture characterized by rotation of fields rather than of crops, clearing by means of fire, absence of draft animals, and of manuring, use of human labor alone, employment of dibble stick or hoe, and short periods of soil occupancy alternating with long periods of fallow." Other literature on this topic uses the term swidden to refer to this farming system. Christanty (1986; citing Kelly 1975) mentioned that only 15% of scientific literature uses the term "swidden" while "shifting cultivation" is used in about 60%.
In Filipino language this system of farming is termed *kaingin*. The practitioners are called *kaingineros*. (In this paper, the terms shifting cultivation, swidden and kaingin will be used interchangeably). In our country the system is practiced in the uplands (areas with slope greater than 18%). Thus, it is also referred to as upland farming. Most of the kaingineros are ethnic minorities and lowlanders who migrated to the uplands since the early 1900's to the 1980's. Kaingin is labelled in different ways depending upon the point of view of the writer. In the past, most government personnel have called kaingin "an evil causing forest destruction, flooding and loss of wild life" (Aspacio 1969*), "a national arson" (Fernandez 1952*), and "a menace " (Gillis and Sulit 1922*). Others would view it more kindly as a political, socioeconomic cancer that cannot be solved by punitive actions (de los Santos 1978) or a socioeconomic system brought about by the interplay of land resources, population and social systems (Duldulao 1978). Some would view kaingin not only as a technology of existence but as a way of life (Bennagen 1978; Maturan 1976) with its own appropriate social organization, its own set of social values, attitudes, and beliefs in which the farmers have a cultural attachment to the land. The kaingineros have been referred to as the squatters in the forest and, more emotionally, "the boat people of Philippine forests" (National Task Force Population Center Foundation 1980).

Why is shifting cultivation viewed in these ways? What are the facts behind all these allegations?

*Quoted from abstracts of their papers cited in annotated bibliography on this subject matter by Briones 1981. The original articles are present only in Philippine libraries and therefore unavailable to the author during the time this paper is prepared.
ENVIRONMENTAL IMPACTS OF SHIFTING CULTIVATION

Forest Destruction

The rate of forest destruction in the Philippines is one of the highest in Southeast Asia. Estimates by Revilla 1984 using landsat imagery show that by the 1990's only 1 million hectares will be left of the old-growth commercial forest which used to be 10.1 million hectares in 1969. The deforestation rate is therefore 476,190 ha/yr. This massive loss of forest is attributed to logging, fire wood extraction, and shifting cultivation. Ooi Jin Bee 1987 has computed the rate of annual deforestation of both virgin and secondary growth forest due to shifting cultivation as 321,250 hectares from 1980-85. These two figures on deforestation rates tend to show that shifting cultivation would account for at least 50% of forest destruction in the country. The Bureau of Forest Development (BFD) reports 54% of the deforestation as due to kaingin (Sajise 1986).

The rate of forest loss computed by Ooi Jin Bee 1987 due to shifting cultivation activities, especially indiscriminate burning, would mean P8.6 billion or $360 million worth of wood lost in five years. These monetary estimates are based on the figures given the National Task Force Population Center Foundation (1980) of 100 m³ that can be taken from 10,000 hectares of forest and a price value of P500/m³ as of 1980. These values do not include the loss of wood for fuel, destruction of wildlife habitat and changes in microclimate of deforested areas. The latter two effects of deforestation are unquantifiable.

Massive Soil Erosion in Kaingin Fields and the Sedimentation of Lowland Infrastructures
Shifting cultivation accelerates the natural geologic process of soil erosion. Of all the land uses in the humid tropics, forest cover gives the lowest rate of erosion. Thus opening and clearing of forest either by logging or kaingin accelerates soil erosion process. The protective vegetation canopy and the litter layers are removed during slashing and burning in the shifting cultivation process. This then exposes the soil surface to the impact of rain drops. This phenomenon, coupled with the location of swidden fields on steep slope increases soil erosion.

Tables 1 and 2A present some data gathered from literature on rates of soil erosion in swidden fields and other land use patterns. There is a great deal of variability on the data not only due to crops cultivated and differences in experimental sites, but also due to methodology used in measurements. Measuring the decrease in soil thickness tends to give higher soil erosion rates compared to direct measurement of soil loss from erosion plots.

Siltation of dams is one of the off-site effects of soil erosion. With 15 out of 39 watershed sites in the country settled by upland families, one can see from the tables given that shifting cultivation has the potential to contribute substantially to sedimentation of dams. Eventually this sedimentation leads to decreased capability of the dams to generate hydroelectric power and irrigation water. Sedimentation yields in water shed areas of Pantabangan and Magat dams in Luzon are presented in table 2B.

On-site, soil erosion removes the necessary nutrients for plant growth as well as the soil particles that serve as media for plant root development. Soil erosion, therefore, is one factor responsible
Table 1. Recorded soil erosion rates in different shifting cultivation fields

<table>
<thead>
<tr>
<th>Area of study</th>
<th>Crop planted</th>
<th>Rate of soil erosion</th>
<th>Source of information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mt. Makiling, Laguna</td>
<td>rice</td>
<td>new kaingin - 0.1 t/ha in 4 mos.</td>
<td>Cuevas, 1985</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 yrs - 14.0 t/ha in 4 mos.</td>
<td></td>
</tr>
<tr>
<td>Mt. Apo, Davao</td>
<td>rice</td>
<td>new kaingin - 0.38 t/ha/yr</td>
<td>Kellman, 1969</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12 yrs. - 27.0 t/ha/yr</td>
<td></td>
</tr>
<tr>
<td>Sta. Fe, Nueva Vizcaya</td>
<td>sweet potato</td>
<td>without gen-gen - 234 t/ha/yr</td>
<td>Lasmarias, et. al, 1988</td>
</tr>
<tr>
<td></td>
<td></td>
<td>with gen-gen -132.6 t/ha/yr</td>
<td></td>
</tr>
<tr>
<td>Bayhang River watershed, Leyte</td>
<td>sweet potato</td>
<td>489 t/ha in 6 mos.</td>
<td>Siebert, 1987</td>
</tr>
</tbody>
</table>

Table 2 A. Soil erosion rates on other land use patterns

<table>
<thead>
<tr>
<th>Land use patterns</th>
<th>Mean Soil Erosion Rates (t/ha/yr)</th>
<th>Source of information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grasslands</td>
<td>100</td>
<td>1982 BFD report cited</td>
</tr>
<tr>
<td>Forest (inadequately stocked)</td>
<td>20 - 40</td>
<td>by Cruz, 1986 a</td>
</tr>
<tr>
<td>Primary forest</td>
<td>0.09</td>
<td>Kellman, 1969</td>
</tr>
</tbody>
</table>

Table 2 B. Sedimentation yields of two water shed areas

<table>
<thead>
<tr>
<th>Water shed areas</th>
<th>Rate of Sedimentation (t/km²/yr)</th>
<th>Source of information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pantabangan</td>
<td>2,020</td>
<td>Sajise, 1986</td>
</tr>
<tr>
<td>Magat</td>
<td>2,050</td>
<td>Coloma, 1984 cited by Sajise 1986</td>
</tr>
</tbody>
</table>
for decreasing crop productivity with increasing years of cultivation of swidden fields. Siebert (1987) reports that farms continuously cultivated for 2-5 years have decreased levels of Ca, Mg, available P, pH, and organic matter. Soil fertility decrease is also one factor in why farmers abandon cultivated sites to fallow.

Increase in Marginal Grassland Areas in the Country

At present, there about 5.2 million hectares of unproductive, marginal areas in the country. These areas constitute about 17% of our total land area. Shifting cultivation practices contribute heavily to the increase of these unproductive marginal lands. Uncontrolled and indiscriminate burning during clearing of swidden fields by lowland migrants to the uplands can run for days (Abregana 1987). Some tribal people like the Gaddangs do not create fire breaks and their fire can spread to grassland and forest areas (Wallace 1970). The intense heat and rapid evaporation of soil moisture resulting from burning of these types kill forest seedlings. The natural forest regeneration process is therefore prevented. The longer periods of cultivation characteristic of the present swidden cycle deplete soil nutrients and further prevent the establishment of forest seedlings which are adapted to high soil organic matter. Repeated burnings characteristic of short fallow periods favor establishment of fire disclimax grasses like Imperata cylindrica (Siebert, 1987; Sajise, 1984). Imperata cylindrica (cogon) has wide tolerance to soil pH and marginal soil fertility, thrives in open areas and produces enormous amounts of easily wind blown seeds (Sajise, 1972). Once this grass has been established in a particular site, it produces rhizomes which help perpetuate the grass under repeated burning or cutting. These characteristics of the species enable it to spread over large areas.
very rapidly. With the high rate of soil erosion on this type of vegetation cover as shown in Table 2, soil degradation is further enhanced.

The original vegetation of the tropical forest (oak forest) in the mountains of the Cordilleras in Northern Luzon has been replaced at present by Pine forest in the mid-altitudes and by cane grassland (*Miscanthus*) in lower elevations (Kowal, 1966). Only small patches in mountain peaks retain the original vegetation. However, Kowal concluded that the montane forests that have existed in the area are also of secondary growth in nature and might have been affected by shifting cultivation in the past. But the process of swiddening before allowing the regrowth of the tropical montane vegetation is very different from the present system which promotes fire disclimax communities of pine forest and cane grasslands.

**SOME FACTS AND FIGURES ABOUT POPULATION DYNAMICS IN THE PHILIPPINE UPLANDS**

The upland areas constitute about 55.8% of the total land area. This is about 16.5 million hectares out of the total 30 million hectares. The most recent analysis of population dynamics in the uplands by Cruz (1986a, b,) shows that population of the uplands rose from 6 million in 1948 to 14.4 million in 1974. This comprises 30% of the total population of the country. With a population growth of 2.5 - 2.8%, the present population is 58 million, of which 17 million are in the uplands.

The doubling of population in the uplands from 1948 to 1974 is due to migration rather than to increased birth rate (Cruz, 1986a). The history of migration of lowland Filipinos to the uplands is
summarized by Cruz (1986b). It started during the Spanish era but the highest rate of migration occurred from 1900 to the 1950's. During American rule, the homestead program of 1903 encouraged many people to migrate to Mindanao and Southern Luzon provinces because the program enabled a person to own up 1000 hectares of land. The post-independence government continued this resettlement program. In 1965, families from Metro Manila affected by the government's project were settled in areas in Luzon provinces that still had virgin forest. Thus, from 1903 to 1978, records of the Bureau of Lands showed that public land application and patents covered 5.3 million hectares.

This migration of the lowlanders is quite different from the trans-migration sponsored by the Indonesian government in their own country. The migration of the Filipinos is voluntary. They pay their own transportation and usually the heads of the family transfer first. In the early 1900's to the 1960's prospects of owning large fertile lands in relatively unexplored territories was the greatest incentive to move. In the 1970's and for years later, besides the chance to own land, high unemployment rates and population pressure in their places of origin were reasons for upland migration (Abregana 1987).

Upland municipalities also constitute 48% of the total registered municipalities in the country. The population in these communities is unevenly distributed. Though the mean population density is 100 \( \frac{2}{2} \) persons/km\(^2\), there are municipalities with population densities of 200 \( \frac{2}{2} \) persons/km\(^2\). In Laguna province (where I am presently residing) there are municipalities that exceed 500 persons/km\(^2\) (Cruz 1986a).

Young people in the dependence bracket (below 14 years of age) constitute about 43% of the total population in the uplands as elsewhere in the country. Tables 3 A and B compare the age
### Table 3 A. Age distribution of upland population

<table>
<thead>
<tr>
<th>Age bracket</th>
<th>Description</th>
<th>% of population</th>
<th>Source of information</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 14</td>
<td>young, dependent</td>
<td>43</td>
<td>Cruz, 1986 a</td>
</tr>
<tr>
<td>15 - 64</td>
<td>working age</td>
<td>54</td>
<td></td>
</tr>
<tr>
<td>over 65</td>
<td>elder</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

### Table 3 B. Age distribution of population in the national level

<table>
<thead>
<tr>
<th>Age bracket</th>
<th>% population</th>
<th>Source of information</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 7</td>
<td>20</td>
<td>Unicef, 1989 cited by</td>
</tr>
<tr>
<td>8 - 14</td>
<td>21</td>
<td>Collins, 1990</td>
</tr>
<tr>
<td>15 - 20</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>over 20</td>
<td>47</td>
<td></td>
</tr>
</tbody>
</table>

Philippine Social Index

- Annual number of deaths: 1,975,000
- Child death: 147,000
- Number of school-age children: 1.25 million
- Per cent of children working: 31
- Number of under-nourished children below age 6: 3.5 million
  - a third suffering from third degree malnutrition
distribution of the population in the country and that of the uplands. These figures indicate the pressure exerted by the population on environmental resources to feed and clothe the young children. Results of a study by Cadelina (1987) show that the expansion of household swidden fields in Balinsasayao, Negros Oriental, increased at the phase when the household had extra labor, when the children reach 10-12 years old. At this same time, the households also experience caloric deficit. The data of Abregana (1987) show the 4-5 fold increase in number of clearings in Balinsasayao starting from 1970 to the 1980's, compared to earlier years. This increase in clearings coincides with the doubling of population in the area within the same time frame.

SHIFTING CULTIVATION SYSTEM OF FILIPINO UPLAND FARMERS

Filipino upland farmers consist of two groups, the indigenous population of upland areas or the tribal people (cultural minorities) and the lowland migrants to the uplands. The tribal people constitute about 60% of the total upland farmers while the other 40% are lowland migrants (Cadelina 1987 citing BFD report).

In the analysis of the problem of shifting cultivation of the country, it is important to distinguish these two groups. Their views on land tenure and environmental protection and their farming activities are distinct (Conklin 1954; 1957; Jin Bee 1987; Russell 1986). It would be erroneous to lump all the serious environmental degradation of kaingin cited previously to all upland farmers (Conklin 1954; Cadelina 1987).
The Farming System of the Cultural Minorities

There are about 43 cultural minorities found in the different islands of the Philippine archipelago; they constituted about 12% of the total population of the country in 1974 (Cadelina 1977). The majority of these tribal people practice shifting cultivation. But there is a good number of them who are still foragers.

They are of varying economic and cultural development and have been the subject of studies since the early 20th century. There is a great volume of literature available on the tribal people of the country. Most of the works are anthropological in nature, 50% of which are written by Americans. It was only starting from the 1960's that most of the research has been conducted by Filipinos.

Swiddening of the tribal people as well as that of the lowland migrants involve site selection, clearing, burning, planting, weeding, harvesting, replanting and then fallowing. However, the swidden cultivation practices of these indigenous people of the uplands are parts of their cultures. Rituals are performed and omens are observed for every step of their agricultural activity. This is the reason why Bennagen (1978) and Maturan (1976) would say that shifting cultivation is a way of life for them.

Their calendar of activities are based more on information received from the bio-physical environment rather than from the standard days and months of the Gregorian Calendar. The Tirurays consult the position of their Zodiac Constellation in the night sky before sowing rice seeds in the fields (Schegel 1979). The Negritos of Negros Oriental also consult the position of the Big Dipper in the night sky for similar activity (Cadelina 1977). The Taubid of Mindoro use the arrival of migratory birds and the blossoming of certain trees.
and vines as signals for the start of the swidden cycle (Pennoyer 1981). Most often this information coincides with the change in seasons in their particular locality, such as the start of the dry season or the coming of the rains.

These people have a deep knowledge of the biophysical characteristics of the upland environment. The Hanunuo Mangyans of Mindoro know 87 basic swidden crop types, 78% of which are food providers, others are for medicine, technological needs, trading, rituals and cosmetics (Conklin 1957). They can distinguish 450 animal types and 1,600 plant types. The Tirurays of Figel know 17 varieties of corn and 137 varieties of upland rice (Schegel 1979). The Tagbanwas of Palawan know 140 varieties of rice which they classify as to length of maturation period, glutinous or non-glutinous variety, color, aroma, flavor, etc. (Warner 1981). The Ikalahans of Nueva Vizcaya know 6 different types of sweet potato with different eating quality, adaptations to particular levels of soil fertility, and length of maturation period (Barker 1984). The Negritos of Zambales are able to enumerate 43 species of plants eaten by birds, 17 species of palm eaten by civet, 38 by fruit bats, 12 by pig and 21 by deer (Brosius 1983).

These tribal people understand and respond accordingly to the risks offered by the variation of weather especially rainfall, and limitations to productivity imposed by the bio-physical environment such as steep of slope of their fields, soil types, incidence of pests and diseases, soil erosion effects, etc. Planting of varieties of crops of different maturation enables them to spread labor activities
during harvest over a longer period of time so as to have more food for longer period of time with minimal storage (Schegel 1979; Barker 1984). The maintenance of two separate fields by the husband and wife in the Tagbanwa tribe helps them reduce the risk of crop failure due to the unpredictability of rainfall in the west coast of Palawan (Warner 1981). The Bontok swidden field is well organized and structured in time and space to maintain continuous crop cover and to fully utilize sunlight. This is also a strategy to minimize soil erosion (Prill-Brett 1986). Multiple cropping also minimizes the build up of populations of pests and disease-causing organisms. Soil erosion control measures such as gen-gen, a form of terracing combined with composting of leaves of sweet potato, and dayog, a form of contour ditch, (Barker 1984) or terracing (Prill-Brett 1986) are normally practiced. Crops planted are mostly subsistence crops, most important of which are the root crops.

In some tribes such as the Ifugao and Bontok, swiddening is supplementary to paddy rice culture (Conklin 1980; Prill-Brett 1986). In other tribes, such as the Ikalahans and Hanunuo Mangyans (Barker 1984; Conklin 1957) swiddening is the main agricultural activity.

There are also variations in cultivation practices among the different tribes. The Agta, Negrito hunters, are starting to use the slash and burn techniques of the lowland migrants. They plant rice, corn, cassava, and sweet potato in their swiddens. Their techniques are not as well developed as that of other tribes (Estioko-Griffin & Griffin 1981).

Burning of cut vegetation in some tribes is a well-thought off and carefully planned activity. Fire-breaks are established,
especially if the swidden sites are near the settlements (Conklin 1957). Direction of the wind breeze is given outmost consideration (Brosius 1983). Fire is started in the afternoon and burning fields are well guarded (Schegel 1979). However, among the Gaddang tribe, burning is not as carefully done. No fire-breaks are established. As mentioned earlier, fire can extend to grasslands where the fire becomes bigger and destroys nearby forests (Wallace 1970).

Among the Mandaya tribe, no burning is done due to frequent rains. They choose to cut primary forest on steep slopes to facilitate easy rolling and sliding of cut logs out of the field. They cultivate the site for only one season and transfer their clearings as well as their residence to a new site the next season (Yengoyan 1971).

The type of vegetation cleared in sites selected for cultivation also vary among tribes. In reality these people have limited choices in the type of vegetation they will clear since the vegetation cover depends upon the intensity of human activities in the area. The Ifugao, Bontok and Ikalahlan clear cane grasslands (Conklin 1980; Prill-Brett 1986; Barker 1984). The Mandaya clear primary forest (Yengoyan 1971) while the Tirurays clear primary and secondary forest (Schegel 1979). The Hanunuo Mangyans clear secondary forest (Conklin 1957) while the Negritos of Zambales clear secondary forest, amukao-wild banana stands and cane grasslands (Brosius 1983).

The length of cultivation and fallow periods of the swidden cycle also vary among tribes. Variations are responses to land scarcity and population pressures. There is a decreasing fallow to cultivation ratio with high population pressure and decreasing land availability. Variations in the type of vegetation cleared, as noted above, are
responses to the changing vegetation cover as the primary forests are cut down. The tribes that can effectively adopt to these changes develop sustainable swidden (i.e., Negritos of Zambales as discussed by Brosius 1982).

Labor exchange is a normal practice among the tribal people. This practice should not be interpreted as a form of communalism but as a strategy that minimizes labor shortage at the peak of labor activities such as during clearing (Dove 1983). Exchange is done among the households within the neighborhood. Benefits derived from the exchange are through the agreed upon method of sharing harvests of crops (Schegel 1979).

The concept of land ownership, though, is almost the same among all the tribal people. Land is communally owned or is considered a free good (Warner 1981). A household owns only the fruits of their labor on the land. There is an unwritten mutual agreement among members of the tribe that only the household who planted the crops can harvest them whether they are annuals or perennials (Schegel 1979). Once the land is left to fallow, another household can make use of it, depending upon the custom observed in each tribe. Among the Bontoks, another household has the right to use a piece of land that has already exceeded the regular 5 years fallow period (Prill-Brett 1986). Among the Mandaya tribe, one can make use of the land with old fruit trees after a pig-bolo (a kind of big knife) exchange with the household who planted the trees (Yengoyan 1971). However, some tribes are now adjusting to the land tenure concept of the national government (Russell 1986). The Ikalahans applied and was granted a 25-year lease
contract with the Bureau of Forest Development (BFD) (Rice 1981).

Kaingin System of the Early Lowland Migrants from the 1900's to 1960's

These upland farmers already have children born in the upland settlements who now also practice kaingin and are referred to as born kaingineros (classification by Nat'l Task Force Pop. Cntr. Fd. 1980). They are homesteaders who migrated to seek land in frontier territories. They have practiced kaingin in their places of origin like those settled in San Jose, Palawan (Eder 1977; 1981). They may also come from families of upland farmers as in the case of those settled in Balinsasayao, Negros Oriental (Abregana 1987). They may claim ownership to the land they cultivate either by Certificate of Land Titles or by receipts of payments of land tax (Cruz 1986 a; Cadelina 1983). Their average land holding is about 3.3 in San Jose, Palawan (Eder 1981); 3.0 ha. in Mt. Makiling (Nguu & Corpuz 1980); and 3.93 ha. in Balinsasayao (Abregana 1987).

They also observe the swidden cycle typical of the shifting cultivation system. Unlike the tribal people they no longer perform rituals and observe omens during their agricultural activities. However, they also observe some criteria in site selection. In Mt. Makiling, the farmers choose sites on the north-facing slope. They believe the south-facing slope is mainit - hot and dry (Sajise, personal communication).

Burning is done carefully. In our present study site in Mt. Makiling, farmers sold the cut tree trunks as firewood or charcoal. The litters and weeds are piled in small patches which are scattered across the fields before burning. Thus the fire they built are small and discontinuous. Ashes are then more or less evenly distributed in
the fields (PESAM, Mt. Makiling Annual Report 1985).

Though their land holdings may be up to 3.0 hectares, they clear only small areas usually 0.2 ha. at a time (PESAM 1985) but simultaneously maintain several fields of different years of cultivation (Nguu & Corpuz 1980). In Balinsasayao, Negros Oriental, the mean total area under cultivation at any one time is 1.59 ha. (Abregana 1987). Other lands are left to fallow.

Cultivation and fallow periods vary in different places. Cultivation in swidden fields in Cebu last up to 7 years, while the fallow period is up to 12 years (PCARRD, Annual Report 1987). In Mt. Makiling, the cultivation period is 5 years and the fallow period is 17-23 years (Nguu & Corpuz 1979). In San Jose, Palawan, the ratio of cultivation to fallow period is 2:1 for rice swidden and 1:1 for vegetable swidden (Eder 1977; 1981). In Balinsasayao, Negros Oriental, the fallow period may be from 1-28 years (Abregena 1983, 1987).

These upland farmers cultivate a combination of subsistence and cash crops. Various cropping patterns are utilized with market demand as the primary factor considered (Nguu & Corpuz 1980; Cruz 1986 a). Root crops are the principal subsistence crops cultivated (Wollenberg 1985).

Soil conservation measures are practiced by some upland farmer groups. Balabag, a form of log terracing (Ramirez 1987) and rock walling are practiced by Cebu farmers (PCARRD 1987). Mt. Makiling farmers plant fruit trees and legume trees for firewood during the fallow period (PESAM 1985). Farmers of San Jose, Palawan plant tree crops during the fallow period (Eder 1981).
The ecologically sound shifting cultivation practices of these early migrants are evidence that the farmers have adapted to the upland environment. The long years of their stay in the region (some have their families in their settlements since the 1920's as in the case of the Mt. Makiling farmers) may be responsible for the adaptation.

Kaingin System of the Later Migrants (1970's and Later Years)

Most of these migrants are also farmers (Fujisaka and Capistrano 1985). They moved to the uplands due to population pressure in their places of origin. These later migrants will be classified in this paper into four categories; resident, fly-by-night, land speculators, and land grabbers.

Resident

These are lowland farmers who have very limited knowledge of the upland environment. They reside in settlements near their fields or in villages in the uplands. They follow the commercial loggers and clear logged-over areas or secondary growth forest (Fujisaka and Capistrano 1985). They may apply lowland technologies such as application of fertilizers and pesticides to their crops. They practice indiscriminate and uncontrolled burning which may run for days and is therefore very destructive (Abregana 1987). Cash crops such as tomatoes are priority crops planted in newly cleared fields. Subsistence crops, i.e. root crops, are planted only after the plots give lower yields for the cash crops (Fujisaka and Capistrano 1986).

They do not practice soil erosion control measures and environmental concerns are not part of their consciousness. Their main concern for the present is acquisition of lands for their agricultural
activities. However, they are trying to adapt to their new environment. They establish home gardens which are sources of food and cash incomes (Fujisaka and Capistrano 1985).

They may not have the same length of time that the early migrants had with regards to their adaption to the upland environment. The high population pressure and stiff competition for land between the early settlers and new migrants in the same settlement area have caught up with them. The above conditions result in a situation whereby they cultivate the land for longer periods and have short fallow periods. Fallow periods can be as short as one year and cultivation periods as long as 10 years (Abregana 1987; Cadelina 1977). The end result is decreased crop productivity.

Fly-by-night kaingineros

These are lowland farmers who do not establish residence in the uplands. They clear the forest and commute from their lowland residence to their clearings. They do not disclose their identities for fear of being caught in their illegal activities. They cultivate their clearings for one season. They do not have any concern for the land. Their main interest is extraction of products from the land which if compared to that of resident upland farmers are low (Cadelina 1983).

Land Speculators

These are lowlanders who do not also establish residence in the uplands. They also do not establish their identities. They clear a site in the forest and then sell their "rights" to cultivate the cleared area to another kaingenero or to anybody interested. Their
concern for the land terminates with the completion of the sale of their "rights" (Cadelina 1983).

Land Grabbers

They are usually lowlanders with powerful political backing. They apply for land titles from the central office of the Bureau of Lands in Metro Manila. They commonly get these titles regardless of the facts that the areas are already occupied by tribal people or by lowland migrants.

GOVERNMENT REGULATION

The Philippines lie in the humid tropics where climate is favorable for the development of evergreen forest. It is generally believed that only the settled areas in flat lands were non-forested when the first Europeans came to the Philippines in the mid 1500's. Though there were indigenous people living in the uplands, their population density was low and the clearings they made easily reverted back to primary forest (Kowal 1966).

The Philippine government, from the colonial regime to the post-independence government up to 1965 had always regarded all forested areas as public lands. Different rules and decrees have been promulgated to regulate forest land utilization. It is considered the duty of the state to protect watershed areas and highly erodable mountainous land and keep them under forest cover for the benefit of the whole country. At present, the Department of Natural Resources and Environment, specifically the Bureau of Forest Development (BFD), has the responsibility to administer forest lands, grazing lands, and forest reservations, including watershed areas (Aquino et al 1987).

There is a conflict of interest between the upland dwellers,
especially the indigenous people of the uplands who have lived in the forest since the beginning, and the government. This conflict was more marked in the pre-1965 period when the government placed more importance on trees than people. During these periods forestry was basically extractive and the government regarded the upland people as squatters and enemies of the forest (Aguilar 1986). The rules and regulations promulgated then regarded shifting cultivation as destructive to the forest and therefore punishable by law. The Royal Decree of the King of Spain of 1889, Kaingin Law-Act of 1901 under American rule, Forest Conservation Law--RA 3523, of 1963 of the post independence government, instituted punitive measures such as imposition of penalties and fines, imprisonment of kaingineros, and their ejectment from forest lands (Aquino et al. 1987). Despite these laws, kaingin persisted.

On the other hand, these laws have not been fully implemented. Access to the uplands has been easy and virtually unhindered often through the roads built by the loggers (de los Angeles 1986). Many migrants are encouraged to clear more areas for cultivation when they see that very few if ever are apprehended for illegal occupancy (Abregana 1987).

A National Conference on the Kaingin Problem was held in Manila in 1965. The open discussion of the problem brought to the attention of the national government the issue of forest and the upland people (Bennagen 1983). Consequently, there has been a change in the official policy of the government. Shifting cultivation is viewed as more of a socioeconomic problem. There have been significant changes in forestry
laws as well as in the type of research conducted (Aquino et al. 1987). Anthropologists and other social scientists play greater roles as these researches become more interdisciplinary and people-oriented in character (Russell 1986). The Department of Social Forestry was created in the University of the Philippines at Los Banos. The Integrated Social Forestry Program was instituted in 1981 (Aquino et al. 1987).

The Integrated Social Forestry Program (ISFP) is a complete turnaround from the original punitive approach to the problem of shifting cultivation. The program now regards the upland people as partners in forest development and conservation. It maintains that the people and the upland environment can have a mutually beneficial relationship (Aguilar 1986). It places more emphasis on socioeconomic development of the people and authorizes long-term land security by granting renewable 25-year stewardship contracts with "deserving" forest occupants. Agroforestry is a major thrust of the program (Aquino et al. 1987).

At present, ISFP is still evolving. Aguilar (1986), in his review of eight social forestry projects, has given some constructive criticisms that can serve as reminders in future implementation of the projects. The planners of the projects have viewed the upland people as not possessing technology on how to exploit the resource system without harming it. They have transferred technology packages which, from the planners' view, contain suitable answers to the perceived environmental problems. There has been very little participation of the upland people in decision making about project implementation. The decision making is usually dominated by the project's personnel. The most telling criticism is the government's indecisiveness regarding
Agroecosystem analysis using the human ecology perspective involves the evaluation of the system's emergent properties. These properties result from the interactions of various components of the ecosystem as affected by the farmers' management techniques (Conway 1984). The agroecosystem's emergent properties are productivity, stability and sustainability (Conway 1984; Marten & Saltman 1986) while that of the social system's are equitability, autonomy, and solidarity (Marten 1988; Marten & Rambo 1988).

All these properties except productivity are difficult to evaluate because they not quantifiable. They are multidimensional in character (Marten 1988). Some are dependent on each other and thus mutually reinforcing, i.e. solidarity and autonomy. Others are contradictory to each other (e.g., productivity and sustainability). In other cases, the property may be strong at one level of organization but vulnerable at the next higher level of hierarchy (e.g., autonomy). Results of the evaluation are highly dependent upon the set of conditions at a particular time and the particular level of organization.

In this study, analysis of the shifting cultivation systems of the different groups of upland Filipino farmers is based only on parameters examined (shown in Table 4) and up to the national level of systems hierarchy. Comparisons made are among swidden types and not with other forms of agroecosystems, i.e. productivity of the swidden vs that of wet rice paddy fields.

The productivity of some shifting cultivation systems recorded in literature are presented in Table 5. The form of data vary depending upon the forms used by the authors in their studies.
<table>
<thead>
<tr>
<th>System's Properties</th>
<th>Parameters Evaluated</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Productivity</td>
<td>yield (t/ha)</td>
</tr>
<tr>
<td></td>
<td>labor productivity</td>
</tr>
<tr>
<td></td>
<td>cash net returns</td>
</tr>
<tr>
<td>b. Stability</td>
<td>yield fluctuations thru time</td>
</tr>
<tr>
<td>c. Sustainability</td>
<td>long term utilization of environmental resources</td>
</tr>
<tr>
<td></td>
<td>in the face of changing social and bio-physical environment</td>
</tr>
<tr>
<td>d. Equitability</td>
<td>access to resources— land, water, natural resources</td>
</tr>
<tr>
<td></td>
<td>distribution of products from these resource use</td>
</tr>
<tr>
<td>e. Solidarity</td>
<td>labor exchange</td>
</tr>
<tr>
<td></td>
<td>observance of custom law</td>
</tr>
<tr>
<td></td>
<td>harmony/conflict among members of the group</td>
</tr>
<tr>
<td>f. Autonomy</td>
<td>ability to resist or be influenced by outside forces</td>
</tr>
<tr>
<td></td>
<td>independence from outside influences in terms of decision-making regarding agricultural activities</td>
</tr>
</tbody>
</table>

Scale - high, medium, low
### TABLE 5. COMPARATIVE PRODUCTIVITY OF DIFFERENT SHIFTING CULTIVATION FARMS

<table>
<thead>
<tr>
<th>FARM GROUPS</th>
<th>YIELD (t/ha)</th>
<th>TOTAL LABOR INPUT (manhours)</th>
<th>TOTAL LABOR PRODUCTIVITY (kg/man-hour/hr/ha)</th>
<th>TOTAL LABOR PRODUCTIVITY (persons/sq km)</th>
<th>POPULATION DENSITY</th>
<th>INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. CULTURAL MINORITIES</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Honunuo Mangyan</td>
<td>2.3</td>
<td>-</td>
<td>3000</td>
<td>2.5</td>
<td>10</td>
<td>Conklin 1957</td>
</tr>
<tr>
<td>Tirurays</td>
<td>2.2</td>
<td>0.9 (corn)</td>
<td>2500-2600</td>
<td>1.19-1.24</td>
<td>56.1</td>
<td>Schegel 1979</td>
</tr>
<tr>
<td>Mandayas</td>
<td>0.85</td>
<td>-</td>
<td>3500-3800</td>
<td>0.22-0.24</td>
<td>4</td>
<td>Yengoyan 1971</td>
</tr>
<tr>
<td>Ikalahans</td>
<td>-</td>
<td>16-32 (sweet potato)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Baker 1984</td>
</tr>
<tr>
<td>Ifugao</td>
<td>-</td>
<td>6.5 (sweet potato)</td>
<td>2400</td>
<td>2708</td>
<td>126</td>
<td>(230)</td>
</tr>
<tr>
<td><strong>B. EARLY LOWLAND MIGRANTS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mt. Makiling</td>
<td>2.0</td>
<td>4.4</td>
<td>(1st yr)</td>
<td>Garlic</td>
<td>2400</td>
<td>2708</td>
</tr>
<tr>
<td>(2nd yr)</td>
<td>1.2</td>
<td>3.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cuyunan Palawan</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>C. LATER LOWLAND MIGRANTS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calmianoe, Cavinti, Laguna</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
valuation of the different parameters of the systems' properties examined are tabulated in Table 6.

The results of this comparative analysis are presented in Table 7. The information discussed in the previous description of each type of swidden system is used as the basis for this valuation.

No system is rated high in sustainability. Though the Igorot tribes have very strong solidarity and autonomy, the high population pressure forces some of the Ifugaos to abandon their village and go to the lowlands (Ilocos provinces) as wage earners. Their communal forest is gradually being depleted through firewood extraction and the gathering of wood for carving (Eder 1982). The Bontok are also increasingly influenced by the outside world. Some people have out migrated. Sale of surplus vegetables is starting in their villages. Swidden fields are sometimes left unattended due to lack of labor (Prill-Brett 1986). There are also Tirurays who have settled in lowland areas and engaged in plow agriculture (Schegel 1979).

However, rituals performed by the tribal people bind them. The rituals performed and omens observed have help them to adjust to the constraints of the bio-physical environment. Observance of the customary law has enhanced equity among members of the group (Prill-Brett 1986). Their subsistence farming has made them less vulnerable to the forces of the social subsystem. The presence of the forests and rivers where they can catch wild animals and fish make them more self-sufficient in food and therefore, highly autonomous. Thus, the shifting cultivation of the tribal people, except the Negritos of Negros Oriental whose society is not as well developed as the other tribes,
Table 6. Scale used in the comparative analysis of the swidden systems of the different Filipino upland farmer groups

<table>
<thead>
<tr>
<th>Systems' Properties</th>
<th>Scale</th>
<th>Criteria</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Productivity</td>
<td>high</td>
<td>$\Rightarrow 2.0 \text{ t/ha - rice}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$\Rightarrow 10.0 \text{ t/ha - sweet potato}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$\Rightarrow $20,000.00 $\text{ - net cash returns}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>medium</td>
<td>$1-2 \text{ t/ha - rice}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$5-10 \text{ t/ha - sweet potato}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$2-4,000 \text{ - net cash returns}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>low</td>
<td>$&lt; 1.0 \text{ t/ha - rice}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$&lt; 5.0 \text{ t/ha - sweet potato}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$&lt; $1,000.00 $\text{ - net cash returns}$</td>
<td></td>
</tr>
<tr>
<td>Stability</td>
<td>high</td>
<td>yield fluctuations minimal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>medium</td>
<td>yield fluctuations moderate</td>
<td></td>
</tr>
<tr>
<td></td>
<td>low</td>
<td>yield decreases quickly</td>
<td></td>
</tr>
<tr>
<td>Sustainability</td>
<td>high</td>
<td>system still strong up to the present despite high population pressures and the disappearance of the primary forest</td>
<td></td>
</tr>
<tr>
<td></td>
<td>medium</td>
<td>system can cope with the changes but its existence is tenuous as shown by members leaving the community</td>
<td></td>
</tr>
<tr>
<td></td>
<td>low</td>
<td>system completely changing and deteriorating</td>
<td></td>
</tr>
<tr>
<td>Equitability</td>
<td>high</td>
<td>majority of the members have access to environmental resources; most members can avail themselves of the products for resource use</td>
<td></td>
</tr>
<tr>
<td></td>
<td>medium</td>
<td>accessibility of resources to members moderate, a growing number of members can not receive the products from the resource use</td>
<td></td>
</tr>
<tr>
<td></td>
<td>low</td>
<td>only a small percentage of the community have access to the resources; majority of the members can not avail themselves of the products of the resource use</td>
<td></td>
</tr>
<tr>
<td>Solidarity</td>
<td>high</td>
<td>most members strictly observe the custom law and participate in societal activities such as labor exchange and ritual performance</td>
<td></td>
</tr>
<tr>
<td></td>
<td>medium</td>
<td>relationships among members of the community harmonious; some forms of societal activities still performed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>low</td>
<td>presence of conflict; societal activities uncommon</td>
<td></td>
</tr>
<tr>
<td>Autonomy</td>
<td>high</td>
<td>system can function without outside influence</td>
<td></td>
</tr>
<tr>
<td></td>
<td>medium</td>
<td>system's dependence on outside influence moderate</td>
<td></td>
</tr>
<tr>
<td></td>
<td>low</td>
<td>system's function highly dependent on outside influence</td>
<td></td>
</tr>
</tbody>
</table>
Table 7. Comparative human ecology analysis of the shifting cultivation systems of different Filipino upland farmer groups

<table>
<thead>
<tr>
<th>Farmer groups</th>
<th>Systems Properties</th>
<th>Productivity</th>
<th>Stability</th>
<th>Sustainability</th>
<th>Equitability</th>
<th>Solidarity</th>
<th>Autonomy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Cultural Minorities</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Hanunuo Mangyan</td>
<td>high</td>
<td>low</td>
<td>medium</td>
<td>high</td>
<td>high</td>
<td>high</td>
<td>high</td>
</tr>
<tr>
<td>as of 1957</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Tiruray</td>
<td>high</td>
<td>low</td>
<td>medium</td>
<td>high</td>
<td>high</td>
<td>high</td>
<td>high</td>
</tr>
<tr>
<td>as of 1966</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Mandaya</td>
<td>low</td>
<td>low</td>
<td>low</td>
<td>high</td>
<td>medium</td>
<td>high</td>
<td>high</td>
</tr>
<tr>
<td>as of 1967</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Igorot tribes — Bontok</td>
<td>medium - high</td>
<td>low</td>
<td>medium</td>
<td>high</td>
<td>high</td>
<td>high</td>
<td>high</td>
</tr>
<tr>
<td>Ifugao, Ikalahan</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>present</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Negritos</td>
<td>low</td>
<td>low</td>
<td>medium</td>
<td>medium</td>
<td>medium</td>
<td>medium</td>
<td>high</td>
</tr>
<tr>
<td>Zambales—present</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Negritos</td>
<td>low</td>
<td>low</td>
<td>low</td>
<td>medium</td>
<td>low</td>
<td>low</td>
<td>low</td>
</tr>
<tr>
<td>Negros Oriental</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>present</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>B. Early lowland migrants</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Mt. Makiling</td>
<td>medium</td>
<td>low</td>
<td>medium</td>
<td>medium</td>
<td>medium</td>
<td>low</td>
<td></td>
</tr>
<tr>
<td>present</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Cuyunon, Palawan</td>
<td>high (vegetable)</td>
<td>low</td>
<td>low</td>
<td>medium</td>
<td>low</td>
<td>low</td>
<td>low</td>
</tr>
<tr>
<td>as of 1971</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Balinsasayao</td>
<td>low</td>
<td>low</td>
<td>low</td>
<td>medium</td>
<td>low</td>
<td>medium</td>
<td>low</td>
</tr>
<tr>
<td>present</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>C. Later lowland migrants</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Calminoe—present</td>
<td>high</td>
<td>low</td>
<td>low</td>
<td>low</td>
<td>low</td>
<td>low</td>
<td>low</td>
</tr>
</tbody>
</table>
are rated high in equitability, solidarity, and autonomy. This shows how the culture of a people can influence the emergent properties of the social system.

The shifting cultivation systems of the lowland migrants are in various stages of development. The productivity of their systems may be high, as in the cases of Calminoe and San Jose, Palawan, but low in almost all other properties. Both of these cases are vegetable-based swiddens. Their farming systems are highly dependent upon cash inputs of fertilizers and pesticides. The system is also vulnerable to market price fluctuations (Eder 1977; Fujisaka & Capistrano 1985). Moreover, the system of Calminoe farmers leads to the opening of more forest land due to seemingly high cash returns. Access to lands becomes a source of conflict among members of the Calminoe community (Fujisaka & Capistrano 1985; 1986). The system, therefore, is unsustainable, environmentally degrading, and with low solidarity and autonomy.

The transformation of the swidden system of the Kankaney and Ibaloi tribes of the Cordillera into vegetable farming is very similar to what Eder 1977 predicted for San Jose farmers. The Loo Valley vegetable farming in Benguet province in Northern Luzon is environmentally degrading in terms of fertilizer and pesticide pollution (Alcantara 1988; Medina 1986). The solidarity, equitability and autonomy of the social subsystem has decreased to a very low level (de Raedt 1988). Cash flow in this farming system leaves the farmer to the threshold of poverty (Tapang, 1988). Thus it is not a very good model to follow for swidden intensification.

The kaingin system of Mt. Makiling farmers is rated medium in
productivity, sustainability, solidarity and equity. As pointed out earlier, these farmers in Mt. Makiling have been in the area for almost 70 years now and therefore have adapted their system to the environment. It seems more studies should be done on their system to draw lessons from them to apply to other systems that are still in the process of development. One interesting result of our experiments in their fields is that their system responds positively to intensification with the use of compost (PESAM 1985).

The shifting cultivation system of the Balinsasayao farmers may be typical of the other lowland migrants. Almost all properties examined are rated low. Investigations of Abregana (1983; 1987) show that the early migrants had a better life in the early years of their settlement that at present. The pressure exerted by the influx of more migrants caused further environmental degradation, land shortage and consequently low productivity.

The quality of life of the upland farmers can be better understood by looking at the annual income of the migrants presented in Table 8. (No such tabulation can be done for the indigenous people because they do not engage in income generating activities that can be measured as can those of the lowlanders). Income varies with the regions. It is highly dependent upon the access to the nearby forest for gathering products that are sold to the market. Rattan is a good source of income for Bayhang watershed farmers in Leyte (Siebert 1987). Carabao logging (an environmentally destructive process) is a good source of income for Calminoe farmers (Fujisaka & Capistrano 1985 & 1986). Off-farm activities such as carpentry and wage labor increase family income (Abregana 1987). But from Table 8, one can see that all
Table 8. Comparison of annual income of migrant upland farmers.

<table>
<thead>
<tr>
<th>Residence</th>
<th>Annual income</th>
<th>Percentage coming from farm produce</th>
<th>Source of information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mt. Makiling</td>
<td>₱ 7,428 (household)</td>
<td>50</td>
<td>Cruz 1986</td>
</tr>
<tr>
<td></td>
<td>₱ 1,485 (individual)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cuyunon, Palawan</td>
<td>₱ 4,293 (household)</td>
<td>100</td>
<td>Eder 1977</td>
</tr>
<tr>
<td></td>
<td>($668) (individual)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Balinsasayao</td>
<td>₱ 4,745 (household)</td>
<td>58</td>
<td>Cadelina 1983</td>
</tr>
<tr>
<td></td>
<td>($73) (individual)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calminoe</td>
<td>₱ 6,628 (household)</td>
<td>52</td>
<td>Fujisaka and Capistrano 1985</td>
</tr>
<tr>
<td></td>
<td>($351) (individual)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antique &amp; Camarines Sur</td>
<td>₱ 2,168 (household)</td>
<td>100</td>
<td>Cruz 1987</td>
</tr>
<tr>
<td></td>
<td>($115) (individual)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* This amount is just the cost of an ordinary shirt (on-sale at Ala Moana) of the son of a logging-concessionaire or that of a prawn grower. It may also be just the cost of a pair of slippers (not shoes) of Mde. I. Marcos.
these farmers' incomes are below poverty level (Cruz 1986a). However, they are not alone. Almost 70% of Filipinos live below poverty line, at present. The Philippines is one of the hungriest nations in the world (Collins 1990).

The need for cash among the lowland migrants is much greater than that of the tribal people due to their differences in culture. Lowlanders need items that entail cash that may not be needed by tribal people. Money is needed for medicine, clothing, and education. The tribal people have a deep knowledge of traditional medicine which may not be the case for the lowland migrants. They may have their own methods of making clothing, too. Such lower need for cash has made them less dependent on the lowland communities. Nevertheless, both the migrants and the tribal people belong to the very low income groups and one of the most neglected sectors of the Philippine society. Due to the distance of their settlements from the urban centers, education, health services barely reach them.

Thus, in analyzing the environmental impacts of the shifting cultivation system, one should not forget that poverty is one very important factor that leads to farming practices that are environmentally degrading. Cassava causes severe soil degradation, especially if cultivated in steep slopes. However, the farmers have to plant it because cassava satisfies their carbohydrate needs. It is the only crop that grows under marginal soil conditions. Thus, to them it is a question of environmental protection and survival (personal communication with Visayan farmers). Environmental degradation is a long-term effect, but to these poor farmers, it is a question of day-to-day
survival (Abregana 1987; Wollenberg 1985). Migrant farmers engaged in land speculation (discussed earlier) to earn cash for survival (Abregana 1983).

Eder (1981) has shown that tree cropping in San Jose, Palawan, gives 3-4 times higher returns to land and labor compared to rice swidden. Trees as we know are more environmentally conservative. On the other hand, Eder also learned that most poor farmers in the community do not plant trees due to lack of economic security. They plant annual cash crops to meet the necessary expenses for daily survival. Seedlings of trees need more attention and care to grow. They become productive only after several years. These poor farmers do not have the time needed for tree cropping because they have to utilize this time and land to do activities that will give more immediate cash returns however low the cash returns may be. The same information was gathered by Fujisaka & Capistrano (1985).

Land tenure is one important aspect related to environmental protection in the uplands. Some Ilokano farmers do not want to plant trees in their swidden fields because the presence of trees would place their fields in the category of forests. This would then give the government the right to declare their fields public land (Harold McArthur, personal communication). Tenant farmers will plant only annual crops in the fields of absentee landlords (Eder 1977). With the high labor and time requirements of tree crops, they fear that the income would redound to the landlords rather than to them, which of course is true.

Furthermore, farmers without land security tend to exclude the stock effects of decreasing forest and badly eroded soil in decision
making regarding cultivation practices. The farmers would place value only on the labor inputs for agricultural productions. Hence, the attitudes become mainly extractive rather than resource conservative. With open access to the public, unsecured lands are cultivated at a much faster rate by several other cultivators. This is in contrast to the case when farmers have land security. These farmers tend to avoid stock effects by developing land conserving techniques or by adjusting consumption patterns to suit the availability of the produce from the land (de los Angeles, 1988).

There is much to be desired on the way the government has been implementing land security to the upland farmers. Fujisaka and Capistrano have documented how the question of the jurisdiction of the Bureau of Land and the Bureau of Forest Development has led to the confusion and conflict of land ownership in Calminoe. Provincial boundaries have not been properly mapped out, such that the farmers are confused to which province they should file their claims and other legal matters.

I did this study to help understand the problem of shifting cultivation. As pointed out, it is still poverty and lack of environmental consciousness among the people that cause most of the environmental degradations attributed to shifting cultivation. Poverty in the country is primarily rooted in social, economic, and political inequity in Philippine society today. Land tenure, high population growth, unjustified market pricing of agricultural products from the uplands and of goods needed by the upland people (Abregana 1987) are specific causes of poverty in the uplands.
Many of the policy recommendations have been discussed by Cruz (1986a). I can not add more to these recommendations. However, these recommendations can not be fully implemented unless there are meaningful and substantial structural changes in Philippine society. Unless all the Filipino people unite to bring about the much needed structural changes the hope for rural sustainability in the country remains a distant dream.

I would like to acknowledge the assistance of Ms. Kate Gillogly, research intern, EAPI, E - W Center in editing this paper.
Literature Cited


SWIDDEN CULTIVATION AND CASH CROPS IN SOUTHERN YUNNAN, CHINA: A CASE STUDY OF AGROECOSYSTEM SUSTAINABILITY

by

Guo Huijin
Researcher
Institute of Tropical Botany
SWIDDEN CULTIVATION AND CASH CROPS IN SOUTHERN YUNNAN, CHINA

- A CASE STUDY OF AGROECOSYSTEM SUSTAINABILITY

by

Guo Huijun

March, 1990

Kunming Institute of Botany, The Chinese Academy of Sciences

Environment and Policy Institute, East-West Center
Honolulu, Hawaii, 96848
CONTENTS

ACKNOWLEDGEMENT

LIST OF TABLES AND FIGURES

I. INTRODUCTION

1. The Research Problem
   A. Extent of swidden agriculture in Yunnan
   B. Government attitude towards swidden agriculture
   C. Effect of government attempts to regulate swidden agriculture

2. The Research Site
   A. Environment
   B. People

3. The Research Design

II. TRADITIONAL AGRICULTURE IN THE RESEARCH AREA

1. Types of Agriculture

2. Swidden Agriculture
   A. Swidden types
   B. Swidden place

III. THE "DONGYA" SYSTEM

1. Stages and Practices

2. Cropping System

3. Temporal Cycle

4. Spatial Cycle

5. Productivity

IV. CASH CROPPING

1. Cropping System: Rattan and Bamboo

2. Cropping Practices

3. Temporal Cycle
V. THE FUNCTIONS OF "DONGYA" SYSTEM

1. Subsistence Orientation
2. Marketing Orientation
3. Impact on Environment

VI. DISCUSSION

1. Strengths and Weaknesses of the Traditional System
   A. Economic stability
   B. Environment sustainability
   C. Integration of swidden agriculture & cash cropping

2. Implications of Outlawing Swidden Agriculture
   A. Impact on cash cropping
   B. Possible stimulation of illegal & more destructive forms of swidden agriculture

3. Policy Recommendations
   A. Legal
   B. Agriculture extension and development
   C. Research

VII. SUMMARY

NOTES

REFERENCES
ACKNOWLEDGEMENTS

I would like to thank Environment and Policy Institute of East - West Center for inviting me to attend the "Workshop on Rural Ecosystem Sustainability" and providing the excellent research resources and staff support.

In particular, I wish to express my sincerest thanks to Dr. A. Terry Rambo of EAPI, and Dr. Pei Shengji of KIB, Academia Sinica, for giving me the opportunity to attend this workshop held at EAPI, EWC, Hawaii, to Dr. Michael R. Dove, for giving me suggestions, comments and encouragement to write this topic.

Supports, comments and assistance from Ms. Marilyn Li, Ms. June Kumaroto, Ms. Kate Gillogly, Mr. Herri Y. Hadikusumah, Mr. Rusydi, Ms. Fannie Lee Kai and all the participants are very helpful for my writing.

I would also like to thank Prof. Cheng Shanyang, Prof. Xue Jiyu, Dr. Nichal Menzies and Mr. Xu Jianchu. We have worked together and shared ideas in the field.
List of Tables and Figures

Tables:
1. National Structure and Its Changes of Xishuangbanna Population
2. Stages and Cropping System of Dongya System
3. Food Crop Productivity of Dongya and Regulated Swidden System
4. The Classification of Ane (Rattan) by Hani People
5. The Major Ape (Bamboo) Cultivated by Hani People

Figures:
1. Extent of Swidden Agriculture in Yunnan
2. Land Uses Leading to Dongya After Clearing Forest
3. Products Exchanges Between Mountain People an Basin People
I. INTRODUCTION

The argument about swidden agriculture has lasted at least half a century, especially since 1957, when the FAO labeled it as the most serious land-use problem in the tropical world. Shifting cultivation has been condemned as destructive and frequently has been seen as the work of ignorant people, thoughtlessly, slashing and burning, wasting valuable forest and soil resources, and increasing the danger of runoff and erosion (Grandstaff, 1981, Marten, 1984). Rarely have there been attempts to increase productivity through improving the existing alternate cycle system (Weinstock, 1985).

In China, most mountainous people in tropical and subtropical area live on different forms of swidden cultivation. There is a widespread popular belief that swidden cultivation will result in desertification, soil erosion, deforestation, flooding, impoverishment, etc. Even there was a series of programs to regulate, restrict and change it. Most scientists have changed their views through the deep research especially living and working with the swidden cultivators for a long time. Planners also have begun to rethink their ideas on swidden cultivation.

In this paper, the author is going to analyze the Dongya system practiced by the Hani people of Bulang mountain. The Dongya system traditionally exists in Mongsong, and the author will look at its functions, structure, its effect on agroecosystem sustainability, and their integral cyclic agroforestry of annuals with rattan, with bamboo that is characteristic of traditional modified swidden cultivation. The author will also compare traditional, regulated and modified swidden cultivation, and suggest some approaches to develop swidden cultivation to raise the living level of the farmers.
1. Research Problems

A. Extent of swidden agriculture in Yunnan

Swidden cultivation prevails from Nujian Lisu Autonomous Prefecture and Dehong Dai, Jingpo Autonomous Prefecture, to Lingchang and the Southern Simao Prefecture, Xishuangbanna Dai Autonomous Prefecture to Honghe Hani Autonomous Prefecture, which is called "Swidden Belt of Southwest Yunnan" (Pei, 1985, Ying 1987). (see fig. 1).

In Southern Yunnan (Xishuangbanna, Southern part of Simao Prefecture), more than 95% of the total land area is occupied by the swidden cultivators. 235,000 mountainous people engaged in swidden cultivation in Xishuangbanna, which accounts for 48% of the population of the total prefecture (Pei, 1985).

B. Government attitude towards swidden agriculture

Based on the misinformation and misunderstanding in semantic and partial observation, swidden cultivation was considered a backward and destructive agriculture, and restricting policies to eliminate swidden cultivation have been always adopted for at least thirty years.

C. Effect of government attempts to regulate swidden agriculture

There were many attempts to regulate swidden cultivation, which were also influenced by some other programs during the past decades, such as fixing land tenure, expanding paddy field and monoculture, changing farming method and cropping system, and transimmigrating etc.

The swidden cultivators were first, called to cultivate by means of buffalo ploughing without slashing forest; second, solidating the cultivated field; and then reclaiming terraced field to raise the yield per unit land area by means of intensive cultivation. The swidden cultivators did not know how to work with plough, buffalo, and hoe, and how to seed and
Fig. 1. EXTENT OF SWIDDEN AGRICULTURE IN YUNNAN
Source: Ying, 1987
transplant rice seedlings (Xishuangbanna, 1986).

In 1956, it was confirmed that, rubber plantation could be developed in large-scale in Southern Yunnan. The land area had been exploited from 300 individuals in 1949 to 44313.3 ha. in 1982 (Xishuangbanna, 1986). Most primary, secondary forest and swidden fields became national rubber plantation farms. The culture and traditional agriculture had been transformed, some swidden cultivators became rubber plantation workers.

Since 1981, the rural policies were relaxed, expanding personal plot, developing family sideline production, opening rural markets, reducing public grains, abolishing equalitarianism, adapting system of responsibility, and distributing according to the work, etc. In this case, the farmers had much freedom to practice swidden cultivation. At the same time, because of unplanned logging, much forest were destroyed for commercial purposes. The consequences, like soil erosion, deforestation, population pressure, finally expanded through 40 years of accumulation. It is unfair to say it was attributed to swidden cultivation. Based on this condition, "Ling - ye - shan - ding" and "Liang - shan - yi -di " agricultural policies have been adopted by the local bureau in China. These attempts may reduce the deforestation, but the farmers have insufficient land for growing grain and still being lack of cash income.

2. Research Site

Southern Yunnan, generally, refers to Xishuangbanna Dai Autonomous Prefecture and parts of Simao Prefecture, with 21.09' -25.50' north latitude and 93.30' - 106.10' east longitude.
A. Environment

Topography: The mountainous area occupies 95% of Southern Yunnan. It is distributed by middle mountains, low mountains, hills and river basins. The irrigation agriculture especially paddy rice cultivation is limited by the topography in this area.

Climate: Southern Yunnan has a typical tropical monsoon and hot humid river valley climate. In the mountainous area, the annual average temperature is 15 - 21 C., with the lowest in Jan. and the highest in June. Annual rainfall reaches 1200 - 2000 mm and the annual relative humidity is approx. 85 - 88% in the mountainous area. The rainy season starts from May and finishes in Oct., while the other months are dry season. The seasonal climate is the important factor that the swidden cultivation can exist. In the dry season, the slashed plants can be quickly sundried. Then the rainy season provides the seeds sufficient water for their growth.

Edaphic: Three major soil types distributed vertically in this area: leteric soil, 600 - 800m, pH 4.5 - 5.5; crimson soil, 800 - 1500m, pH 4.5 - 6.0; yellow soil, 1500 - 2200m, pH 4.75 - 5.13. The soil in this area is acid soil.

Biotic diversity: Along the mountain areas, the main vegetation is tropical mountainous rainforest, displaying a quality of transactional subtropical evergreen forests. In recent years, owing to the largescale opening up of forests, the vegetation types have changed sharply. Most of the virgin forests have been reduced into secondary ones. Some of them have been replaced by shrubs, bamboos and grassland, with only a few trees left (Pei, 1985). Even though tropical forest still covers approx. one-third of Xishuangbanna, flowering plants and ferns number roughly 4,500 species (Pei, 1984). Especially, many wild species of crops have been preserved in this area, like 3 species of wild rice which is the gene pool
of rice cultivation. Many crop varieties have developed by the local people. There are about 71 varieties of upland rice cultivated by Jinuo people (Ying, 1987). Because of the hot and humid climate, the plants grow very quickly, and vegetation succeeds also soon.

Seasonal climate, montaneous topography and rapid reforestation are the major factors for swidden cultivation existing in this area.

B. People

The rural ecosystem of Southern Yunnan is inhabited by four main ethnic groups: Dai people in basins and riverines; Hani (Akha), Lahu and Bulang in mountainous area before 1949. Recently, the national structure has been changed very much, because Han people from Hunan province immigrating in stocks into this area fell forest and plant rubber in the late 1950s. The indigenous population is also increasing naturally (cf. Table 1).

Table 1. National Structure and its Change of Xishuangbanna Population

<table>
<thead>
<tr>
<th>Nationality</th>
<th>1949(%)</th>
<th>1956(%)</th>
<th>1982(%)</th>
<th>1982(persons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dai</td>
<td>57.40</td>
<td>49.12</td>
<td>34.87</td>
<td>225,485</td>
</tr>
<tr>
<td>Han</td>
<td>0.26</td>
<td>6.80</td>
<td>28.75</td>
<td>185,894</td>
</tr>
<tr>
<td>Hani</td>
<td>16.00</td>
<td>17.75</td>
<td>19.10</td>
<td>129,198</td>
</tr>
<tr>
<td>Lahu</td>
<td>6.50</td>
<td>6.20</td>
<td>5.10</td>
<td>33,336</td>
</tr>
<tr>
<td>Bulang</td>
<td>6.80</td>
<td>7.40</td>
<td>4.20</td>
<td>27,664</td>
</tr>
<tr>
<td>Others</td>
<td>13.10</td>
<td>12.73</td>
<td>7.98</td>
<td>44,872</td>
</tr>
</tbody>
</table>

Source: Xishuangbanna, 1982
In 1949, it was only 10.3 person per square kilometer. According to the 1982 census, the average population density in Xishuangbanna was 33.6 person per square kilometer, which was less than the average population density of Yunnan province with 80 persons per square kilometer.

Close to 291 thousand people still live on swidden agriculture in mountainous area at 800-1700 meters elevation, who occupy more than 95% of the total land area in southern Yunnan.

All of them has formed their own culture, language, religion with the social evolution. Associated with the social development is agricultural development and techniques evolution. Depending on their abundant natural resources, they live in this area for thousands of years. Traditional knowledge has maintained the agroecosystem stable and sustainable. As Pei indicated in 1985, for instance, the careful protection of Holly Hill forest vegetation by the local Dai people has allowed the forest vegetation and its biotic and abiotic components to be maintained in a stable yet internally dynamic ecological balance. So, traditional beliefs and practices are not always bad (Soemarwoto, 1984).

3. Research Design

Three villages were selected as the major cases: Mongsong, Minzhishan and Manan, except 10 general investigation villages.

Human ecological, ethnobotanical, ethnoecological approaches have been applied in this study.
Interviewing the farmers is helpful for me to see the world as they see it. Through the interview, we can understand what their most urgent needs and wishes, the lackness, and the interaction of social system and ecosystem are, about 40 villagers we have interviewd.

In attempting to explain and develop the swidden agriculture, I try to explain and analyze it in two different perspectives. The first is "emic" perspective of the swidden cultivators themselves, and the second is "etic" perspective of the external to the swidden cultivation. This method has been developed for swiddening research by Conklin (1956) and Dove (1986). The purpose of this study: first is to investigate the actual nature, the economic and environmental functions of swidden cultivation, so as to fairly evaluate the swidden agriculture; second, the most important is to develop the living level of the upland farmers.

II. TRADITIONAL AGRICULTURE IN THE RESEARCH AREA

The local people have developed various agricultures in this area, paddy rice cultivation, swidden cultivation, homegarden, and tea plantation are the four major traditional types of agriculture in this area.

Perhaps, no aspects of agroecosystem management are more important to long-term agroecosystem sustainability than those involving the farmers to view the agroecosystem as a whole. It is also notable that traditional agriculture is practiced successfully on many kinds of agroecosystems which including forests, swidden fields, paddy fields, homegarden and etc. These folk perceptions have been ignored by the planners, agronomists, and etc.
1. Classification of Agriculture

Four types of agroecosystems can be found in Southern Yunnan: paddy rice cultivation, swidden agriculture, plantation (rubber, sugarcane, tea), and homegarden (Pei, 1985).

The Hani people traditionally classify the agroecosystem into 5 types and 11 subtypes:

A. Dongya - upland field
   a. Qieya - upland rice field
   b. Adoya - maize field
   c. Aneya - rattan cultivated field
   d. Apeya - bamboo planting field
   e. Aduya - vegetable field

B. Dema/Eya - paddy field

C. Sizi - forest
   a. Songpabawa - headman's forest (water source forest)
   b. Puchang - ritual site forest
   c. Pumuotouzhuo - grayveryard forest
   d. Yapie - fallowed field (grass land or secondary forest)

D. Guo - tree crop plantation garden
   a. Maguo - fruit tree garden
   b. Nuobuoya / Luokeyakuo - tea garden

E. Yakong/oniuyakong - homegarden

The traditional division of agroecosystem by Hani people is based on the following criteria: 1) environment, 2) management, and 3) crop cultivation. They cultivate different crops for different purposes in different environment with different technology and
knowledge. Local people have very rich knowledge about their environment, agricultural technology, classification and utilization of plants. Based on their realization, they have lived in this area for hundreds of years. With the opening of this area by the government, most traditions have to change.

2. Swidden Agriculture

A. Swidden types

Due to a series of attempts during the past decades, swidden agriculture has lost its original features in this area. The swidden cultivation is classified according to cultivation and fallow periods.

Agriculture variation is associated with the tool changes. Different farming methods used in agriculture can lead to different working efficiency and different environment consequences. Associated with the technology development, many new tools have been invented and introduced into swidden societies.

According to fallow period, farming methods, and cropping system, recent swidden agriculture can be divided into following types:

1. Traditional swidden agriculture: short cultivation with long fallow, dibbling stick for seeding, annual cropping. Some Yao, Hani, and Kemu people practice this one. Nowadays, because of many factors, it is too difficult to find traditional swidden cultivation.

2. Developed (Modified) swidden agriculture: medium cultivation without fallow or with cash cropping, various tools, annuals integrated with perennials. 2a. annuals intercropping / rotation; 2b. perennials intercropping / rotation; 2c. annuals - perennials intercropping / rotation, etc.
3. Regulated swidden agriculture: long cultivation with short fallow, hoes and ploughs used for cultivation, annual crops over long time.

B. Swidden place

The location and scale of swidden cultivation depends on the ownership of the land and the cultivation experiences. Except national forests and protected area, in a traditional mountainous village, the land is traditionally divided into various cultivation purposes as stated above. According to different water, soil, climate, vegetation and other environment conditions, the farmer arranges the land in different place.

Swidden field is usually located at the slope of the hills or mountains. Some spread from the top to the bottom, like Minzhishan village, Jiangcheng county.

In Mongsong village, the swidden field is between the civil protected forest - Songpabawa, and paddy rice field or villages. They open the forest from the top to the bottom of the slope year by year. Most swidden groups studied move uphill.

Except house moving and village expanding due to population increase, they don’t open primary forest that is located adjacent to, as they have civil rules to protect it.

III. THE "DONGYA" SYSTEM

Dongya is a synthetic (or comprehensive) agricultural term, which refers to the agroecosystem in the upland area, especially for the rotation agriculture in Hani society. The farmer said, dong means upland, ya means field. Otherwise, paddy field is called "Eya". Under this concept, the other crop plantation names are usually connected with "ya," like "Adoya," "Aneya," "Apeya," etc.
Dongya is the product of generations of trial and error that has adapted Hani people to the local environment, social, cultural, and economic realities of village life while fulfilling a variety of subsistence needs. It is also a successful example of modified swidden cultivation in Southern China for improving the impoverish region. Dongya system is prevailing in the Bulang Mountain area, and we would like to take Mongsong village as the case (see fig.1).

1. Stages and Practices

The Dongya system usually consists of four stages - Qieya, Aduya (or Adoya), Aneya (or Apeya), and annuals cultivation. When they expand their villages, Dongya will be changed to Oniuyakong. Each stage serves a different function (see fig 2.). Qieya is the first stage, mostly planted with upland rice, sometimes intercroped with vegetable. This stage has a food function. Since their grains mostly from this cultivation, food annuals plantation is their original stimulation of swiddening, they have more than ten varieties of upland rices in this village. This stage takes two to three years. While the yield decreases, they plant maize, or vegetable, or rattan, or bamboo. One kind of rotation is rattan directly planted in the rice field. Another kind is rattan planted after maize, etc. In the former condition, the seedlings of rattan are planted in the rice field at the last year of rice plantation. After one or two years, rattan grow higher and occupies the field, and it is difficult for farmer to grow, harvest, and weed rice. The Qieya gradually evolves into Aneya, where wild trees and ground grass mixed with half - grown rattans. After three years, the rattan can climb the forest trees which have grown higher. After five years, the farmer selectively harvests rattan. While the next annual crop plantation begins, they do not
Fig. 2. LAND USES LEADING TO DONGYA SYSTEM AFTER CLEARING FOREST
leave a empty forest.

In some sites, after two to three years annuals croping (rice, or rice to maize), the next rotation is bamboo plantation, which is a good plant for maintaining soil and water. It is called Apeya by the farmers. Next rotation is the successful fourth-rotation. Crops will be started in a five-year-old or older bamboo plantation site. Ginger, or tabacco is used for fourth rotation. As farmers have many years of experiences, these annuals are more suited to the site and more fitted to supply the needs of the locality with bamboo remains after burning.

2. Cropping System

Dongya system has a high diversity. More than 10 varieties of upland rice, four species of cultivated rattan, and more than 15 species of cultivated bamboo can be found in Dongya system in Mongsong village, which have been cultivated and domesticated by the Hani people for hundreds of years. As Aneya immitates the natural rainforest, its diversity can match the natural rainforest. The mixture of annuals and perennials forms both horizontal and vertical structure.

Choice of crop species depends on the distribution of rainfall and temperature, plantation tradition and living needs. The mix of crops and levels of products are the consequence of biological, socioeconomic, and cultural factors.

The species structure of Dongya is different at each season and successional stages.

The Qieya stage is usually dominated by upland rice (Oryza sativa L. spontanea Mat). During the rainy season, it is surrounded by the vegetable seedlings or sometimes intercropping with some annuals which are local annual plants like chilli peper, egg
plant, potato, etc. suited the local environment. They will be mature after rice. During the dry season, Chinese cabbage, watermelon, sesamums, taro, pumpkin, sweet potato will be planted after the rainy season is over. Qieya also provides the farmer other needs, like perfume grass (Gynbopogon citratus), leaves used for seasoning, cover of rotten fish, exchange with Dai people), Coix lacryma-jobi (seed is edible, also used for ornaments, root used for medicine).

The Aneya stage is dominated by a mixture of trees and rattan, forming four vertical layers. The Apaya stage is dominated by various bamboo. There are three types of bamboos harvested to meet farmer's different utilization. One is selectively cutting the mature bamboo. The harvesting takes two to three years. The second is collecting the bamboo shoots, which also exist in other types. The third is clear cutting followed by burning the leaves and branches in piles, and using the ash as fertilizer for annuals cropping period as discussed earlier. Cuozhuoya is dominated by the annuals like tabacco, soybean, and ginger.

3. Temporal Cycle

Fallowing is the period in which the land is prepared for the next shifting cultivation or unused in the future by natural reforestation or feeding livestock and forest enrichment. The dominant vegetation in the fallow is different in each year and different human acting condition and environment condition like grass fallow, feeding livestock, bush fallow, and forest fallow, for next cultivation. If the environment condition is not so good, the grass will stay for a long time. Because the growth ability of Eupatorium coelesticum is very strong, it has spreaded all over the tropical area, especially the fallow field of swidden in
Southern Yunnan.

Fallow period used to be seven years in southern Yunnan. Due to population increase, limited land, and natural soil degradation, the fallow period has been changed very much. In Dongya system, after 1 - 3 yr. annuals cultivation, there are 7 yr. fallow. In each household, according to different requirement, they grow rattan or bamboo in the last year annuals cropping. During the fallow period, there are not only natural plants, but mostly mature cash crops like rattan and bamboo cultivated, so the whole cycle is about 7 - 10 yr.

4. Spatial Cycle

Each farmer had more than 5.0 ha. swidden field in 1956. But each farmer only can possess 1.6ha. for swiddening according to the land law adopted in 1983.

In the case of large land area, the farmer usually practice nomadic cultivation for two reasons: the farmer find a suited place for settling down and the population expansion leads to establish a new village. Rarely can it be seen in China nowadays. In the limited and fixed land, swidden cultivation take two forms, permanent annuals cultivation and integral agroforestry. Dongya system in Mongsong is an integral agroforestry. They exploit all the forest, except water source forest, ritual forest, national forest and fuelwood forest in a certain area in a different year.

They divide their land into six or eight plots. Every year they cultivate one plot. After seven or eight years, the first plot will be mature for next cycle. The swidden cultivator unit has taken three types in the history. Before 1949, all the farmers in the same tribe worked together, slashing, burning, seeding, weeding, and harvesting. Since 1950s to 1970s, all the farmers in the collective work together, unequally contribution, equally distribution.
After 1982, it takes family as the working unit. Each family has different large scale plots in different places, but usually on the same hill for conveniently rotated cultivation.

Table 2. Stages and Cropping System of Dongya System

<table>
<thead>
<tr>
<th>Name of Stage</th>
<th>Length of Stage</th>
<th>Major Cultigens</th>
<th>Major Constraints</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qieya</td>
<td>1-3 yr.</td>
<td>Rice</td>
<td>Limited land</td>
</tr>
<tr>
<td>Aduya</td>
<td>1-2 yr.</td>
<td>Maize</td>
<td>Soil Degradation</td>
</tr>
<tr>
<td>Adoya</td>
<td>1-2 yr.</td>
<td>Vegetable</td>
<td>Soil Degradation</td>
</tr>
<tr>
<td>Aneya</td>
<td>5-7 yr.</td>
<td>Rattan</td>
<td>Labor</td>
</tr>
<tr>
<td>Apeya</td>
<td>3-5 yr.</td>
<td>Bamboo</td>
<td>Labor</td>
</tr>
<tr>
<td>Annuals</td>
<td>1-2 yr.</td>
<td>Ginger</td>
<td>Labor</td>
</tr>
</tbody>
</table>

5. Productivity

Statistics shows that the yield of upland rice in Xishuangbanna is only 1.5 ton / per crop / per ha. On the other hand, the average production of wet rice is 3 ton / per crop / per ha. However, some research reports indicate that upland rice production is up to 2.5 - 3.2 ton / per crop / per ha in some swidden areas (Wang, 1964, Pei, 1985). The upland rice production of Mongsong village is up to 3.75 ton / per ha., but in the regulated swidden cultivation is only 1.56 ton / per ha. in Jiangchen village (see table 3).
Table 3. Food Crop Productivity of Dongya System (Mongsong) and Regulated Swidden (Minzhishan)

<table>
<thead>
<tr>
<th>Crops</th>
<th>Mongsong(Dongya)</th>
<th>Minzhishan(Regulated)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paddy Rice</td>
<td>5.85 ton / ha.</td>
<td>2.2 ton / ha.</td>
</tr>
<tr>
<td>Upland Rice</td>
<td>3.75 ton / ha.</td>
<td>1.56 ton / ha.</td>
</tr>
<tr>
<td>Maize</td>
<td>2.25 ton / ha.</td>
<td>1.52 ton / ha.</td>
</tr>
</tbody>
</table>

Productivity of wet rice per unit of land tends to be low, but productivity per unit of labour is high. Food crop productivity is one of the agroecosystem output. Cash crop such as rattan, bamboo, games, and minor forest products are partial from swidden field. These should be considered in the productivity of swidden agroecosystem. The farmer say they spend much more time working in a little amount of paddy field, but our grain and cash income are mostly from Dongya.

IV. CASH CROPPING

Southern Yunnan is famous for the successful rubber tree plantation and traditional tea plantation in China. But the traditional cash crop plantation has been ignored, in which, rattan is one of the main traditional cash crops of the Hani people in Mongsong, and bamboo is the major crop all over southern Yunnan. They utilize both cultivated and wild rattan and bamboo, but the wild one in the jungles is considered as the germplasm by the Hani people. This cultivation of rattan and bamboo practices not only increase the farmers
profits but also relieve some of the pressure on natural resources. The utilization of rattan and bamboo in Southeast Asia is considered as the culture of rattan and bamboo.

1. Cropping System: Rattan and Bamboo

The cultivated rattan of Hani people is selectively domesticated from their surrounding jungles, which are traditionally divided into four species according to their morphological observation and physical natures from their handmaking article of daily need (see table 4).

Rattan is a wood vine whose natural habitat is tropical rainforest. As it grows, it climbs the forest trees, securing itself by means of barbed whips which protrude laterally from the main stem and from the leaf tips. Its growth is rapid with as much as several meters being added to its length in a single year (Weinstock, 1986). The upper layer is occupied by the perennial trees; the second layer is occupied by some wild bamboo or tea trees or tree ferns; third layer is occupied by the younger rattan, grass, and herbaceous ferns. Mature rattan usually makes use of any layers as the sunlight and rainfall is available, which forms extra layer with some other epiphyte and vines.
Table 4: The Classification of Ane (Rattan) By Hani People

<table>
<thead>
<tr>
<th>Hani Name</th>
<th>Scientific Name</th>
<th>Physical Nature</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Danghong</td>
<td>Calamus yunnanensis</td>
<td>Tenacious</td>
<td>1.2</td>
</tr>
<tr>
<td>Haji</td>
<td>Pletocomia kerrana</td>
<td>Fragile</td>
<td>0.5</td>
</tr>
<tr>
<td>Lebele</td>
<td>C. yunnanensis var. xishuangbannaensis</td>
<td>Tenacious</td>
<td>1.2</td>
</tr>
<tr>
<td>Le</td>
<td>C. sp.</td>
<td>Fragile</td>
<td>0.5</td>
</tr>
</tbody>
</table>

* Price: RMB / Kg, 1989

** Danghong and Le are very difficult to be divided.

Rattan’s flexibility and long stems of great strength have led to its use as a primary binding material (Weinstock, 1983).

Bamboo is cultivated both in Dongya system and Yakong (homegarden). There are more than fifteen species of cultivated bamboo found in one village (The majors are listed in table 5).
Table 5: The Major Ape (Bamboo) Cultivated By Hani People

<table>
<thead>
<tr>
<th>Hani Name</th>
<th>Scientific Name</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ajie</td>
<td>Dendrocalamus giganteus</td>
<td>Construction</td>
</tr>
<tr>
<td>Aqie</td>
<td>D. hamiltonii</td>
<td>Shoots for vegetable</td>
</tr>
<tr>
<td>Amio</td>
<td>Dinochloa puberula</td>
<td>Seeds for food</td>
</tr>
<tr>
<td>Aniu</td>
<td>Oxytenanthera felix</td>
<td>Construction</td>
</tr>
<tr>
<td>Ane</td>
<td>Dendrocalamus sp.</td>
<td>Weaving</td>
</tr>
<tr>
<td>Axio</td>
<td>Gigantus sp.</td>
<td>Ornaments</td>
</tr>
<tr>
<td>Aha</td>
<td>Pleioblastus sp.</td>
<td>Shoots</td>
</tr>
</tbody>
</table>

2. Cropping Practices

Rattan and bamboo are not only planted in Dongya system, but also alternately planted in the Yakong (homegarden) and permanently planted in the valley where the slope is very steep and the water is rich.

In Dongya system as discussed above, rattan is usually transplanted in June to July and harvested from Oct. to Nov. In the case of the upland rice yield is getting lower, the Qiye field will be changed to plant rattan and bamboo. The Hani people know very much about their environment including the uses of many plants, such as in what ecological situation the rattan can grow better. The species selection of rattan of Hani people is based on the physical nature, such as Danghong and Lebele are the common cultivated rattan, for their
good upsplit quality and tenacious. The seedlings are transplanted in the rice field from
the jungles or from mature Aneya, and Songpabawa is the major germplasm of rattan. On
the other hand, the farmers collect the rattan seeds from the rainforest in Oct. to
Nov., when the seeds are mature. When the land is again ready to be used for food crop
cultivation, typically five to ten years, the farmers return not to "empty" forest but to a
mature rattan forest. The rattan is harvested for home consumption or for sale and then the
forest is again cut, burned, and planted with rice and other food crops. During the
harvesting period, the seedlings of rattan are moved to a new Qieya field and seeds are
collected for breeding. In the valleys, the forest is left when farmers slash and burn the
forest on the slope for annuals cultivation, which can provide rattan arboreal support and
shade by existing trees. Rattan is perennially grown in these places which can provide
permanent products and seeds.

In Songpabawa forest, there are much rattan can be used, but they don’t harvest it.
There are two reasons. First, since Songpabawa belongs to the collective village, it is the
treasure of the whole village. Second, the farmer said that Sonpabawa is the source of
water, seeds of rattan and medicine.

3. Temporal Cycle

Different cultivation has different cyclic period. Monoculture like sugarcane plantation
needs 2 - 3 years, rubber tree plantation needs 20 - 30 years. Traditional cash crop like
rattan plantation needs 5 - 7 years, bamboo plantation needs 3 - 5 years. Traditional
swidden usually needs 7 - 13 years. The Hani people practice both traditional and
rattan, bamboo / swidden cultivation. As is typical of swidden cultivators, they slash and
burn a section of forest, and plant upland rice and other annuals. After 2 - 3 years, the land is allowed to regenerate into forest, bush, sometimes Eupatorium grassland. The difference between rattan, bamboo / swidden and traditional swidden is that, when rattan and bamboo forest plantation is again ready to be used for food crop cultivation, the land has provided both cash income for the farmer and enough biomass for the next annual plantation. Henceforth, every year he makes a new swidden, and harvests another mature rattan and bamboo field. Bamboo remains, the farmer said, are also good for some annuals plantation as described previously.

V. THE FUNCTIONS OF THE DONGYA SYSTEM

Various agricultural strategies have been tried in swidden areas of tropical rainforest. Some have focused on food production, others on cash crops. Certain strategies have disrupted the ecological balance of the rainforest, while others developed with ecological stability in mind, but rarely have production and cash cropping been coterminous and maintained ecological stability (Weinstock, 1983). The "corridor system" tried by the Belgians in the Congo (Sanchez, 1976, Weinstock, 1983); "rattan / swidden system" practiced by the Luangan in Indonesia (Weinstock, 1983) provided both ecological and economic stability and sustainability. Dongya system traditionally practiced by the Hani swidden cultivators in Xishuangbanna of China is a traditional swidden agroecosystem of producing both subsistence consumption and cash income without environmental consequence and ecological disruption. Many different kinds of crops and wild plants grow in Dongya system. Crops diversity provides a balanced diet, serves the household cash
income, spreads labour requirement and the harvest over the year, reserves the germplasm of cultivated plants and domesticated crops, and also avoid unstably depending on few crops.

1. Subsistence Orientation

Food crops cultivation is the original stimulation, Dongya system not only provides the farmer grain, but also various vegetable, medicine and ornaments. The diversity of the crops in Dongya system provides the farmer diets with different nutrients over the year, and minor products for their various use. Except rice, there are more than 20 species annuals often grown in the Qiaya fields, for instance, grains like *Coix lachryma-jobi*, *Impomoea babatus*, *Corex bacinus*; vegetable like *Colocasia aquatica*, *Amaranthus spinosa*, etc.; perfumes like *Cymbopogon citratus*, *Adenosma buchnerioides*, etc., fruits like *Citruilus vulgaris*, *C. melo*, *C. pepo*, etc.. In the fallow fields, many plants have also been used and gathered such as *Meconopsis spp.*, *Phyllanthus asteranthus* (fruits), *Imperata cylindrica* (roots used as herb medicine, leaves used as thatch), *Thysanolaena maxima* (dry flowers used for making broom), etc.

Rattan and bamboo are major products from the Dongya system. They are used for house construction, articles of daily needs, etc. The rattan is invaluable to village-life that one can speak of the rattan civilization of Southeast Asia as one can speak of the tree-palm civilization of India and the bamboo civilization of Indochina, China and Japan (Corner, 1966,p. 220). Not all the Hani people cultivate rattan. Hani people in Mongsong is famous for their rattan plantations and stable cash income. Fuelwood usually comes from swidden field. It is different from the Dai people in the basins. They plant rapid fuelwood
Cassia siamea. After felling, slashing, and drying, the trunks and branches will be collected together and taken back to the house used for fuel and house construction.

2. Marketing Orientation

The diversity of Dongya system provides the Dongya cultivators different products for their exchange and cash income. It is very common to have exchange household needs among different ethnic groups or between mountainous groups and riverine groups. For instance, Hani people usually bring their swidden products such as pumpkins, potatoes, yams, bamboo and rattan handicrafts, and games down to the basins to exchange clothes, needles, sometimes rice with Dai people. Or they sell these products in the rural markets, and then purchase radio, sewing machine, bicycle, etc. They can make cash income about 640 RMB each person per year (see fig.3.).

The cash income from Dongya system comes from selling their plant products and animal products (grain, grass as the fodder). They grow rice in the rainy season (May to Sept), and vegetable in the dry season (Oct. to Apr.). Swidden cash income increases in dry season. There is a tendancy for the income from the Dongya cultivator in Mongsong to be higher than the income from regulated swidden cultivation in Minzhishan (see table 2.).

The farmer takes two types of trading: one is barter, the other is directly to the market. If they have left enough for their home consumption, the rest will be sold in the market or exchanged with other people. There was no cash exchange except tea in the traditional societies, and barter was the most important economic type before 1949 (Xishuangbana, 1986). Since rural society was opened, their need of cash is increasing, and
Fig. 3. PRODUCTS EXCHANGE BETWEEN MOUNTAINEOUS GROUP AND BASIN GROUP

Hani Village  Dai Village  Rural Market  National Farm

- rattan, bamboo (shoots)
- potato, flowers, fruits, taro
- cash
- rattan, bamboo (shoots), vegetable
- cash, radio, bicycle, cloth, salt
the cash economy has been developed greatly in the upland agroecosystem.

Cash and noncash economies, distance to market, types or varieties of crops grown, and population density are major determinants for commercial transactions (Thandee, 1984). The cultural and subsistence needs of the farmers are also the important factors, especially in tropical Yunnan, they need not only food, clothes, but also radios, bicycles, and sewing machines. Crops in the swidden agriculture provide not only for home consumption, but also for social and cultural needs of the family and community.

3. Impact On Environment

A. Soil and water conservation

Agroecosystem function can change the natural resource base, an important with significant consequences for agricultural sustainability. Perhaps, the most important impact is soil conservation - maintaining soil fertility and preventing soil loss due to erosion. Most of the erosion on a field can be caused by the few heaviest rainstorm in the year if the soil surface is bare (Saltman, 1984).

In Dongya system of Hani agriculture, the land is almost always covered with vegetation and tree roots are left in soil, the annual crops are seeded when the rainy season comes, during which the organic matter content of the topsoil increases (enriches), so rice seedling and some weeds grow up. The root system of rice and some weeds are also good for maintaining water and soil nutrients. Relating to the long-term soil and water conservation, bamboo is also the plants for soil and water conservation, because of their complex roots system which can reach the deep soil. Aneya is a natural forest with cash crop - rattan, the function of soil and water conservation is obvious.
B. Germplasm preservation

The more accessible minor plant products are rapidly becoming exhausted. Many species have disappeared or become rare and endangered species, and the pressure on the natural forest is increasing. These consequences are always attributed to swidden cultivation. In fact, it is because of the failure of management to meet the increasing population, and the failure of fault regulation in the past decades.

There are different results among different management of upland agriculture. About 41333.3 ha forest has been substituted by rubber plantation. In Minzhishan with regulated swidden, there is only one species of rattan. But the farmer said they had three species ten years ago. In Dongya system, there are four species of rattan and more than twenty varieties of upland rice. As they plant many crops for home consumption and commercial purposes, they don’t need to collect them from natural forest in great amount. Simultaneously, wild animals in the jungles also have been preserved.

C. Domestication of Crops.

Domestication of crops is the most important factor of the development of agriculture. Usually, cultivated plants are from traditional agriculture, especially those close to the nature. They know the wild plants very much. An important significance of swidden cultivation is domestication of wild plants. Dai people have domesticated 67 species of crops from the surrounding forests (Yu, 1985). The mountainous people also have domesticated many wild plants like *Calamus spp.*, *Zinge spp.*, and many species of bamboo into their swidden field and home garden.
VI. DISCUSSION

The rich and practical knowledge and techniques that farmers possess and employ are important, yet often overlooked element in the evolution and analysis of traditional agriculture. The ignorance that the farmers have lived in their agroecosystem for thousands of years cause a series of failures in official regulation programs. Knowing how traditional agriculture affects the environment, socioeconomy and culture is the key to understand why it has been able to function for centuries on sustainable basis and make the more suitable plans to develop the upland agriculture. The traditional agroecosystem, of course, has both advantages and disadvantages, which is necessary to be further realized.

1. Strengths and Weaknesses of the traditional System

A. Economic stability

Monetary value is the most universal measure of agroecosystem production, but no single measure - not even monetary value - is of universal significance (Marten, 1988). The cash and labour investment for paddy field is much higher than upland field. Every year, they should buy chemical fertilizer and pesticides for paddy field, and should do weeding and intensive transplanting. Otherwise, the output of swidden field flows into paddy field.

Dongya provides the farmers various products for barter, and cash increase in every year. There are several factors: a. the technology of planting cash crop has been developed, b. the products are more suited to the market demands, c. transportation is getting better.

The crops that cash income derives from are domesticated from the local vegetation, which have adapted the local environment's sudden changes. Moreover, because of the diversity of the crops, the cash income is not influenced by the reduction of one species.
In different seasons, they also can harvest some species crops for cash or exchange, so the economy does not fluctuate from year to year. In another word, various crop may be considered stable if grown for a market economy with fluctuating prices.

B. Environmental Sustainability

Soil and water erosion, destructive of forest, impoverishment of the upland farmers have been attributed to swidden agriculture. In fact, different swidden form has different impact on the environment (see table 6). In its traditional form, swidden agriculture was applied to a system of forest cutting, cropping, and fallowing that was sustainable, because the cultivator was a long-term resident in one place with rotated cropping in the surrounding area. The fallow period was long enough in secondary forest to permit rebuilding of the nutrient budget on one site prior to cutting, and usually burning for the next cropping period (Hamilton, 1985).

Regulated swidden exist in tropical Yunnan is characterized by the ploughing soil upset on the deep slope or on the top of the mountain. It is evident that swidden will lead to soil nutrient and water erosion, and stream sedimentation. Applying chemical fertilizer and herbicides also leads to change the soil and flora structure.

Aneya in Dongya system as a traditional modified swidden system is a mimic of the rain forest, and bamboo forest is actual type of tropical forests. The farmers only have added some artificial elements into the natural forest, or added one or more succession during the natural succeeding of reforestation for the farmer's subsistence, socioeconomic purposes. It is suggested that, these traditional systems are successful because they imitate the structure, diversity and productivity of natural ecosystem (Gertz, 1963, Rambo, 1984). In this view, they are stable because they are pseudo - climax communities. These traditional
systems are sustainable because the farmers are able to use essentially free natural energy to set back the succession to a pioneer stage favorable to the growth of crop species (Rambo, 1984).

Table 6. Environmental Impacts of Different Swidden Types

<table>
<thead>
<tr>
<th>Swidden Types</th>
<th>Impact on Soil Erosion</th>
<th>Impact on Soil Nutrients</th>
<th>Diversity of Cultigens</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional</td>
<td>Light</td>
<td>Light</td>
<td>Medium</td>
</tr>
<tr>
<td>Regulated</td>
<td>Heavy</td>
<td>Heavy</td>
<td>Low</td>
</tr>
<tr>
<td>Modified</td>
<td>Medium</td>
<td>Light</td>
<td>High</td>
</tr>
</tbody>
</table>

Swidden cultivation does not sufficiently make use of soil nutrient and light. During the annual cropping, the root can't reach the deep soil which contains much more water and mineral material. During the perennial cropping period, the roots mostly use the deep soil, but the topsoil contains much more organic nutrients. So, imitating the natural rain forest, farmers make use of sufficient material and energy from the environment to practice agro-forestry, i.e. intercropping of annuals and perennials. It is also considered that, in Xishuangbanna, as in northern India, shifting cultivation is undertaken on steep slopes (30 - 40). It involves large loss of topsoil, water and soil nutrients during the cropping period, and extended fallow period is required for soil to recover. As the length of the cycle is reduced, the degree of soil recover is reduced, the yield of the land declines, and the spiral
of environmental declines begins (Mishm, 1983, Haigh, 1985). We should make distinctions among traditional swidden, regulated swidden, and modified swidden agriculture existing in China to evaluate its impacts, which have different effects on the environment as discussed previously (see table 6.).

C. Integration of swidden agriculture and cash cropping

We have not much land to alternate to feed the increasing population in tropical area. It is necessary to develop more efficient integral agroecosystem of annuals and perennials continuously to occupy the same parcel of land.

Perennials may be planted alternate rows or alternate strips with food crop annuals, or perennials may be planted randomly amid the annuals. For instance, rice, fodder, fuelwood, building materials and other forest products are gained through the planting of perennials (Weinstock, 1985). Since traditional swidden has a weakness of insufficiently making use of material and energy as stated above, due to its long term fallow, traditional swidden required an extensive land area to maintain ecological stability. While through the use of shorter fallow periods in certain farms of integral agroforestry, ecological stability can be sustained in areas having higher man / land ratios (Weinstock, 1985).

In Dongya system, rattan or bamboo are not competing with annuals during the period of food crop production, because the Hani people plant the rattan seedlings in the last year of food annuals cultivation or transplant the bamboo after food annuals cropping. From the temporal view, planted rattan or bamboo make secondary forest during the fallow period in the same site commercially exploited. Comparing Dongya system of Hani with Taungya (Allsop, 1949, Weinstock, 1985) or simultaneous cropping system (Weinstock), which has minimized the problems of shading. But the requirement of labor input are much higher in
Dongya than that of traditional swidden system both in amount and timing. In traditional swidden, the farmer can make some cash income through selling the minor products, but it depends on the naturally growing plants which they can not control to suit the market demands, and it requires an extensive land area, long-term rotation.

2. Implication of Outlawing Swidden Agriculture

The agricultural goals and strategies of China have been aimed at increasing the food production (rice, wheat, and corn) since 1950s, and also based on expanding rice paddy irrigation field, agricultural regulation including improving modern varieties of paddy rice, adapting chemicals and fertilizer, insecticides and terraced field. At the same time, monoculture of rubber tree and tea tree plantation has been greatly expanded in this area with developing the monoculture, environmentalists, economists, and government have paid special attention to restrict the so-called "slash-and-burn" agriculture, and ignored the traditional ethnic cash crops existing in the traditional swidden societies, and attributed all negative impacts to it. It leads to a series of consequences during the past years.

A. Impact on Cash Cropping

Most swidden field have been replaced with rubber tree plantation by the national farms, which was practiced by the immigrants from central China or put under the local forestry bureau for reforestation. Except natural resource, the state investment for the farmers is 420,000,000 RMB more than the cash income from the rubber from 1970-1980. It is relevant that rubber plantation is the failure example from economic and environmental view.
The farmers have developed many cash crops in their traditional agriculture, as discussed above, and established a series of techniques to plant cash crops. These technology and strategies are acceptable for society and environment which have both socioeconomic and ecological significance, but which have been neglected by the planners, and economists. For example, rattan planted by Hani, which is in great demand in the world market, is also commonly used by themselves, bamboo cultivated by most local people, Cassia siamea is an important fuelwood plantation by Dai people in Xishuangbanna (Pei, 1987). Annuals, like ginger, tobacco, and beans are cultivated after bamboo plantation etc. All of these have not attracted them, otherwise, swidden agriculture involving cash cropping has been restricted. In the case of great demand of these crops, they have to import it from neighbouring countries.

B. Possible stimulation of illegal agriculture & cash crop

During the Cultural Revolution, all China was urged to replace forest by grain lands, irrespective of local cultural traditions or environmental considerations (Leeming, 1985, Haigh, 1985). Especially, swidden field was mostly replaced by terraced field and tree plantation, otherwise, the swidden cultivators were called to immigrate to basins, and to exploit small valleys into paddy fields since 1950s. For restricting swidden agriculture, "Liang - shan - yi - di" and "Ling - ye - shan - ding" had been adopted in 1982 and 1983 by the government. And the population is always increasing. It caused the reduction of fallow period from 7 - 13 yr. to 3 - 5 yr. and even to 1 yr. (Ying, 1990). The nutrients provided by the regenerated forest during the fallow period, the adoption of ploughing on the swidden field or digging by hoes caused the heavily soil erosion. The fallow period is not enough for reforestation and production of enough biomass for next swidden cycle, and
the annuals productivity becomes lower year by year. In the result, the farmers have to open other forest or immigrate to other place, but because of the solidation agricultural policies, it means they will lose their land if they move to other place. To solve this problem, "Liang - hua - shnag - shan" program (chemical fertilizer and chemical insecticided developed to the mountains) was put into practice. It led the soil structure to change worse.

3. Policy Recommendation

A. Legal

From the above analysis, we would like to suggest to planners, environmentalists, foresters, and economists that, all environment destructions attributed to swidden cultivation is unfair. It is neccessary to consider not only different forms of swidden, but also the regulation program based on the actual information and understanding. In the low density population area, we should make swidden cultivation legal, or develop it more efficient. In some higher population area, the best way is to help them develop agroforestry. In destructive forest area, it is to promote reforestation to farmers.

B. Agriculture extension and development

(1) To quicken reforestation

Reforestation is generally defined as the natural or artificial restocking of an area with forest trees, including measures obtain natural regeneration as well as tree planting and seeding (Hamilton, 1983).

It should accept any forms of reforestation suiting the subsistence and socioeconomic needs of the farmers and protecting natural resources or environment. There are some
programs to quicken reforestation in the area. In fact, traditional agroforestries in the
tropical area are also reforestation with more benefits from the forests.

(2). Agroforestry

Many successful modified or developed swidden cultivation like Dongya system in
Xishuangbanna, Taungya in Burma, Talun in Indonesia, Corridor system in Congo, have
been practiced in the tropical world traditionally. Another example is swidden fuelwood
agroforestry, for instance, in the second or third year of swidden cultivation lands, the
seeds of Cassia siamea are spread with dryland rice seeds, 3 - 5 yr later, the trees can
provide fine fuel wood for their consumption. Planting tea trees under yunnan camphor
plantation provides a small amount of tea for their home consumption and local
markets (Pei, 1985, Xu, 1987), which is traditionally practiced by Dai people.

In recent years, integrated system has been developed in some mountainous areas of
the tropics for subsistence and commercial purposes of both farmers and government
experimented by the institutions. Even though, agroforestry system has not gained leading
position in the mountain areas agriculture yet, it is no doubt that some effective models of
the system will be developed quickly in the tropics (Xu, 1987). Therefore, exploiting, and
spreading of agroforestry system should be considered from both traditional experiences of
the local people acceptive and their needs for exchanges and marketing among different
ethnic groups.

3. Research

There were a few studies of swidden cultivation in China. Only some fragmentary
materials appeared in some monographs and ethnic investigation reports ( National
Committee of China, 1956; Spencer, 1966) before 1980s.

Recently, some papers have been published since heated dispute about the relation of swidden cultivation and tropical deforestation in China (Xishuangbanna Territory Economy, 1983, unpublished; Pei, 1985; Haigh, 1985; Xu, 1987; Yang, 1987; Ying, 1988; Menzies, 1988). Dongya system with high productivity, stability and sustainability has been practiced by the Hani people in Mongsong for hundreds of years. It can be transferred for the development of impoverish area.

The research topics listed here are aimed at a deeper understanding and investigating, studying for rural system development of upland.

A. Investigation of existing swidden agroecosystem

* The knowledge and perceptions of swidden cultivators about their environment: ethnobotany, ethnoecology.

* Farming methods of swidden cultivation and its impacts on the soil and water conservation

* Comparison research: traditional, regulated, developed, modified swidden cultivation; the past, present and the future

* Economic sources of the swidden cultivator: input and output; relation of swidden and other system

* Vegetation succession on swidden field: swidden cause deforestation and species loss?

B. Understanding swidden agroecosystem from human ecological approach

* The local people lived on swidden cultivation for thousands of years, is it stable, sustainable, autonomous?
Different swidden forms have different flows of material, energy and information with different properties.

Understanding the social and environmental impact of the government attempts

C. Development of swidden agroecosystem

* Dongya system: from traditional swidden to agroforestry
* Experiments of agroforestry to meet the farmers' needs and national demands
* Testing and modifying of existing swidden agroforestry
* Spreading the successful modification swidden cultivation.
* Extension needs in swidden cultivation, according to cultivators themselves
* Actual amount of land & number of people involved in swidden systems in China
* Current contribution of swidden system to national economy from rattan and bamboo
* Inventory of traditional cultigens used in all swidden systems
* Current limitations factors in swidden cultivation according to the cultivators themselves

VII. SUMMARY

Swidden cultivation has been condemned as the destructive and has frequently been seen as the work of ignorant people by economists, environmentalists and planners etc., the most serious problems in the tropical Yunnan - soil erosion, deforestation, species loss, - impoverishment are always attributed to swidden cultivation.

Swidden cultivation used to be classified according to fallow period. I have divided swidden agriculture in Southern Yunnan into three types: traditional, regulated and
developed (modified) swidden agriculture, according to fallow period, farming method and cropping system.

Dongya system, one of the traditionally modified swidden agriculture, has been practiced by Hani people of Mongsong for hundreds of years. It is the product of generations of trials that have been adapted to the local environment and socioeconomic realities of village life. Dongya system consists of four stages: Qieya (upland rice cultivation); Aduya or Adoya (maize or vegetable cultivation); Aneya (rattan plantation) or Apeya (bamboo plantation); NA* (annuals like ginger, tobacco, bean cultivation).

Rattan and bamboo are the major cash crops in the Dongya system. Rattan is usually planted in the upland rice fields or maize fields in the last year of annuals food cultivation. When rattan and bamboo forest plantation is ready again to be used for food crop cultivation, the land has provided both cash income and materials for the farmer and enough biomass for the next food annuals cultivation. Hence, these swidden agroecosystems are continually productive.

Different swidden forms have different impacts on the environments, with different productivity, stability and sustainability. Government attempts to regulate swidden agriculture and promote intensive agriculture caused illegal and more destructive forms of swidden agriculture during the past decades. Dongya system as a modified or developed swidden agroecosystem produces both home consumption and cash income for the farmers without environmental consequences and ecological disruption, because it imitates natural forest. The farmers only have added some artificial elements or some succession during the natural succeeding for the farmer's subsistence, socioeconomic purposes. In essence, some traditional modified swidden system can be spreaded to develop the living level of
rural people, because they are successful and acceptable in the local conditions and also can meet the needs of both farmer and nation.

* NA: name not available, but it is a transition stage leading to homegarden.

Notes
1. Ling-ye-shan-ding refers to stabilizing the ownership of mountains and forests, designing the hills for personal needs, and setting responsibility system of forest management.
2. Liang-shan-yi-di refers to the land being divided into responsible hills, personal hills and swidden fields for household.

REFERENCES
Allsop, F.,

Conklin, H. C.,

Christanty L. et al,
1986, Traditional Agroforestry in West Java: The Pekarangan (Homegarden) and Kebun-Talun (Annual-Perennial Rotation) Cropping System. Traditional Agriculture in Southeast Asia. Edited by Marten G. G.
Dove, M. R.,


Haigh, M. J.,


Hamilton, L. S.,


McGrath, D. G.,


Pei Shengji,

1985, Preliminary Survey of Swidden Cultivation in the Tropical Area of Yunnan, China, From Ethnoecology Point of View, paper presented on Workshop on Rural Ecosystem Research, Nanjing, China.

1986a, Traditional Agroecosystems in Xishuangbanna, Yunnan, China, Papaer presented for SUAN Symposium at Chiangmai university, Thailand.

Rambo, A. T.,

1984b, Human Ecology Research by Social Scientists on Tropical Agroecosystem, the same as above.
1984c, No Free Lunch: A Reexamination of The Energetic Efficiency of Swidden Agriculture.
1984d, Information Flow in the Functioning of Tropical Ecosystem.

Peluso, N. L.,

Networking in the Commons: A Tragedy for Rattan in Indonesia.

Polthanee, A. et al,

1986, Rainfed Cropping System in Northeast Thailand, Traditional Agriculture in Southeast Asia, Edited by Marten, G. G.
Spencer, J. E.,
1966, Shifting Cultivation Southeast Asia, University of California Publication in Geography Vol. 19, University of California Press.

Weinstock, J. A.,
1985, Alternate Cycle Agroforestry, Agroforestry System 3. no. 4

Xishuangbanna Editing Group,

National Committee,

Xu Zaifu,

Ying Shaoting,