

SHIFTING CULTIVATION AND COPING MEASURES TO DEAL WITH FOOD SHORTAGES AMONG THE THAI AND KHMU IN KY SON DISTRICT, NGHE AN PROVINCE

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1. Research Background

Slash and burn agriculture, shifting cultivation, and swidden agriculture are all modes of exploiting hilly land which is most ancient and has been maintained through the present in most tropical countries in Asia, Africa and Latin America. In Vietnam, shifting cultivation is a popular mode of cultivation used by ethnic groups in mountainous areas, particularly those who live in the highlands where the hillside slopes as steeply as 25° in some areas (FIPI, 1990). According to the Planning and Designing Institute branch of the Ministry of Agriculture (1993), of the 2.7 million ha of agricultural land in Vietnam's mountainous areas, up to 1.4 million ha are hillside fields. Shifting cultivation is always closely linked to food security for mountainous ethnic groups in Vietnam.

Ky Son is a mountain district which is considered the poorest in Nghe An Province. A report released by Ky Son District People's Committee in 2005 says that the poverty rate is over 80% in the district.¹ The population of the district in 2006 was 65,094 persons, and included five ethnic groups:

Hmong (36.7%), Khmu (32.6%), Thai (27.0%), Kinh and other ethnic minority groups (3.7%). The natural land area of this district is 209,484 ha; of that land, the area under wet rice cultivation is only 900 ha (or 0.014 ha/person on an average), and the remaining agricultural area is hillside land. According to the 2006 district statistics, the total cultivated area in the district was 13,780 ha, of which the area under wet rice cultivation was about 900 ha, and the remaining 12,880 ha was hillside land. As this data shows, shifting cultivation is the main production mode used by the ethnic groups in Ky Son district.

For mountainous ethnic groups such as those in Ky Son district who rely on shifting cultivation, it is necessary to exploit the available natural resources, such as hillside land, forests, living things and water sources, in order to earn enough income to meet their daily needs. In the past, shifting cultivation was self-sufficient and almost no commodity production was practiced. Mountainous ethnic groups exploited natural resources to meet their food needs. However, today, as a result of the development of markets and transportation, the focus of highlanders in general, and those in Ky Son district in particular, has shifted to commodity

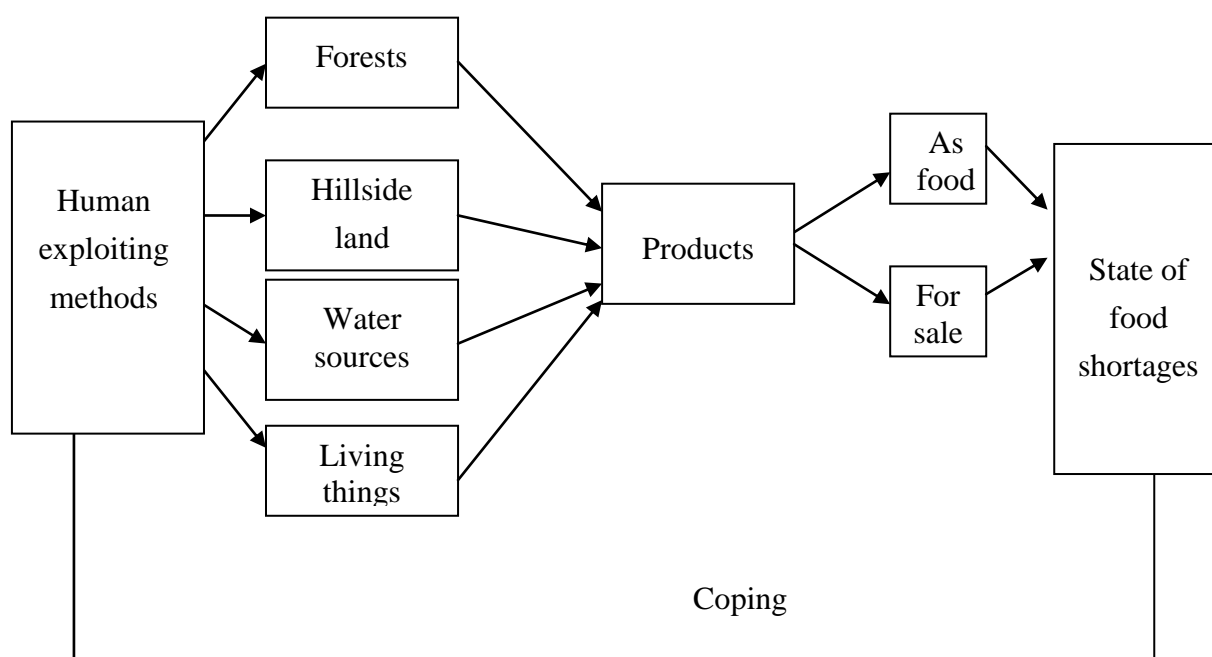
¹ Calculated using the new poverty standard.

production. This means they farm not only for their own food but also for sale. Therefore, they can exploit natural resources to generate different income sources, to help directly or indirectly eliminate hunger. Thus the perception of food security for the ethnic groups in mountainous areas in general and in Ky Son district in particular is now not limited in the

production food but other commodity products to generate income, contributing to a stable food market for them. In reality, the lives of these people are closely linked to the restoration and regeneration of natural resources.

Activities to exploit available natural resources of the mountainous ethnic groups in their shifting cultivation are shown in Diagram 1 below.

Diagram 1: Exploiting natural resources and the issue of food security of upland farmers



In the shifting cultivation system, restoration and regeneration of natural resources are always dependent on the interaction of mountainous ethnic groups. This is well understood by the ethnic groups in mountainous areas. Forests protect hillside land and terrace fields from erosion, and rivers, streams, ponds and lakes provide water to humans. Forests also provide many products, contributing to reducing food pressure on upland farms. Sustainable development of hillside farming will reduce

pressure on forests, contributing to restoring and regenerating forests. Products from hillside farming, husbandry, rivers, streams, ponds and lakes will contribute remarkably to reducing pressure on these ethnic groups to exploit the forests, thus ensuring the sustainable existence of said forests. When the exploitation of natural resources cannot meet human food needs, food shortages will take place. In such a situation, the most important coping measure is to readjust behavior, and explore new

ways to exploit natural resources, such as forests, farmlands and living resources, to fill the gap. Wise adjustment of exploitation methods will help overcome food shortages and maintain sustainable existence. If safe practices are not followed, it will lead to unexpected consequences, including degradation of natural resources and famine.

As explained above, coping measures used by people facing food shortages depend largely on the methods used by different ethnic groups and communities to exploit natural resources. In this study, we focus our analysis on the exploitation of natural resources and the coping measures used to combat food shortages of two ethnic minority groups in Ky Son District: the Thai in Pieng Pho Village, Pha Danh Commune and the Khmu in Binh Son 1 Village, Ta Ca Commune. By concentrating on these two groups, we will be able to make recommendations for reducing food shortages and increasing sustainable development in this disadvantaged and sensitive ecological area.

2. Research Sites and Methodology

The survey was conducted in the Thai Village of Pieng Pho, Pha Danh Commune and the Khmu Village of Binh Son 1, Ta Ca Commune, Ky Son District, Nghe An Province, from January 14, 2007 through January 24, 2007. It was conducted using the following methods:

- a. Collection of secondary literature from the province, district, commune and village
- b. Household surveys using questionnaires
- c. In-depth interviews

d. Focus group discussions

e. Field visits, which resulted in discussions with local people

f. Data analysis and report writing

3. Survey Outcome and Discussions

3.1. *Shifting Cultivation and Exploitation of Natural Resources of the Thai in Pieng Pho Village, Pha Danh Commune*

Since 1984, the majority of the Thai in Pieng Pho Village have migrated to the area from Tuong Duong district, under the direction of a Thai named Lo Van Panh. The village is located in a narrow valley next to a range of steep sloping hills and mountains. Pieng Pho Village contains 35 homes which house 187 people. The village is about 4 km from Muong Xen Township.

3.1.1. *Shifting Cultivation*

Most of the farms in this area are located along very steep hillsides. The crops here is rather diverse. The Thai in Pieng Pho Village have been clever in the arrangement and restructuring of crops to be appropriate to natural, economic and social conditions in the region.

Upland rice is grown on top of the hills for a year or two and then the fields are left fallow for two or three years. When *bop bop* plants are green, they are burnt and rice is planted again. The result of an analysis of samples of dry *bop bop* crops by the Hanoi University of Agriculture No. 1 shows that $N\% = 1.05$; $P_2O_5\% = 0.16$; $K_2O\% = 0.91$. As shown by these results, the development of *bop bop* crops after the land is left fallow for two or three years helps partly restore the fertility of the land after each harvest.

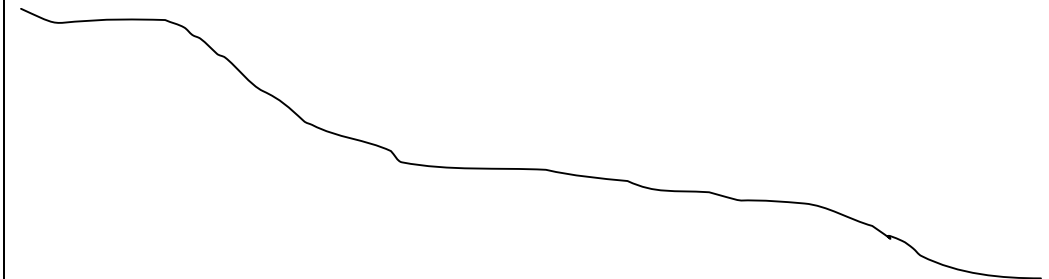
However, in our opinion, with the duration of each fallow stage being two to three years, the land still suffers nutrition deficiency, particularly with regard to phosphor and potassium. *Bop bop* leaves and stems do not have enough nutrients to make up for the losses created by harvesting rice. The survey outcome also shows that most of the farmers interviewed said the land becomes more infertile because rice yield tends to decrease as the land is used again and again. This use of short fallow stages is a massive problem with the way shifting cultivation is currently practiced. Upland rice is often sown in the fifth lunar month, once the rainy season has begun, and it is planted in three seasons. The first season is called *Khau lac lo*, the second season *khau vieng*, and the third season *khau luot cay*. These seasons of rice are sown 5 to 7 days apart. The rice varieties grown on hillside farms are local varieties, mainly sticky rice and some plain rice. Rice is sown by using a pole to poke into the soil to make small holes where rice seeds are placed. The hole is 2 - 3 cm deep and each is filled with 5 - 7 rice seeds. The spacing between holes is 40 x 30 cm. The holes are not covered with soil because rains will later cover the seeds with powdered soil. For this reason, timing the planting is very important. If it rains 5 to 7 days after the seeds are sown, the seeds will be covered with soil and sprout very well. If it does not rain, it is unlikely that many of the seeds will sprout; thus, the yield will be low. To deter ants and birds from eating the seeds, farmers mix the rice seeds with a light soap water solution or an anti-mosquito substance before sowing. When the rice plant has 3 or 4 leaves, farmers use hand

tools to eliminate weeds disturbing the soil. In Pieng Pho, farmers often weed each crop of rice three or four times. The average rice yield is 3 - 3.5 tons/ha (Table 1). With such a high rice yield, most of the households interviewed said they have enough rice to feed their family, except during years of adverse weather, such as drought, of which there have been two in recent years: in 1998 and in 2000.

Upland maize is often grown on the middle part of the hillside, next to rice fields. However, in some cases rice and maize are grown in rotation or inter-cropped in the same fields. Maize is also sown in the fifth lunar month when the rainy season starts. Prior to 2003, farmers grew local sticky maize varieties. These local sticky maize varieties are of good quality and weather tolerant, but produce a very low yield. Since 2003, these varieties have rarely been planted; instead high-yield hybrid maize varieties introduced by the district are preferred. Maize is often grown for one or two years and then the fields are left fallow for two or three years before re-cultivation. Most of the maize produced in the village is sold at a price of 2,000 - 2,200 VND/kg. Traders come to the village to buy maize directly from farmers. This is a remarkable source of money for Pieng Pho villagers, helping generate income to buy rice when there is a shortage. However, to grow hybrid maize in a sustainable way, it is necessary to enrich the soil through technical measures such as lengthening the duration of fallow stages, using fertilizer and growing leguminous crops to provide mulch and organic matter to the farmland during fallow stages.

Table 1. Upland crops of the Thai in Pieng Pho Village

Targets	Rice	Maize	Banana	Cassava	Vegetables	Cotton
Growing seasons (Lunar calendar)	May: Early, Middle and Late rice growing (5-7 day interval)	April - May	Feb. - March, replanting after 2-3 years	March - April	April - May	April
Strains	Local varieties (mainly sticky rice)	- Hybrid maize (mostly) - Local maize (few)	Banana, local varieties	Local varieties	Mustard greens, pea, onion, garlic, chilly...	Local varieties in the past, now new varieties
Harvesting time	August-September	August-Sept.	Year-round	2-3 years after planting	May - October	Nov. - Dec.
Yield, income	2-2.5 tons/ha	4-4.5 tons/ha	150,000-200,000 VND/month	75-80 tons/ha	1 million VND/year	
Use	As food	Sale: 2,000-2,200 VND/kg	Sale twice a month (15 th and 1 st Day)	As feed for pigs, chickens...	As food and for sale	Spinning, weaving for use
Distribution by the height of the hill	Top and middle area	Middle areas	Middle and low areas	Middle and low areas	Low areas	Low areas



Source: Survey in January 2007.

Note: Equivalent area and yield: 24 kg Hybrid maize seeds/ha, 64 kg rice seeds/ha; 1 bag of rice = 40kg; 1bag of maize = 40 kg; 15,000 cassava plants/ha.

Table 2. Survey outcome of shifting cultivation of some representative households in Pieng Pho Village in 2006

Household heads	Rice	Maize	Cassava	Banana	Vegetables	Cotton
1. Kha Van Hung (35)	2.1 tons (sufficient)	1.5 tons (for sale 2,200 VND/kg)	150 plants (as feed)	400 clumps (sale: 350,000 VND/month)	2 pieces (eating and selling: 80,000 VND/month)	
2. Lo Van Nghia (33)	1.9 tons (sufficient)	1.5 tons (for sale 2,200 VND/kg)	400 plants (as feed)	350 clumps (sale: 250,000 VND/month)	1 piece (eating and selling: 100,000 VND/month)	
3. Luong Van Binh (41)	2.3 tons (sufficient)	1.0 ton (for sale 2,200 VND/kg)	1000 plants (as feed)	1000 clumps (sale 350,000 VND/month)	2 pieces (eating and selling: 80,000- 100,000 VND/month)	Yes
4. Luong Van Phong (55)*	3.3 tons, 2 crops (surplus of 300-400 kg)	0.5 ton (For sale 2,200 VND/kg)	200 plants (as feed)	120 clumps (sale: 150,000 VND/month)		Yes
5. Hoang Dinh Thien (72)	2.4 tons (sufficient)	0.7 ton (For sale 2,000 VND/kg)	100 plants (as feed)	70 clumps (Sale: 200,000 VND/month)	2 pieces (eating and selling: 50,000- 100,000 VND/month)	Yes

Source: Survey in January 2007.

Note: * Only one household grows wet-rice.

Cassava is also a food crop grown on hillside farms. It is grown lower on the hillside than rice and maize. Most of the households in the village grow local varieties of cassava but with different scales. Cassava is grown in the fourth and fifth month of the lunar year, without fertilizer. Approximately 15,000 cassava clumps are grown on each hectare. After growing for two or three years, cassava is harvested. While harvesting the first crop of cassava, farmers then plant it in a second field. Normally, cassava is harvested gradually; after two or three years, a cassava crop will be completely harvested from the first field. Farmers then plant cassava in the part of the field they harvest first. This routine is repeated and the land is left fallow for two or three years before cassava is planted again. The yield of cassava is 6-7 kg/clump after 2-3 years growth. In the past, cassava was grown in a large area, but in recent years, most of the area previously reserved for growing cassava has been planted with hybrid maize, banana and vegetables. In Pieng Pho Village, cassava is mostly used to feed pigs and poultry.

Banana is one of the important commodity crops of the Thai in Pieng Pho Village. It is often grown on the middle and lower parts of the hillside. Most of the bananas grown here are local varieties. Banana is grown in the third month of the lunar year with a spacing of 5 x 5m. Once planted, it is ready to be harvested three or four years later; it is then replanted. Bananas are harvested all year round and are sold twice a month (on the 1st and the 15th day of the lunar month). Traders come to the

village to buy bananas from the farmers. This is a tremendous source of monthly income for the Thai in Pieng Pho. Beyond the monetary incentive to grow banana trees, they are tremendously useful to the villagers for a number of other reasons. Their big leaves trap rainwater and dew, which help keep the soil moist and protect it from erosion. The banana plant's leaves also provide a great deal of organic matter, helping to nourish and rejuvenate the soil. In addition, banana leaves are collected to feed fish, the trunks are used to feed pigs and cows, and young banana roots are a popular food among the local people.

During the 1980s and 1990s, growing vegetables on hillside farms was a rather popular mode of shifting cultivation used by the Thai in Pieng Pho Village. At present, vegetables are not a terribly popular crop in the region because they are being grown by many other groups, thus reducing their selling price. Even still, vegetables remain one of the main income sources of many households in Pieng Pho. Vegetables are often planted when the rainy season starts in the fifth lunar month. Traditional vegetables grown in and around Pieng Pho include mustard greens, onion, garlic, coriander, and peas. In recent years, chili peppers have become highly valuable, so many farmers are also growing this vegetable. In an interview with Mr. Luong Van Binh, a chili farmer, he said that he earns over VND 2 million from chili peppers every year. Chili peppers are planted in the fifth lunar month and harvested in the eighth or ninth lunar month. They can also be harvested two years after planting if they are well tended during

the dry season. If chili peppers are grown and harvested within the same year, the yield is even higher. Chili peppers are harvested and packed in small nylon bags and sold at the Muong Xen market at a price of 10,000 VND/1 kg bag.

Cotton is grown at the foot of the hill. In the past, the Thai used to grow small local varieties of cotton for spinning and weaving. Over the past two or three years, they have begun planting newer larger cotton varieties with higher yields. According to Mr. Hoang Dinh Thien, an old farmer who is 72 years old, cotton trees are suitable to grow in this region and develop well. Cotton growing and weaving help local people reduce their expenses and create work for the village's labour force during the off season.

In summary, in Pieng Pho Village, the Thai practice shifting cultivation using a diverse variety of crops. This practice has more or less resolved the concern over possible food shortages. Bananas, maize, and vegetables, coupled with the cultivation of upland rice, provide important income sources for local households. In addition, the choice to grow these different crops has actively contributed to stabilizing food sources and reducing risks in production for the local people, particularly when rice crops are lost due to drought.

Pieng Pho Village has a village regulation which stipulates that any household that does not till its land has to give it to another household to till it. Such community-based land administration shows solidarity and cooperation among households in the village. This is a very positive trait amongst the Thai in Pieng Pho,

contributing to reducing possible famine in the village.

3.1.2. Garden, Ponds and Pigsty (V-A-C) Production

Most of the households in the village have gardens in which they can grow fruit trees and vegetables. The survey shows that the main fruit trees grown in the village are tamarind, mango, jackfruit, star fruit, chicken-like fruit, hybrid guava, and jujube. Of these fruit trees, the best one is tamarind. Tamarind is grown very well in the soil present in Pieng Pho Village. After four or five years of growth, tamarind fruit can be harvested. On average, a five year old tamarind tree can earn 500,000 VND/year for its owner. Tamarind fruit is often harvested in the first or second month of the lunar calendar. The Thai in Pieng Pho village either sell the mature tamarind at the Muong Xen town market or sell it to traders who visit their farms.

Vegetables gardens are also popular in this region. Most of the households in the village have vegetables gardens around their houses or along nearby streams. Popular garden crops grown here include mustard greens, lettuce, coriander, mint, dill, and peas; of these, mustard greens and peas are the most popular. Garden vegetables are used to prepare daily meals and are also sold, creating an income source for these households. Manure taken from pigsties is used to fertilize the vegetables, and water taken from the common pipeline from streams to the village is used to water the vegetables. The local people do not use any chemical fertilizers or pesticides.

The Thai people in Pieng Pho have also dug ponds in which to build fish farms. Most of these ponds are located along streams. The main types of fish raised here include amur, major carp, bream, carp, and tilapia. In the past, thanks to clean water sources, fish developed very well in these ponds, creating yet another source of income for the Thai people (Table 3). However, over the past two years, the water source has been

heavily contaminated as a result of construction of a highway running through the village. The loss of a reliable water source has killed off many fish, and has caused those who have survived to develop very slowly, thus greatly reducing this income source for the Thai people. Despite this recent change, fish farms are expected to continue to be one of the main long-term income sources of the local people.

Table 3: Gardening, fish farms and animal husbandry in Pieng Pho Village, Pha Danh Commune

Household heads	Orchard (fruit trees)					Domestic animals (heads)			Fish Ponds (m ²)
	Tamarind	Hen eggs	Mango	Jack fruit	Star fruit, guava	Cows	Pigs	Chickens, ducks	
1. Kha Van Hung (35)	3	2	1	2	3	8	8	12	600
2. Lo Van Nghia (33)	5	4	4	3	5	6	4	10	300
3. Luong Van Binh (41)	10	4	30	8	8	11	6	16	300
4. Luong Van Phong (55)*	3	2	3	2	1	8	4	18	100
5. Hoang Dinh Thien (72)	5	10	15	3	3	13	4	13	300

Source: Household survey in January 2007.

Note: * Only one household raises 3 buffaloes because of growing wet rice.

With regards to animal husbandry, cows and pigs are the most important animals raised by the Thai in Pieng Pho (Table 3). Most of the households in the village have a herd of 5 to 10 cows. Most of the households raise between one and four heifers for breeding and the rest are sold to butchers. This is a remarkable source of income for the

local people. For example, Mr. Hoang Dinh Thien said in an interview that he has 13 cows, including 3 heifers and 6 cows available for sale at a price of about VND 2.5-3 million/head.

Pigs are raised in pigsties and cared for very well. The survey shows that all

households in the village raise pigs and each sells between 4 and 6 pigs a year on average. The Thai people have made use of all products from their shifting cultivation for husbandry. Cassava, rice bran, and a small portion of maize are used as pig feed. In addition, banana trunks and roots and vegetables are also used to feed pigs. Household income from pig rearing is extremely important. The survey shows that, on an average, each household can sell pigs twice a year, each 2 - 3 pigs and each pig is between 60 and 80 kg at a price of 12,000 VND/kg. For instance, Mr. Luong Van Binh sells three 60 kilogram pigs twice a year.

3.1.3. Exploitation of Forest Resources

The village has 150 ha of protected forests, which are another source of income for the villagers. Fortunately, due to shifting cultivation, crop diversification, personal gardens, increased animal husbandry, and the emergence of fish farms, the pressure to exploit the forests has reduced markedly. The Thai in Pieng Pho are not largely dependent on forest products, leading to less exploitation and more protection.

Forests provide firewood to the villagers. Under a village regulation, people are only allowed to collect dry branches from forests for family use, and are forbidden from harvesting timber for sale. As a result, in Pieng Pho, people only collect firewood for cooking and it is not considered a source of income for households. The survey shows that a household with five members uses a 20 kilogram bundle of firewood per day. If

they continue to use wood at this rate, the 150 ha of protected forests can provide enough firewood for the villagers indefinitely. In addition to firewood, forests also provide other products to the villagers, such as bamboo shoots and vegetables. However, these products are only used for daily meals, and are not considered a source of income for the Thai in Pieng Pho. Under another village regulation, any household that needs timber for construction must submit an application and receive approval before harvesting the wood. Logging is also forbidden.

Community management of forests seems to be very effective in this village. As a result, once shifting cultivation develops and food security is ensured, the pressure to exploit the forests will decrease dramatically. In turn, forests will protect farms from erosion and ensure water sources for the development of the V-A-C² system. This is the basis for food security and agro-forestry sustainable development in mountainous areas.

3.2. Shifting Cultivation and Exploitation of Natural Resources of the Khmu in Binh Son 1 Village, Ta Ca Commune

3.2.1. Shifting Cultivation

The crop system employed by the Khmu in Binh Son 1 Village is rather simple, mostly food crops and no commodity crops like those grown by the Thai in Pieng Pho village. Food crops here include rice, maize and cassava (Table 4).

² V stands for gardens, A for fish ponds and C for pigsty.

Table 4: Cropping system of the Khmu in Binh Son 1 Village

Features	Rice	Maize	Cassava
Sowing, planting time (Lunar calendar)	Sticky rice: in May Plain rice: in June	May	March - April
Varieties	Local (mostly sticky rice)	- Hybrid maize (mostly) - Local maize varieties (few)	Local
Harvesting time	Sticky rice in October Plain rice in Oct. and Nov.	August - early Sept.	After growing for 2-3 years
Yield, income	1.2-1.5 tons/ha	4-4.5 tons/ha	75-80 tons/ha
Use	As food	As food and for sale	As feed, for wine distillery and sale
Distribution by the height of hills	On top	Middle area	Middle and low areas

Source: Household survey in January 2007.

There were two different rice crops here: the sticky rice crop was planted in May and harvested in August, and the plain rice crop was planted in June and harvested in November. Rice is often grown for one or two years and then the land is left fallow for two to three years before it is grown again. Observations of the land left fallow after two years in Binh Son 1 Village show that, unlike Pieng Pho Village, here there are very few *bop bop* plants, and more reeds. It is possible that this is a typical difference between the two land areas. In general, *bop bop* plants create a thicker layer of mulch and are better than reeds, which belong to the 1-leaf gemma family. Survey data show that the rice yield in Binh Son 1 is much lower

than that in Pieng Pho. The reason for this difference is that the land in Pieng Pho is much more fertile than that in Binh Son 1, because Pieng Pho Village was only established in 1986. Binh Son 1 Village was founded much longer ago, and shifting cultivation has been practiced much longer there than in Pieng Pho. Moreover, through field observations and interviews with farmers, it is noted that the Khmu in Binh Son 1 sow rice with much narrower spacing and do less weeding and less tending than the Thai in Pieng Pho. In Pieng Pho, the Thai use tools to weed the crops three to four times per harvest. Field observations show that the spacing of rice in Binh Son 1

is often 30 x 25 cm, while that in Pieng Pho is 40 x 30cm. With larger spacing between plants, upland rice can reproduce more and their ears are bigger. Because of the low rice yield in Binh Son 1, rice output of each household there is much lower than in Pieng

Pho (Table 4 and Table 5). All this despite the fact that, the area on which rice is planted in Binh Son 1 is larger, and the amount of rice seeds planted is more. For this reason, food shortage is quite common among most of the households in Binh Son 1.

Table 5: Survey outcome of shifting cultivation of some representative households in Binh Son 1 Village in 2006

Household heads	Rice	Maize	Cassava
1. Moong Van Kim (51)	1.7 tons (Shortages for 4-5 months)	0.5 ton (As food, feed and for sale)	1,000 clumps (Wine distillery, feed and sale)
2. Lu Van Khuon (43)	1.0 ton (Shortages for 2-3 months)	0.3 ton (As food, feed and for sale)	600 clumps (Wine distillery, feed and sale)
3. Vi Van Thach (50)	1.4 tons (Shortages for 2-3 months)	0.6 ton (As food, feed and for sale)	1,000 clumps (Wine distillery, feed and sale)
4. Moong Nhu Binh (59)	1.5 tons (Shortages for 2-3 months)	0.8 ton (As food, feed and for sale)	5,000 clumps (Wine distillery, feed and sale)

Source: Household survey in January 2007.

In Binh Son 1, maize has long been grown by the Khmu. However, the maize grown here is only local varieties with a low yield, and it is only planted in a small area. Maize is often sown in May and harvested in August and early September. It is grown without fertilizer and the field is often grown with maize for one or two years and then left fallow for 2-3 years before it can be grown again. Over the past one or two years, hybrid maize with a higher yield has been introduced by Ky Son District to Binh Son 1

Village, and so the Khmu have shifted over to growing hybrid maize. Local sticky maize varieties are grown less frequently now. The survey results show that most of the households in the village typically plant 2 to 4 kg of seeds per year (24 kg seeds/ha). Maize in Binh Son 1 is mostly used as food during the months of rice shortage and partly as feed for husbandry; not much is used for sale. As such, maize in this village is not really a commodity crop like in Pieng Pho, although in-depth interviews of some

maize farmers here show that the maize yield is quite high. With 1 kg of hybrid maize seeds, farmers can harvest 150 to 200 kg of maize grains. This shows that the Khmu are still used to autarkic shifting cultivation, only paying attention to growing the food crops they need, not commodity crops for sale. Moreover, the Khmu in Binh Son 1 are less active, less creative, and less industrious in their agricultural production. The result of a women's group discussion on January 17, 2007 shows that the male villagers often spend their time on wine jars and ceremonial offerings, while most of the field work, collecting firewood, and gathering bamboo shoots are taken care of by the women. When there is a rice shortage, households borrow them with a heavy interest rate and return them right after harvest. This is possibly the largest obstacle in the shifting cultivation of the Khmu at present. The next section on ethnology will provide a deeper analysis of this issue.

Cassava is grown widely in Binh Son 1 Village. According to the survey results, each household grows between 600 and 1,000 clumps of cassava (Table 5). Local varieties

of cassava are planted in April and May. After 2-3 years, cassava can be harvested. The yield is about 7-9 kg/clump. The growing density is about 14,000-15,000 clumps/ha. Cassava is grown without fertilizer. As it is mainly used for making wine and for husbandry, cassava is harvested gradually and grown again on another piece of land after it has lain fallow for 2-3 years. The Khmu in Binh Son 1 Village mostly use cassava for making wine. Wine is drunk daily and particularly during festivals and ceremonies. For example, in a wedding, the bride and the groom families each must have 6-7 big jars of *can* wine.

3.2.2. Gardening and Husbandry

The Khmu in Binh Son 1 Village are not very interested in making use of the land around their house. It is partly because the village has just settled down in a narrow area of land along a highway, and partly because they are not interested in gardening. Very few households in the village grow vegetables in their small gardens, and fruit trees are extremely rare. When asked about this, most of the respondents showed their indifference and disinterest in growing fruit trees.

Table 6: Survey outcome of some Khmu households in gardening, fish rearing and husbandry in Binh Son 1 Village

Heads of household	Income from gardens	Income from ponds	Husbandry (head)		
			Cows	Pigs	Chickens, ducks
Moong Van Kim	No	No	1 (died of disease)	1 sow, 2 litters/year	7-10
Lu Van Khuon	No	No	3	2	>10
Vi Van Thach	No	200m ² Not yet	3	1 sow, 2 litters/year	12
Moong Nhu Binh	No	No	2	4	14

Source: Household survey in January 2007.

It can be said that there is no income from gardens and ponds for the Khmu in Binh Son 1 Village. At present, only two households in the village have dug ponds for fish rearing, and neither has generated any income from doing so yet. The local people have to exploit natural resources from rivers and streams for their subsistence. The Nam Can River not only provides the local people with a water source, as well as food. The local people collect moss and catch fish from the river for their daily meals. Small streams running through forests also provide them with some daily food (shrimp, crabs, snails, and small fish). When observing small children silently carrying small fishing nets to catch small fish from streams in the forests or collect moss from Nam Can River for family food, I was moved thinking of their fate and their future.

With regards to husbandry, the Khmu still follow the tradition of letting their cattle graze freely without stables. Cows and pigs are raised freely and most of them are local breeds with low yield. The main sources of pig feed are banana trunks, forest vegetables, cassava, rice bran, and maize. Pigs and poultry are not well cared for, which leads to low production and greater susceptibility to infections and disease, particularly with new animal breeds that do not adapt easily to the local environment. Recently, many households in the village got bank loans to buy new breeds of cow. However, it is dubious that such the households are able to succeed in raising these cows because they are inexperienced in this field. For example, Mr. Kim's family borrowed VND 3 million from the bank to buy a cow which has since died of

disease. As a result, his household has failed to repay their bank loan. Pigs and poultry are raised mostly for festivals, ceremonies, and family use. The custom of treatment of diseases with ceremonial offerings held by shamans is quite popular among the Khmu in Binh Son 1 Village. Ms. Lu Thi Com said that in 2006 her household used 2 pigs and 4 chickens as offerings to pray for curing diseases. Another woman, Mrs. Lu Thi Sam, said her family used 1 dog, 1 pig, and 1 chicken for the same purpose. Many households in the village raise sows used for their festivals, offering ceremonies, weddings and funerals. Only piglets are sold, and they bring in very little money.

3.2.3. *Exploitation of Forest Resources*

As above-mentioned, because shifting cultivation and production of a V-A-C bio-system do not generate income and the Khmu in Binh Son 1 Village have to face many other constraints, food shortages are rather popular among their community. Therefore, they have had to intensify their exploitation of forest resources. As a result, their lives are largely dependent on forest products, which put increasing pressure on these natural resources.

Binh Son 1 Village now has 175 ha of protected forests and 25 ha of reserved forests, bringing the total number of area controlled by rangers to 200 ha. The survey results show that the Khmu exploit products from forests all year round. These forest products have generated income for the Khmu, and have helped to reduce their food shortages, particularly in the periods prior to harvests. Of these products, bamboo shoots, firewood and

dot are the most commonly sold items. They use the money earned from the sales of these products to buy food. Firewood is gathered year round, and bamboo shoots are gathered seasonally (Table 7). In addition, other forest products such as a kind of wild tuber (the so-called tuber 30), amomum, chestnuts, and

vegetables have been collected by the Khmu people, contributing to their income from forests. These findings lead us to believe that once shifting cultivation cannot ensure enough food, people are more dependent on forests. This is completely different from the Thai in Pieng Pho Village.

Table 7: Exploitation of forest resources of the Khmu in Binh Son 1 Village

Heads of household	<i>Dot</i> reeds	Firewood	Bamboo shoots	Vegetables	Chestnuts	Tuber 30	Amomum
Moong Van Kim	10-15 kg/time; 5-7 times/month. For sale: 2,000 VND/kg	For cooking For sale: 15 bundles/month, 10,000 VND/bundle	30 kg/time, 10 times/month As food and for sale: 1,500-2,000 VND/kg	Sweet vegetables ferns, rattan shoots	12-15 kg/year. For sale: 5000VND/kg fresh	Gathering. Sale: 3,500 VND/kg	Yes Sale
Lu Van Khuon	10 kg/time, 5-7 times/month. For sale: 2,000 VND/kg	For cooking. For sale: 30 bundles/month, 10,000 VND/bundle	20 kg/time, 7-8 times/month. As food and for sale: 2,000 VND/kg	Sweet vegetables ferns, rattan shoots	5-7 kg/year. For sale: 5,000 VND/kg fresh	Gathering. Sale: 3,500 VND/kg	Yes Sale
Vi Van Thach	7-10 kg/time, 5-7 times/month. For sale: 2,000 VND/kg	For cooking. For sale: 10-15 bundles/month, 10,000 VND/bundle	15-20 kg/time, 7-8 times/month. As food and for sale: 2,000 VND/kg	Sweet vegetables ferns, rattan shoots	10-15 kg/year. For sale: 5,000 VND/kg fresh	Gathering. Sale: 3,500 VND/kg	Yes Sale
Moong Nhu Binh	10-15 kg/time, 5-7 times/month. For sale: 2,000 VND/kg	100 bundles/month. For sale: 50-60 bundles/month, 10,000 VND/bundle	20 kg/time, 10 times/month. As food and for sale: 2,000 VND/kg	Sweet vegetables ferns, rattan shoots	10-15 kg/year. For sale: 5,000 VND/kg fresh	Gathering. Sale: 3,500 VND/kg	Yes Sale
Harvesting time	Jan. and Feb.	Year-round	August-Sept.	Year-round	Oct.-Nov.	Year-round	August-Sept.

Source: Household survey in January 2007.

4. Food Shortages and Coping Measures of the Thai and Khmu

As mentioned above, food is mainly produced from shifting cultivation. When production is not sufficient for daily use, it leads to food shortages. During these food shortages, people have to change their methods of exploiting natural resources to cope with the situation. Food shortages are due mainly to the following reasons:

1) Degraded land, mostly due to over-population leading to increased pressure on farmlands. This increased pressure forces farmers to shorten the fallow stages in shifting cultivation. Shorter fallow stages lead to increasingly impoverished soil, making the soil unable to restore, which in turn results in a reduced rice yield. According to a number of agricultural experts, the recommended fallow period in a tropical region such as Vietnam should be between 8 and 10 years (Zinke et al., 1978;

Kyuma et al., 1985; Tanaka, 1997).

The Khmu in Binh Son 1 Village, used to have very large families with many children; often as many as 5 or 6 children per household. The reason for having such large families was due to the need for extra hands working in the fields and forests. The Khmu did not understand that the increasing number of family members forced them to produce more food, thus further exploiting the land which was unable to meet their food needs. This in turn led to increased famine and poverty. However, this situation has recently changed, especially among young married couples of the Khmu in Binh Son 1 and the Thai in Pieng Pho. Young families now have fewer children (Table 8). The continuance of this trend should be encouraged, as it can be viewed as an important solution in eliminating hunger and poverty, as well as contributing to the sustainable development of the highlands.

Table 8: Family size in the past and at present

Heads of household	Age	Number of children	Village
Moong Van Kim	51	5	Khmu
Lu Van Khuon	43	6	Khmu
Vi Van Thach	50	5	Khmu
Moong Nhu Binh	58	5	Khmu
Kha Van Hung	35	3	Thai
Luong Van Binh	41	3	Thai
Hoang Dinh Thien	72	8	Thai
Luong Van Phong	55	5	Thai

The increase in the number of household members means more degradation of the farmland. However, this situation is more urgent for the Khmu in Binh Son 1 Village because they have practiced shifting cultivation for a long period of time. The most typical sign of land degradation is low rice yields and rapid development of grasses and reeds, which can live on exhausted lands. The Thai have only lived in Pieng Pho since 1984, so the land there is more fertile. This is evidenced by higher rice yields and the rapid development of *bop bop*, which require more nutrition from the soil.

2) Natural calamities, mainly drought and adverse weather. For example, long drought spells in 1988 and 2000 caused serious rice losses.

3) The farming practices and lifestyle of the local people. The customs and traditions of the Khmu and Thai have greatly affected the state of food shortages in these mountainous areas. The Khmu in Binh Son 1 only grow food crops such as rice, maize, and cassava; they are not interested in other commodity crops. For this reason, food shortages occur more often and are more serious, particularly during periods of drought. Alternatively, the Thai in Pieng Pho Village combine food crops such as rice, maize, cassava, vegetables, bananas, and fruit to generate diverse income sources; thus, food shortages rarely occur. This is the most effective coping measure utilized by the Thai in Pieng Pho Village in the face of food shortages.

4) We have also tried to learn about the rice farming practices employed by these two ethnic groups. The Thai in Pieng Pho sow rice with larger spacing between seeds (40 x 30 cm); the Khmu in Binh Son 1 sow rice with narrower spacing between seeds

(30 x 25 cm). Additionally, the Thai plant varieties with bigger ears, and weed more frequently and effectively (3-4 times per crop). The Khmu use varieties with smaller ears, and weed less frequently (2-3 times per crop). As a result, rice yield in Pieng Pho is higher than that in Binh Son 1.

Moreover, autarkic farming is a typical feature of the Khmu in Binh Son 1 Village in their shifting cultivation. They grow crops for food, not for sale. The sale of garden crops and animals has also failed to develop here. Thus, when autarkic production faces difficulty and food shortages occur, the Khmu do not have other commodities which they can sell. Conversely, the Thai in Pieng Pho are very sensitive to the market economy. They know how to combine food crops with other commodity crops to form a type of commodity farming practice. For this very reason, food shortages in this village are better resolved and famine does not occur. In addition, the Khmu in Binh Son 1 still heavily practice old customs such as ceremonial offerings for curing diseases, which often consume a large amount of food and foodstuffs. Animal products are often used for ceremonial offerings, festivals and domestic use, not for sale.

As above-discussed, when production does not meet food needs, and food shortages occur, people change their behavior and increase their exploitation of the natural resources. The survey results in the two villages show that the coping measures of the Thai and the Khmu are distinctly different. The Thai in Pieng Pho have reacted sensitively to natural and socio-economic changes by introducing hillside farms, vegetable gardens, fish ponds, and animal husbandry. These actions have served to

create diverse commodity products such as maize, bananas, vegetables, fruit, pigs, cows and fish. The diversity of sources of income has reduced production risks and makes full use of natural and human resources. Autarkic farming practice combined with commodity production has remarkably reduced the instances of food shortages, particularly in years affected by adverse weather. Moreover, the change in production mode in shifting cultivation to generate more income sources from commodity crops has reduced pressure on forests. Well protected forests will help protect the soil from erosion, reduce drought, and maintain water sources for aquaculture and for domestic use.

On the contrary, due to their continuous reliance on autarkic farming and old customs and habits, the Khmu in Binh Son 1, suffer serious food shortages. When faced with food shortages, the Khmu employ the three following coping measures:

a. Increased exploitation of forest products such as *dot*, bamboo shoots, firewood, medicinal herbs, and bamboo. These products are then sold in order to generate income to buy food. This coping measure, if continued without any adjustments, will put more pressure on forests, leading to the possible degradation of these very important natural resources.

b. Working as hired labourers. The household survey and related interviews show that the Khmu in Binh Son 1 often have to work as hired labourers inside and outside the village to earn money to buy food. They can do farm work, such as weeding and sowing seeds for well-off families. Recently, there has been a tendency to send their older children to work in distant places. For example, Mr. Vi Van Thach has

two children who are working faraway, one in Saigon and the other in Laos.

c. Reducing expenses. When the other coping measures cannot overcome the food shortages, the Khmu are forced to cut their daily expenses. For example, they reduce the amount of food used for each meal, cut out non-necessary purchases, and stop sending their children to school. The survey results show that very few children in the village finish upper secondary school. Most of them only go so far as primary or lower secondary school.

5. Recommendations on Food Security for Mountainous Ethnic Groups Practicing Shifting Cultivation

a) Continue communication and strict population control to reduce population growth among highlands ethnic groups. Population growth is directly related to the exploitation of natural resources, which are already facing degradation. Farmland will degrade rapidly if fallow stages are shortened, and forest resources will be exhausted if they are increasingly exploited by people.

b) Strengthen measures to restore the fertility of soil during fallow stages. The use of leguminous crops to cover land during fallow stages is essential. It is possible to grow many crops that can prevent the soil from erosion such as *cot khi*, *nho nhe*, *sesbania*, *crotalaria striata*, and *tintinabula*. These mulching crops can be grown on contoured ridges. They can also be sown with thick density, which can help reduce erosion and enrich the soil, while providing organic matter full of protein to the soil and soil bio-system. This is a simple solution but very effective in restoring soil fertility during fallow stages. If following the recommended guidelines for fallow stages is combined with growing these crops to

increase organic matter in the soil, soil fertility will be restored more rapidly.

c) Diversify agricultural products, on the basis of making better use of the already diverse ecosystems in mountainous areas. This will help to create different income sources, and will be a very important solution to ensure sustainable food security for mountainous areas. In certain conditions, the development of commodity crops to generate different income sources around the year will make an important contribution to ensuring food security for highlanders who practice shifting cultivation. The combination between autarkic production and commodity production will actively contribute to changing the methods of exploiting natural resources of mountainous ethnic groups in Vietnam in general, and in Ky Son District in particular. The special role of agro-forestry extension agencies and the establishment of markets for farmers' products should be stressed when addressing this solution.

d) Communication is needed to improve people's awareness on the close relationship between natural resources in shifting cultivation. Protecting forests means protecting hillside land from erosion and drought, and exploiting it in a sustainable and effective way; thus, reducing the pressure on forests, which will contribute to their protection. Sustainable forests will ensure sustainable water sources for the development of aquaculture and domestic use. To exist and develop in a sustainable way, will also ensure food security, as well as create more sources of income.

e) With regards to long-term strategic solutions, government macro policies and lines and strategy for economic development in mountainous areas are of special importance.

Over the years, we have clearly seen that for sustainable economic development of mountainous areas, we have to maximize their three strong points: forestry, cash crops, and grazing animals. In the past, when the country faced difficulties, people living in mountainous areas had to be self-sufficient and feed themselves. Today, Vietnam exports 4-5 million tons of rice a year to the world markets, so it is feasible to bring food from the plains to the mountainous areas. In return, the mountainous areas will provide forest products, cash crops, and grazing animals to society. This does not mean that we should completely eliminate food crops in mountainous areas, but rather make changes to better use our natural resources. Wet rice can develop in the lowlands and valleys along rivers and streams. Upland rice should be reduced in size, particularly in the upstream areas of rivers, and pressure should be reduced on hillside land by lengthening fallow stages.

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