

Linkage of Forest Policies and Programs with Land Cover and Land Use Changes in the Northern Mountain Region of Vietnam: A Village-level Case Study

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Abstract

This paper examines the land cover and land use changes in one village in the Vietnam's northern mountain region. It overviews the changing forest policies in Vietnam from the country's independence in 1954 to 2005 and relates these changes to the management of forest land at the village level. Findings show that until the late-1980s/early-1990s Vietnam's policies encouraged the harvesting of timber for nation building activities and the expansion of cultivated land, leading to the decreased forest area within the village. After this, as government policies changed to encourage forest protection and the planting of trees by local people, tree covered forest land area increased. The trigger for the change in land cover and land use at the village level in both periods is a consistent political intention represented in a series of laws and decrees and consequent extension activities. These established a strong linkage between national and the village level forest governance and led to the almost simultaneous occurrence of national policy change and forest recovery. It is concluded that it is important to recognize the multiple channels that link the government agencies with people and the intensive learning process needed for local people to understand the political intentions behind laws and regulations promulgated at the central government level.

Keywords: land cover change, land use change, forest policy, Vietnam, Pu Mat

I Introduction

Throughout the world, some 350 million people live within or adjacent to dense forests [FAO 2005]. Forests provide a wide range of products, ranging from food to non-food items for people's daily livelihood needs. However, this resource has been depleted seriously over the last century if not to say the

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last few decades. FAO's 2005 statistical data shows the rate of net forest loss slowing down from 8.9 million ha per year during the 1990–2000 period to 7.3 million ha per year during the 2000–05 period. It is believed that this is the result of many countries' policies and programs that emphasize the planting of new tree plantations and the natural expansion of existing forests.

Vietnam's hills and mountains occupy three-quarters of the country's area. The area is home to one-third of the nation's population, a group that has undergone rapid changes to their livelihood systems following a wide range of national-level socio-economic development programs [Be Viet Dang 1993]. As such, land and forest, the main resources used in the local production systems, have suffered from severe human impacts over the last decades.

Vietnam's forest cover has been reduced from 43.2% in 1943 to 28.1% in 1995 [Nguyen Manh Cuong 1999]. This reduction has been attributed to many socio-economic and historical factors including wars and poor management [MARD 2006a; FAO 2005]. Over this period, forest area was not only reduced in quantity but also in quality. Under the impact of human activities, forests have been modified in structure, vegetation type, and species diversity. Consequently the habitats encompassed in forests have changed and various flora and fauna reliant on those habitats are now threatened [UNDP and FPD 2000]. In response to the negative impacts of deforestation and to protect the remaining natural forest as well as to restore the forest cover, the Vietnamese government has issued and enforced new laws and policies.

Government laws that are the basis for forest conservation include:

- (1) The 1988 Land Law and the 1993 Revised Land Law, both implemented under *Doi Moi*/Renovation. These laws stipulated that a household is the managing body of land resources and has to be responsible for its property, including forest resources.
- (2) The Law of forest protection and development passed by the National Assembly on 8th December 1991.

These general laws are implemented through several decrees and programs including:

- (3) The 327 Program established in accordance with Decision 327/CT passed by the Council of Ministers on 15th September 1992 regarding policies on the use of bare land, denuded hills, forests, alluvial flats and water bodies.
- (4) The Government Decree 02/CP issued on 15th January 1994 on the allocation of forest land to organizations, households and individuals for long-term use for forestry purposes.
- (5) The Government Decree No. 77-CP of 29th November 1996 on sanctions against administrative

violations in the protection and management of forests and the management of forestry products.

- (6) The National Five Million Hectares Reforestation Program (5MHRP), a follow-on to the 327 Program, approved in 1997 by the National Assembly. Decision 661 on the implementation and funding of the 5MHRP was approved in 1998 by the office of the Prime Minister. In short the 5MHRP was called the 661 program.

Nghe An is one of most heavily populated provinces in Vietnam. Forest in Nghe An plays an important role in the socio-economy and environmental life of the province's people. This was true in the past and is still true today. Nghe An's forest area is unevenly distributed and is found mostly in the northwestern mountain districts of Ky Son, Tuong Duong, Con Cuong, Que Phong, Quy Chau and Quy Hop. Pu Mat National Park (formerly Pu Mat Nature Reserve) in Anh Son, Con Cuong and Tuong Duong districts has the largest continuous area of natural forest cover in Vietnam. The park has about 91,000 ha of core zone area and about 100,000 ha of buffer zone area. Pu Mat is one of the most important biodiversity nature reserves for Vietnam as well as for the region and the World [Vietnam Pictorial 2003].

The population that lives in the Pu Mat buffer zone has an extremely hard time earning their livelihood because of the steep sloping topography, poor transportation network and severe climate conditions. Their production system is based on traditional upland shifting cultivation, also referred to as swidden, a system that frequently needs to open new fields in forest areas. This has many impacts on forest resources and creates difficulty with regards to the protection and development of this resource [Nghe An DoF 1993]. Together with both large-scale legal and illegal logging along streams in the past, the population's use of the forest resources has changed the flora and fauna makeup of the area. As a result, in 1995 the Social Forestry and Nature Conservation project in Nghe An was proposed, approved and implemented for the purpose of conserving forest resources and biodiversity of the then Pu Mat Nature Reserve and its buffer zone.

The study reported in this paper aims to investigate the process of changes in land cover/land use (LCLU) over the past 50 years and to identify the underlying causes of these changes in the Pu Mat area, with emphasis on the linkage of forest policies and related programs, such as the setup of the Pu Mat Nature Reserve, with LCLU. This study is based on an analysis of the time series data of LCLU generated from remote sensing imagery and field research in Chau Khe village,¹⁾ located in Con Cuong district, Nghe An province.

1) In Vietnam, although there is sub-unit called hamlet (*thôn/bán*) under village (*xã*), village is the smallest administrative unit that has data or information "officially" documented.

II Study Site and Research Methods

II.1 Study Site

Physical Characteristic

The study site of Chau Khe village is located in the southern part of Vietnam's Northern Mountain Region (Fig. 1).

Chau Khe village is one of 12 villages located in Con Cuong District, Nghe An province. Geographically, the village is located between 18°51' and 19°08' North and between 104°31' and 104°48' East. It is about 15 km from the district town, 135 km north-west of Vinh city, Nghe An's provincial capital, and 400 km south of Ha Noi, the capital of Vietnam.

Sharing similar topography to mountainous villages in the west of Nghe An, Chau Khe has very complex and rugged terrain, and includes several mountains with an elevation of over 1,300 m above sea level. High mountains on the northwest-southeast running border of Vietnam and Laos include Pu Mat (1,841 m asl.), Pu Van and Pu Den Dinh. The northeastern slopes of these mountains fall steeply towards the Ca River (locally known as the Lam River). As a result of such topography, Chau Khe has very little flat land (Fig. 2). According to the 2005 village report, the total area of Chau Khe village is 43,888 ha, of which 27,000 ha and 6,500 ha are the core and buffer zones of the Pu Mat Nature Reserve, respectively, which was first established in 1996 and upgraded to Pu Mat National Park in 2003. The core zone is under the management of the provincial government and designated for forest ecosystem and biodiversity conservation. The buffer zone is under State Forestry Enterprise (SFE) management. The remaining area, close to settlements and located in the north-eastern part of the village, is under village management.

The national highway No. 7, running through the north-eastern part of the village in parallel with the Ca River, is the sole route to connect villages and four district towns on the south bank of the Ca River with the provincial capital to the southeast and with Xieng Khoang province, Laos, to the north-west (Fig. 1).

According to records kept at the Con Cuong meteorology station, the area has on average an annual temperature of 23.5°C and annual rainfall of 1,791.1 mm [MARD 2006a]. The village has a tropical monsoon climate that is influenced by the hot and dry southwest wind ("foehn" wind) during the summer and northeast wind. The uneven distribution of rainfall creates two seasons a year, the rainy season from April to November with an average monthly temperature of 25.7°C and an average monthly rainfall of 205.5 mm, and the dry season from December to March with an average monthly temperature of 18.5°C and an average monthly rainfall of 36.8 mm.

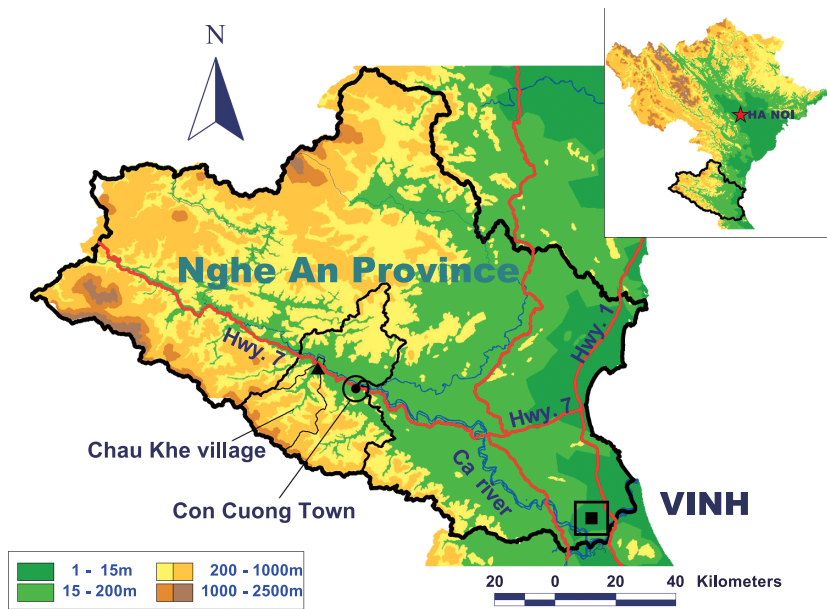


Fig. 1 Location of Chau Khe Village in Vietnam's Northern Mountain Region

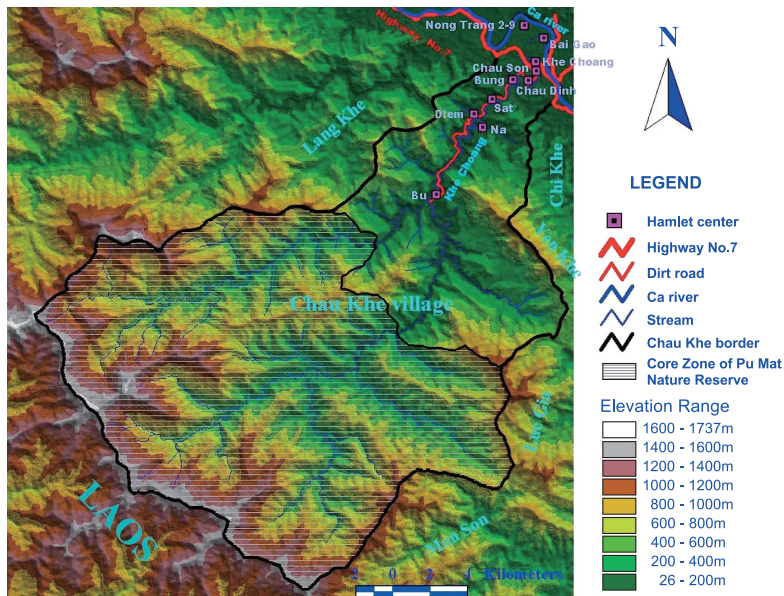


Fig. 2 Topography, Road Network and Hamlet Distribution of Chau Khe Village

Socio-economic Characteristics

The population and the number of households of Chau Khe village was 5,319 and 1,131 respectively in 2005, consisting of three ethnic groups: *Thai* (2,466 persons), *Kinh* (1,586 persons) and *Dan lai* (1,267 persons). There are 10 hamlets, of which three hamlets including Khe Choang (*Kinh, Thai*), Bai Gao (*Thai*) and Nong Trang 2-9 (*Kinh*) are located to the north of Highway No. 7, and the remaining 7 hamlets including Chau Son (*Dan Lai, Kinh*), Chau Dinh (*Thai, Dan Lai*), Bung (*Thai*), Sat (*Thai*), Diem (*Thai*), Na (*Thai, Dan Lai*) and Bu (*Dan Lai, Thai*) which are located to the south of Highway No. 7. A single dirt road, 16 km long, running along Khe Choang stream connects these hamlets with the village centre located along national highway No. 7. Bu hamlet is the furthest, at the end of the road and close to the core zone of the Pu Mat Natural Reserve (Fig. 2).

Household livelihoods are based on agriculture and forest related activities. Agriculture practices include paddy and upland rice. Upland rice accounts for about two-thirds of rice production. Statistical data sources since 1998 use the term “cash-crop land” to indicate areas of upland agriculture. In fact this land use type includes areas where upland rice and cash-crops like maize, cassava, sweet-potato, beans and peanut are planted. Other sources of household income include animal husbandry activities, the exploitation of non-timber forest products (NTFPs) like bamboo-shoots, rattan, and small bamboo (*nira*) that naturally grows back every year, and large planted bamboo (*mét*).

II.2 Image Analysis and Field Survey

This research adopted an approach that combines the interpretation of remotely sensed imagery with an analysis of statistical data and information collected from field studies.

Remote sensing is a reliable and effective source of detailed data that can be frequently collected and used to support management planning, monitoring and mapping of natural resources. Studies of LCLU changes using remote sensing data can take advantage of having consistent and comparable data [IPCC 2003].

The study uses several types of remote sensing data including Corona satellite photos acquired in 1967, Landsat Thematic Mapper (TM) satellite images in 1989 and 1998 and Enhanced Thematic Mapper (ETM) images in 2005 for mapping and analyzing LCLU changes in Chau Khe.

A forest is an area with a high density of trees. There are many definitions of forest, based on various criteria. Forests can be classified in different ways and to different degrees of specificity. In Vietnamese forest inventory and production planning, forest and forest land is classified by forest type such as evergreen broadleaf, deciduous broadleaf, semi-deciduous broadleaf, needle leaf, mangrove, and so on. Then each type of forest is further sub-classified based on the vegetation structure/status

Table 1 Adopted Land Cover Classification

Class	Description
Closed forest	Multi-storey tree cover, dominated by tall and large trees with or without medium tree (<15 cm diameter, 5–7 m height)
Open forest	Sparse tree cover, selectively logged areas or re-growth, and bamboo
Bush	Small woody trees (<5 cm diameter, <3 m height) mixed with shrubs
Grass	Natural short and long grass with small shrubs (associated with 1 or 2 year fallow areas)
Paddy field	Both flat land or terrace land associate with water content
Upland field	“bare land” (under preparation for planting, newly harvested areas, early seasons) and even cropping area (based on topography, field investigation and distinct signature in digital image processing)
Water body	Water: rivers, streams, lakes, and other water bodies.

according to the 1984 Normative Act QPN6-84 of the Ministry of Forestry. For example depending upon its quality the evergreen broadleaf and semi-deciduous broadleaf forest can be classified as: (I) non-forest, (II) regenerated forest, (III) secondary forest and (IV) virgin/primary forest. Each of these classes is divided into further sub-classes [MARD 2006b].

Using this classification system in this study, however, would create difficulties in carrying out the time-series analysis. It is rather difficult to identify forest type precisely when the source image resolution is low. Moreover, as the changes in forest cover are the central question of this study, classification of forest according to forest canopy cover should be more appropriate. Therefore, tree-related land cover is simply divided into the three classes; closed forest, open forest, and bush where tree canopy is >70%, 40% to 70%, and <40%, respectively. Adding grass, paddy field, upland field and water bodies, and the overall land cover classification is fixed as shown in Table 1.

The 1967 Corona satellite photos were manually interpreted and classified. The results of the classification were transferred to a 1:25,000 base map using recognizable topographic features (streams, roads, mountain ridges, etc.). The land cover maps were digitized and entered into a Geographic Information System (GIS). The accuracy of the final land cover classifications was checked through field surveys. Judging from the authors' experience and knowledge of vegetation types and land cover patterns gained during field investigation of the site, they appear accurate.

Earth Resources Data Analysis System's (ERDAS) Imagine software for image processing was used for the TM and ETM images analyses. All satellite images (1989, 1998 and 2005) were rectified to the same base map used in the aerial photo interpretation step, so that the ground survey data can be located on the images, and the maps have a common area for data extraction and comparison. The satellite imagery was interpreted using supervised classification methods. The training sets/classification keys were selected based on knowledge gained during field investigation combined with information

derived from normalized difference vegetation index (NDVI) analysis of the images, and with information regarding how the images' pixels are clustered that was gained by running an unsupervised classification on each image. Field investigations and observation regarding structural appearance of the different types of vegetation helps to define suitable criteria for each land cover class. NDVI and the results of the unsupervised classification were used as references for fast identification and selection of training sets. Final results were overlaid on top of its false, true color and NDVI image then flickering/swiping (utilities in ERDAS imaging) were used for visual assessment of the accuracy of the results.

Field survey included land cover and use observations, interviews with local officers and the collection of statistical data. These activities were done in June 1999, March 2004, July 2006, May 2007 and December 2008.

Interviews with local people and officers at the village and district levels focused on agricultural practices, forest uses and living conditions, and helped to understand and identify the major factors of LCLU changes. The interviewees include past and present hamlet leaders, production unit leaders, cooperative leaders, village leaders and SFE leaders. The interviews also revealed valuable information about the past socio-economic situation of the site. Information regarding changes in infrastructure (roads and markets) helped the researchers to understand incentives for forest exploitations. Local perceptions on the influences of government policies and programs on LCLU were also revealed from the interviews, making a significant contribution to the understanding of the dynamics of LCLU.

Statistical data was collected from different sources including statistical year books at village, district, province and national levels; official and non-official reports. Data collection included information regarding population, land use areas, and agricultural data about the area planted and productivity of different crops. This data was cross checked and compared with the interview data to see if there were logical connections between the statistical data and the qualitative recollections of the interviewees. Differences and similarities between the recollection data and statistical data were noted. Basic quantitative and qualitative information regarding crop area and yield and production shows the evolution of food sufficiency, and at the same time, reveals pressures on the forest cover.

III Land Cover Land Use Changes

III.1 *Period Before 1967*

Field investigations indicate that, before joining the cooperative in 1960, Chau Khe people's livelihood system was of a self-sufficient nature and based on upland food production. Their activities included swidden agriculture and gathering forest products for food, and hunting for foodstuffs. There was almost

Table 2 Reconstructed Population and Population Density of Chau Khe Village

Item	1967	1989	1998	2005
Population	1,361	3,737	5,136	5,319
Population density (person/km ²)	31	8	11	12

Source: Statistics and reconstructed.

no paddy grown in the village. The village forest was abundant and rich in valuable timber trees. Large trees of more than 30 cm in diameter could be found easily within close proximity by residents for house building. The reconstructed population data based on the district and provincial statistics and field interviews suggests that the population density of the village was less than 10 persons per square km until the end of the 1980s (Table 2). Although the population distribution was uneven in the village area due to the topography and the road network, human impacts on the forest were thought to be limited.

In this period upland fields were opened in old forest areas as villagers believed soils in this area were more fertile. For the same reason, they also opened fields in the long fallow areas where tree diameter reached to 30 cm or more. Upland fields were used for several years and then abandoned because of soil fertility depletion.

After 1960, households of Chau Khe's hamlets formed into hamlet-based cooperatives in the three Red-flags Movement. Depending on the number of laborers in each cooperative, they were divided into several production brigades. People worked together and received products based on their labor points. According to Mr. Mun, born in 1922 and the former village party secretary and village chairman, collective work brought significant changes to the landscape of the village.

While the village continued with traditional upland agricultural practices, each brigade in the cooperative opened larger fields close to each other instead of individuals opening small and separate upland plots. Many big trees were burned down in the newly opened fields. The brigades did not make use of those trees because the forest was still abundant.

The 1967 LCLU map shows large plots of upland field as well as bush and grass fallow land as a consequence of upland cultivation around hamlets (Figs. 3a and 3b). The area of each plot ranges from half a hectare to several tens of hectares. The large areas of upland fields could be indications of the impact of collective work.

Logging activities of Con Cuong State Forest Enterprise (SFE) also affected LCLU. The SFE was established in 1955 to manage forest resources, to exploit timber in particular, in all villages of Con Cuong district including Chau Khe village. Their activities were in line with a common plan from the central government and included exploiting, transporting and processing timber. The SFE first selectively logged high quality timber for making wooden railway ties and logging was carried out by army

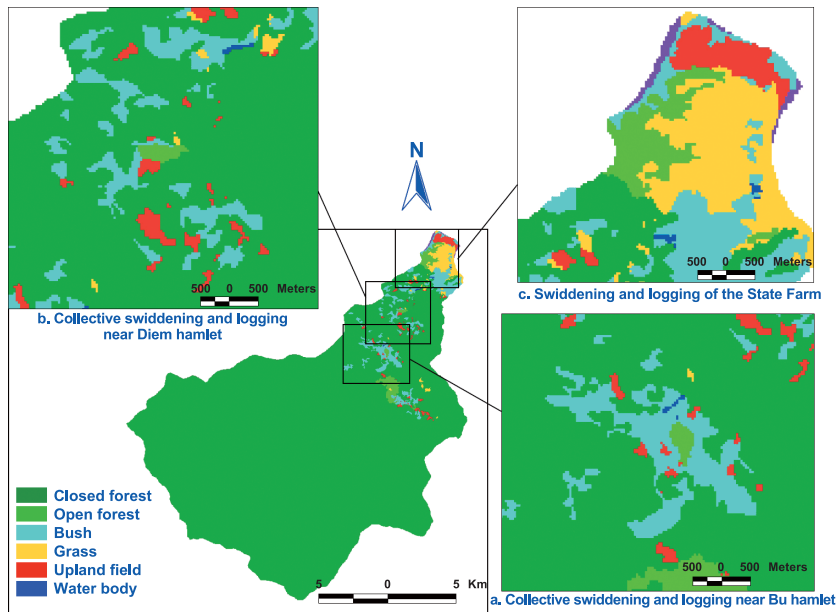


Fig. 3 Chau Khe Land Cover Land Use in 1967

Source: Remote sensing image interpretation

personnel. Later on, the quality of forest was reduced, demand for timber for the country's economy expanded, and the SFE had to use local people for the logging activity.

During the cooperative period, each hamlet had a wood-cutter group (*tổ sơn tràng*) of 8 to 10 people who went to the forest to exploit timber based on the demand of the SFE. People in the hamlet took turns to work in the group, and the SFE provided food for their activities. Logging activities were intensive within 10 km of Highway No. 7 and along the Lam River and Khe Choang stream because of easy transportation. All the work was done by hand axes, hand-saw and animal power was used to transport the logs to the transportation route. Many smaller trees are thought to have been damaged around each logging site and during the transportation of timber to the transport routes. As a consequence this converted forest land to bush, after which the area was in most cases used for swiddening. This implies that government-initiated logging led to the expansion of swidden fields.

In 1961 during the Land Opening/Reclamation Movement, Nghe An authorities resettled people from Nam Dan district to a newly setup resident area called *Nong Trang* 2–9 (State Farm 2–9) in the northernmost part of Chau Khe village. One of the major purposes of the resettlement program was to expand paddy field area, to stabilize food production, and to meet the food requirement at the national level. Although this area has better topographical conditions for paddy development, the new settlers

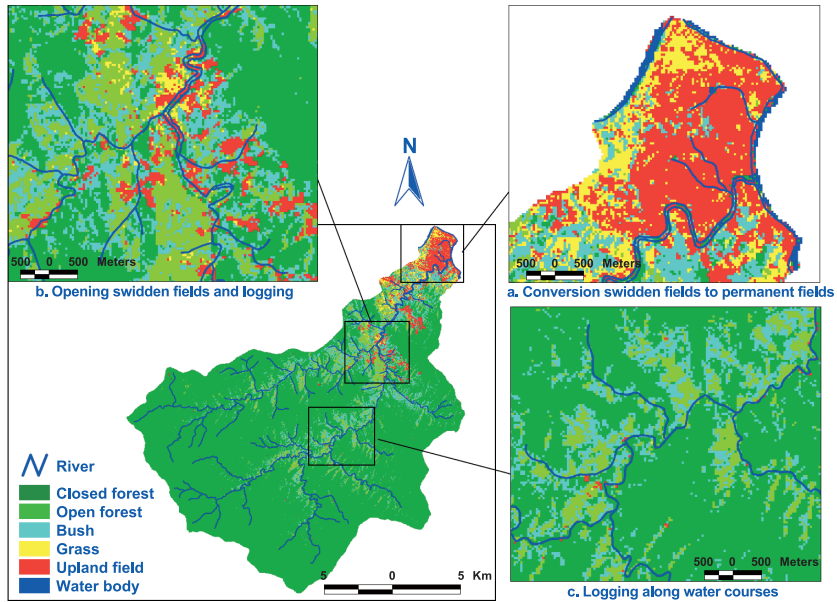


Fig. 4 Chau Khe Land Cover Land Use in 1989

Source: Remote sensing image interpretation

also practiced swiddening, similar to people already living in the area, due to the lack of available water resources as well as a lack of capital for investing in the building of paddy fields. This resulted in an extensive decrease in forest (Fig. 3c). A similar situation of a newly established state farms was reported in a *Nghe An Newspaper* on 23rd May 1962 stated that “In 1961, out of 13,000 ha of reclaimed land, there is very little flat land for paddy. Even in a State Farm that has more than 100 ha of flat land, they did not making use of it, instead they practiced slash and burn cultivation” [Minh Nguyen 1962].

III.2 Period between 1967 and 1989

The process of collective agricultural practices continued until 1986. After that people worked individually. Households reclaimed fields to produce more food primarily for their survival. The then deteriorating national economy and food crisis at the national level increased demand for food and is thought to have influenced the expansion of agricultural land in the village. Opening swidden fields was popular in the areas far from Highway No. 7 where forest land was still abundant (Fig. 4b), while the conversion of swidden fields to permanent fields dominated in the areas close to Highway No. 7, including *Nong Trang* 2-9, where land resources are limited (Fig. 4a). As a result, the area of upland fields that included both swidden and permanent fields increased 4.6 times between 1967 and 1989, from

288 ha to 1,328 ha, though in the same period, the population grew 2.7 times (Table 2).

SFE and village households continued timber exploitation after the dissolution of the wood-cutter group in the mid-1980s, in connection with the collapse of collective farming. However, this work was succeeded by individual households. Although the annual volume of exploited timber reached as high as 30,000 m³ in the 1970s and then fell to 5,000–7,000 m³ in 1989, logging by villagers accelerated, even doubled, after the introduction of individual logging. The extent of timber exploitation gradually penetrated deep into forest areas, particularly along water courses. The 1989 LCLU map clearly shows the distribution of open forest and bush along the upstream of Khe Choang stream which in 1967 was totally covered by closed forest (Fig. 4c).

As a result of farming and logging activities, the area of closed forest decreased from 40,490 ha in 1967 to 34,891 ha in 1989, while areas of open forest and bush increased from 427 ha and 1,101 ha in 1967 to 2,472 ha and 3,510 ha in 1989, respectively. The spatial distribution of human-induced LCLU including open forest, bush, grass and upland field areas spread from the north-eastern part to the whole village area.

III.3 *The Period after 1989*

Timber exploitation by villagers further accelerated in the early 1990s. The National Assembly started to deliberate the “Law of forest protection and development,” under which any logging or exploiting of the forest and destroying of the forest resources or ecosystem would be prohibited. Before this, the villagers had a feeling that the forest was their property and they could exploit it at anytime as they needed. News of the new law upset them, and they realised that their access to the forest would be limited. This became the impetus for villagers to rush to exploit large numbers of trees for the renovation of their stilt houses. Consequently, many houses were upgraded and became larger and better during the period.

As represented by the above law, which was finally approved in December 1991, the end of the 1980s and the beginning of the 1990s was the turning point for forest policies and programs in Vietnam, from utilization-oriented to protection and restoration-oriented policies and programs. SFE, as one of state organizations in the forestry sector, changed its major task from timber exploitation to tree planting and forest restoration in 1989. Its management area was reduced from 61,000 ha in the 1980s to 20,000 in the early-1990s, and further to 8,500 ha in 1996, of which an area of 5,500 ha is located in Chau Khe village. The annual exploitation of timber significantly reduced from 2,000 m³ to 3,000 m³ in the mid-1990s and to 1,000 m³ in the 2000s. On the other hand, the SFE started forest rehabilitation and restoration programs and tree plantation programs and annually implemented these programs on areas

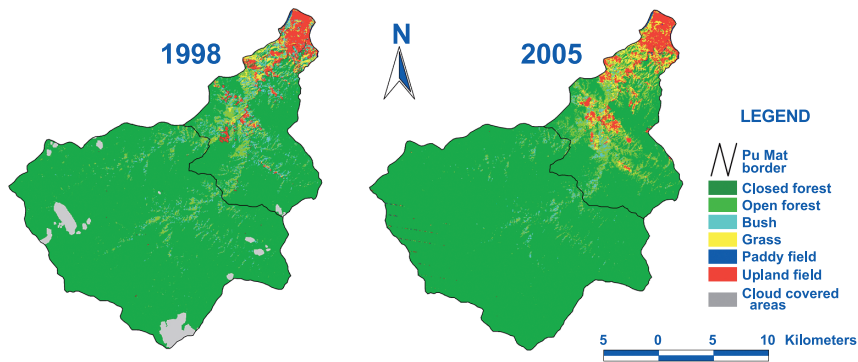


Fig. 5 Chau Khe Land Cover Land Use in 1998 and 2005

Source: Remote sensing image interpretation

of about 300 ha to 400 ha respectively.

The freedom to clear areas for swidden substantially ended at the end of the 1990s. This came about because of the pressure to protect the forest following the establishment of Pu Mat Nature Reserve in 1996. It was a core part of a multi-million US dollar project called “Social Forestry and Nature Conservation in Nghe An Province” [SFNC 2000], an European Commission funded project. The investment plan of the project was approved in December 1995, and implementation began in January 1998 [UNDP and FPD 2000]. The setup of the reserve took a large area of Chau Khe village land for inclusion in the reserve (Fig. 2). About 70% of the village land was designated as a core zone of the reserve, with strict controls over the access local people have by the Forest Protection Station established at Bu hamlet which lies on the only outward route from the reserve by road as well as by stream.

The creation of Pu Mat Nature Reserve had an indirect effect on the forest land use by the villagers, as discussed later, and accelerated the enforcement of laws related to forest protection and development and the implementation of related programs. Consequently, the free cultivation of swidden drastically decreased even in areas outside of the core zone. Although, in order to cope with the limited land suitable for permanent cropping, the Con Cuong district government allowed Chau Khe villagers to have rotational upland fields in certain planned areas in 2003, swidden farming is now disappearing in Chau Khe village.

The 1998 and 2005 LCLU maps clearly show the trend of recovering forest vegetation (Fig. 5). The area of closed forest increased from 34,891 ha in 1989 to 37,165 ha in 1998 and then remained basically stable, at 37,031 ha in 2005, while the area of bush rapidly decreased from 3,510 ha in 1989 to 2,329 ha in 1998 and 846 ha in 2005. The area of open forest fluctuated, from 2,472 ha in 1989, to

1,538 ha in 1998 and 2,785 ha in 2005, reflecting both the impacts of forest conservation and the planting of tree plantations. In the core zone of Pu Mat Nature Reserve, bush and open forest along streams reverted to closed forest, reflecting the restoration process of forest vegetation.

In the area outside the core zone, farming was intensified in terms of productivity and concentrated in terms of the spatial distribution. The area of upland field did not increase much. Rather it is better to say it stagnated after 1989. In 1989 there was 1,328 ha, in 1998, 1,222 ha, and in 2005, 1,449 ha, even though the population of the village increased from 3,737 in 1989 to 5,136 in 1998 and 5,319 in 2005, about a 40% increase during the decade of the 1990s. Villagers have made efforts to expand their paddy field area, but its area was still as small as 30 ha in 1998 and 40 ha in 2005, and the contribution of paddy production to food supply is limited. In-kind income from logging work done for the SFE and the collection of non-timber forest products, such as wild yams, bamboo shoots, rattan, honey, and wild animals to eat or to exchange for food, was reduced during the period. The villager's livelihood in recent years depends more on upland farming on the limited land resources available, a shift which was achieved by means of the conversion from swiddening to permanent cropping and crop diversification from the monoculture of upland rice to a combination of rice, cassava and corn. These shifts resulted in the concentrated distribution of upland fields close to the hamlets.

IV Implications of Forest Policies and Programs

IV.1 *Changes in the Changing Trend of Land Cover Land Use*

The LCLU of Chau Khe was dynamic over the study period (Fig. 6). The proportion of closed forest was 94% in 1967, decreasing to 81% in 1989, and then recovering to 86% in 1998 and 2005. Bush areas show an opposite tendency. There was 2.6% of the bush area in 1976, 8.2% in 1989, 5.4% in 1998 and 2.0% in 2005. The increase in upland field area is drastic during the period between 1967 and 1989, from 0.7% to 3.1%, then stagnated afterward until 2005. These changes suggest that the trend of LCLU in Chau Khe village changed at the end of the 1980s or the beginning of the 1990s from forest-to-agriculture conversion to stabilization. This is exactly when the Vietnam government changed forest policies from exploitation-oriented to protection and restoration-oriented ones.

The results of this study suggest that changes in forest policies at the national level and the changing trend of LCLU at the village level happen almost simultaneously or with a minimum time lag if any. Is there any effective mechanism to link them? Focusing on the tree plantation and extension programs and the establishment of Pu Mat Nature Reserve, we discuss this point.

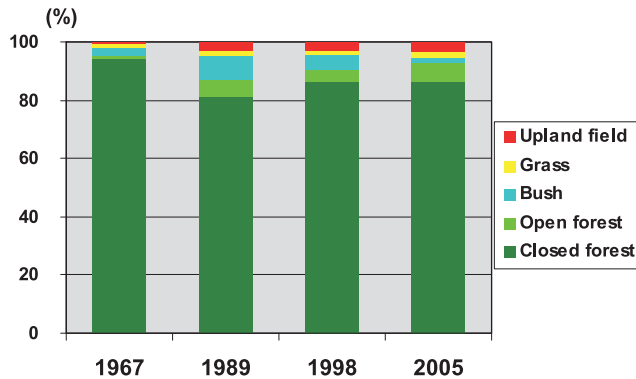


Fig. 6 Changes in Land Cover Land Use of Chau Khe Village
Source: Figs. 3, 4 and 5

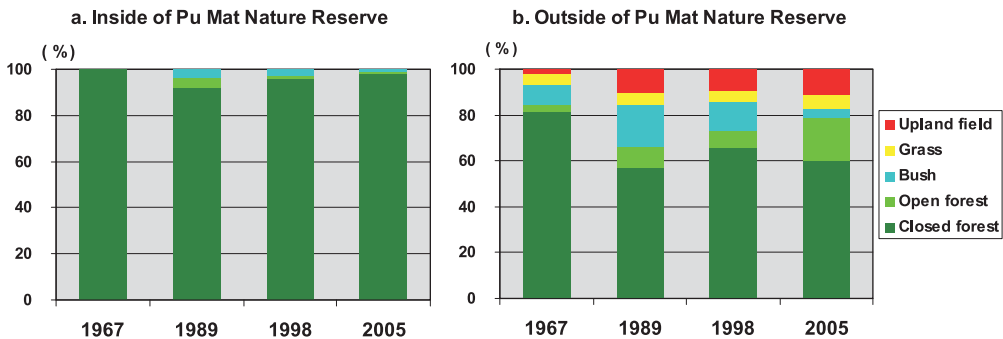


Fig. 7 Land Cover Land Use of the Inside and Outside of Pu Mat Nature Reserve
Source: Figs. 3, 4 and 5

IV.2 Tree Plantation and Extension Programs

The SFE, a line agency under the then Ministry of Forestry,²⁾ initiated the tree planting and rehabilitation activities in 1989. SFE staff reported that it set up 1,100 ha of forest, consisting of 2 plots for afforestation and a plot for rehabilitation forest, in the first decade. The increase of closed forest area and an almost equal area of decrease in open forest and bush outside the Pu Mat Nature Reserve between 1989 and 1998 reflect these SFE efforts (Fig. 7). Mr. Lai, a former director of Con Cuong SFE, reported that he received two State Labor Heroic Medals, one for timber exploitation or forest destruction in 1985 and the other for forest protection and plantation in 2000.

2) The Ministry of Forestry was subsumed into the Ministry of Agriculture and Rural Development in the late 1990s.

At the same time, the government set up new laws, decrees and programs as listed in the introductory chapter to extend its governance to customary forest management areas and over the utilization of forest by local communities. The laws and decrees provide, in general, all the legalities necessary to cover the setting up of forest management, such as providing the initial support for forest protection and development, and to ensure long-term use of the forest land and to set the fines and penalties charged for illegal forest destruction activities. These, of course, never take effect immediately or in a straight-forward fashion, and it takes time for the policies and programs to go from paper to practice.

In Chau Khe village, activities under the 327 Program started in 1997, five years after Decision 327/CT was passed by the Council of Ministers. The activities included the allocation of forest land to organizations, households and individuals for long-term use for forestry purposes. This land was often degraded forest land and was allocated to local people, with long-term land use rights attached to it, under the provision that trees be planted on it. Because of the timing of the implementation of these activities, the 1998 LCLU map does not reflect the impacts of these programs. This being the case raises the question: if the 327 Program was not responsible, what was the mechanism to restore forest and to stop expansion of upland cultivation before the implementation of these program's activities?

The villagers recognized a sign of changes in forest development policy even before the laws and decrees were issued. Mass media outlets such as TV, radio, and newspaper repeatedly reported on-going deliberations at the National Assembly and debates in the ministries. Villagers also received news from timber traders who have "eyes and ears" to serve their business. These sources provided opportunities for villagers to learn of the new decisions of policy-makers and sometimes lead to villagers' speculative behaviour, such as rushing to exploit timber as mentioned above.

In addition to the core programs such as the 327 Program, the government provided a wide range of extension programs to support local people in improving their living conditions as well as their forest protection activities. These included providing rice subsidies against food shortages, introducing new food crop varieties, providing credit for buying and raising pigs and cattle, providing tree seedlings for planting, and introducing new bamboo species for bamboo tree and bamboo shoot cultivation. Some of these were initiated before the implementation of the core programs. The village authority worked with local people to draft rules on forest exploitation and protection, fire prevention in the dry season, the burning of swidden fields, and created a list of fines and punishments for those who broke the local rules. These extension programs provided the villagers with opportunities to attend meetings, to work with program/project cadres, and to exchange ideas and experiences with their neighbors about land and forest issues.

These are the ways that the villagers learned about new forest policies and also adjusted their own

policies as they gradually changed their attitude toward forest protection. They recognized their responsibilities in terms of not only participating in the programs but also contributing to comprehensive conservation of forest resources.

Small mechanisms including tree planting and forest restoration by a line agency and a wide range of extension activities, including information dissemination from national political debates and experiences of program implementation were aggregated and formed a significant mechanism to change the trend of LCLU changes within the village.

IV.3 *The Establishment of Pu Mat Nature Reserve*

The setup of a forest protection station at Bu hamlet in 1998 was the substantial start of the conservation work of Pu Mat Nature Reserve. Before this, the district forestry sector and the village administration office were in charge, but they did not have a large enough budget and enough manpower to carry out conservation and protection operations.

The station has seven staff members and is obliged to manage 27,000 ha of the core zone. It is very difficult for them to both patrol such a large area and guard at the check point. The whole area is divided into 18 zones for patrolling based on the topography. The zones that are close to the station are a fixed assignment for one or two staff. The zones that are far from the station are taken care of by a group of two or three staff members. Each staff has to be armed and patrol in the forest for 7 to 10 days every month. Besides this, they also have the responsibility for carrying out other activities such as organising meetings to disseminate government policies and regulations and cooperating with village organizations and the SFE for the forest protection and management tasks in the buffer zone.

Although the volume of works assigned to the station staff is large and the frequency of patrolling is limited, the amount of illegal forest exploitation is rapidly decreasing. A station staff member reported that there was one case of illegal logging and 20 cases of illegal collection of non-timber forest products in 2007, which was just 5% of what happened when the station was established. This reflects the changes of the understandings of the villagers regarding forest use and also changes in their actions. The villagers have started to fear carrying out illegal activities. They have learned from the process of receiving warnings, self-criticism, signing commitments not to repeat their offences, having their materials confiscated, such as chainsaws and axes when caught, being forced to pay fines, and being prosecuted when caught. These experiences have been related to other members of the village and as a result, cases of forest violations have been reduced significantly.

Even in the core zone of Pu Mat Nature Reserve, the forest area started to recover before the establishment of Bu station (Fig. 7). The activities of the station are, therefore, not the direct cause of

changes to LCLU trends. Rather the reality of the station and the staff members activities have acted to strengthen villagers' understanding of the new forest policy. This has resulted in an accelerated recovery of the forest not only in terms of area but also in terms of vegetation quality.

V Conclusions

Chau Khe was a forest rich village in the Northern Mountain Region of Vietnam. The villagers' livelihood was subsistence-oriented and based on swidden agriculture and the collection of NTFPs until the 1960s. The government started to intervene in land use activities of the village immediately after the country's independence in 1954. It set up the SFE for logging in the 1950s, implemented collective farming and the procurement system and promoted the migration program from lowland areas in the 1960s. All of these interventions substantially decreased and deteriorated the village's forest resources. The turning point came at the end of 1980s or the beginning of 1990s. Since then, the area of closed forest has increased and those of open forest and bush have decreased. The timing of this change coincides with the time when the central government changed its forest policy from utilization-oriented one to a protection and restoration-oriented one.

The village study reveals that the change in LCLU change trends cannot be directly linked to any specific laws, regulations, or programs. Instead, a wide range of small and repeated extension activities that originate out of the national laws and regulations have linked the policy changes of the national level with the daily activities at the village level. This provided the process and environment for the villagers to learn about the new policy and to adjust their land use to the new governance actions. The consistency in the repeated political messages provided the opportunities for the villagers to confirm their understandings through changes in their local actions and local land and resource use decisions.

This process was well recognized during the mid-term review of Pu Mat Nature Reserve [SFNC 2000].

The main successes include improved forest protection, an encouraging change in people's attitudes, the spreading of the conservation idea, a biodiversity—friendly forestry, and an increased living standard for many stakeholders. Technologies related to agricultural, livestock and forestry development have been disseminated. In addition, SFNC (Social Forestry and Nature Conservation) has accelerated the land allocation process, which will have a positive impact on the stabilisation of farming systems and on sustainable soil and forest management. Logging activities, both legal and illegal, have decreased, although still threatening the resource.

This case study suggests the importance of the multiple channels that link the government agencies with people and the intensive learning process needed for local people to understand the political

intentions behind laws and regulations promulgated at the central government level. We cannot expect successful forest policy implementation without the cooperation of local people and we can't expect local people to act in accordance with laws and regulations unless they clearly understand what those are and why they are important.

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