

Land Use After Forestland Allocation and the Potential for Farm Forestry in a Mountainous Region of Northeast Vietnam

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Abstract As a response to serious deforestation in Vietnam, the forestland allocation (FLA) policy was introduced in the 1990s. The process still continues, having allocated 80% of the forestland to various management entities, among which individual households are the most important one for production forests. While previous studies focusing on local livelihoods reveal negative impacts of the FLA, particularly in the initial stage, studies on forest cover change as well as government statistics indicate positive changes in the longer term. We focused on micro-scale land use change after the FLA, and selected two upland villages with different accessibility in the Northeast region of Vietnam. Though the FLA was initiated in 1995 in both villages, the government reforestation program first reached Village G with paved road, and they did second planting. However, forestland recipients in Village A, with no paved road, also planted timber species as soon as the program was introduced. Though the mean allocated areas in Village A was larger than that of Village G, the mean of tree plantation areas was comparable, 1.39 ha (SE = 1.09) in Village A and 1.38 ha (SE = 1.01) in Village G. These results suggest that government support is a determinant of the timing and area of tree planting activities. After the FLA, one of the next policy challenges is how to make small-scale farm forestry financially independent.

Keywords Ethnic minority · Shifting cultivation · Reforestation program · Tree planting · Bac Kan Province

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Introduction

After the reunification of Vietnam in 1975, the Ministry of Forestry was set up in 1976 and State Forest Enterprises (SFEs) were established to execute forest management (Nguyen et al. 2008). However, the sharpest forest cover drop took place under the state management, from 33.8% of the total land area in 1976 to 27.8% in 1990 (de Jong et al. 2006).

In Vietnam, forests are mainly distributed in three regions: Northeast, North Central, and Central Highlands (FAO 2009), where populations are dominated by ethnic minorities (Kozei 2014). Unlike Kinh people, who accounted for 85.4% of the country's population in 2015 (GSO 2016) and have historically engaged in wet rice cultivation in plain areas, traditional livelihoods of ethnic minorities were associated with shifting cultivation (Castella et al. 2006). It is estimated that around 2.9 million people were engaged in shifting cultivation in 1989 (Tran 2007) and the total area under shifting cultivation were 3.5 million ha in 1991 (Do 1994). Deforestation was particularly serious in the Northeast and Northwest regions (Meyfroidt and Lambin 2008). Rapid expansion of shifting cultivation was largely responsible for the deforestation (Donovan et al. 1997; Jamieson et al. 1998; de Koninck 1999), and how to lead the ethnic minorities in the direction of sedentary agriculture and recover denuded hill slopes became a political priority.

Following the shift in the land policy from collectivization to decollectivization in the 1980s (Akram-Lodhi 2007), the forestland allocation (FLA) policy was introduced and the land has been reallocated to eight categories of management entities under the Land Law of 1993 (amended in 2003) and Decree 02/1994. Households, as one of the eight management entities, were vested exclusive rights on certain plots for 50-year period. In parallel, the Forest Protection and Development Law of 1991 (amended in 2004) categorized forestland as special use, protection, and production; logging activities in the former two categories is restricted. A series of reforestation programs were accompanied to provide financial and technical supports for tree planting. As a result, forest cover change in Vietnam reversed in the mid-1990s, a major driving force of which was rapid expansion of tree plantations (Sunderlin and Huynh 2005; de Jong et al. 2006; Meyfroidt and Lambin 2008; MARD 2011).

As of 2014, 12.6 million ha (79.7%) of the total forestland has been allocated to: individual households (4.4 million ha), government organizations including the SFEs (5.2 million ha), economic entities (2.2 million ha), and other entities including communes (0.8 million ha) (MONRE 2014). While special use and protection forests were mostly managed by government organizations for conservation purposes, production forests were mostly allocated to households and economic entities (ibid.). Consequently, the FLA policy resulted in creation of numerous small-scale farm forests managed by ethnic minorities, while the area once under the control of the SFEs was drastically reduced. On the other hand, arable land in mountainous regions was critically limited. Therefore, under the Decision 178/2001 of the Ministry of Agriculture and Rural Development (MARD), the government allowed barren forestland recipients to use up to 20% of their allocated areas for agricultural annual crops.

With regard to the early stage of the FLA, previous studies emphasized negative impacts of the FLA on rural livelihoods and social relations. A descriptive study in the Northwest region reported the people's resistance against the FLA (Sikor 2001), and other household surveys in the Central Highlands reported local conflicts caused by collective forestland ownerships, which was applied under the FLA at that time, and pointed out that the FLA did not favorably treat the poor (Sikor and Nguyen 2007; Sikor and Tran 2007). In the Northwest region, negative impacts of the FLA were observed among households without lowlands because their free access to forestland and forest products became restricted after the FLA (Castella et al. 2006). In the North Central region, forestland recipients did not comply with the policy and higher dependency on forest resources was observed among low-income groups (Nguyen and Sato 2008). Lack of the villagers' participation in the allocation process caused inequality in forestland allocation (Nguyen 2006a, b; To 2007), and kinship ties with local officials tended to work favorably for forestland recipients (Nguyen et al. 2008). As to the impacts of the FLA on forest cover, population-driven increase of shifting cultivation was detected in the 1990s and a shift to wet paddy fields started in the late 1990s in the North Central region (Jakobsen et al. 2007). Another study in the Northwest region revealed that the FLA produced no or even negative impacts in the initial stage (Clement and Amezaga 2009).

On the other hand, a few studies reveal that the FLA brought benefits to local livelihoods. In the Northwest region, local households did not only acquire forestland but also participated in natural forest conservation under contracts with the state forest management boards, which consequently contributed to poverty alleviation (Tran 2012). In the North Central region, creation of *Acacia* spp. and rubber plantations on allocated forestland slightly increased household income (Hoang 2012); in another study site of the same region, the Gini coefficient was also slightly improved when household incomes excluding allocated forestland and incomes including forestland were compared (Nguyen et al. 2016). Apart from these weak positive impacts on local livelihoods, it is pointed out that proximity of allocated forestland to recipients' settlements was an important factor to make recipients satisfied (Castella et al. 2006).

Considering the major concerns about the effects of the FLA on livelihood improvement, which likely caused turmoil in the initial stage but later functioned positively, previous studies do not pay much attention to how the allocated forestland has been converted and what the driving forces were. It is well known that significant areas of the North Central region were covered by *Acacia* spp. plantations with 5- to 7-year rotation periods (Bueren 2004; Amat et al. 2010), but how about the mountainous northern regions with less suitable climates for such fast-growing species, particularly in the areas distant from the wood processing industry?

Byron (2001) notes that the keys to successful farm forestry are: secured land tenure, viable production technology, capacity for crop protection from natural risks, and adequate markets. In fact, farm forestry has already developed in homesteads of the Mekong and the Red River Deltas without the FLA (Sandewall et al. 2010), where demand for raw materials have been generated by the wood processing industry. Notably, tree planting after the FLA started earlier among forestland recipient households living closer to major roads—a convenient location for transporting

forest products—while people in remote areas were more reluctant to move into tree planting (Lang 2002; Sunderlin 2006; Meyfroidt and Lambin 2008).

The objectives of this study are to clarify the process after the FLA for individual households in a northern mountainous region of Vietnam and find determinants for land use changes. Land use patterns can be regarded as a response to the adaptation of forestland recipients both to the FLA policy and to the market. Taking negative impacts emphasized in previous studies into consideration, we first described how the local people recalled the initial stage of the FLA. Next, we focused on the potential of farm forestry as a key factor for income generation and forest conservation. Among the conditions listed by Byron (2001), we examined how secure land tenure, which can be examined by issuance of land use certificates (LUCs), and market conditions, which can be represented by locations of settlements, affected the allocated land use patterns.

Study Sites and Methods

Study Site Selection and General Settings of Each Site

Local administrative units in Vietnam, from the highest to the lowest level, are: province, district, and commune. Each commune consists of a number of villages. We first selected Bac Kan Province in the Northeast region, where the forest cover rate was highest (71.0%) compared to surrounding provinces (GSO 2014). As of 2015, the total forest area in Bac Kan was 370,243 ha, which consisted of natural forests (281,672 ha) and plantation forests (88,571 ha) (MARD 2016). The area allocated to households was 210,867 ha (57.0% to the total forests) (FPD 2016). Next, we selected Village A from A Commune, and Village G from G Commune in Cho Don District (Fig. 1) based on the following similarities: (1) most of the population was comprised by Tay people, (2) shifting cultivation once prevailed, and (3) the FLA started at about the same time in 1995. In addition, Cho Don had not yet had projects aiming at creation of specific forest management systems supported by donor agencies. On the other hand, Village A is in one of the most remote areas from the center of A Commune, and the villagers had to follow mountain trails before an unpaved road reached the village in 2005 (Fig. 2). In contrast, Village G is located along a paved road connecting it to the commune center, which was first opened in 1990 as an unpaved road and then widened and paved in 2003 (Fig. 2).

Cho Don District is one of eight districts in Bac Kan Province with a total area of 911 km², extending from 21°57' to 22°25', N latitude and from 105°25' to 105°43', E longitude. The climate is subtropical. The weather is divided into two distinct seasons: the hot, rainy season (from April to September) and the cold, dry season (from October to March). The topography is characterized by a complex of valleys intertwined with rocky hills and mountains. The altitude of the district ranges from 200 to 1500 m. As of 2012, the population density was 55 people km⁻². The majority were Tay people, accounting for 70.0% of the population. Other ethnic groups were: Kinh (19.4%), Dao (8.6%), Nung (1.7%) and Hoa (0.3%) (Cho Don DPC 2012).

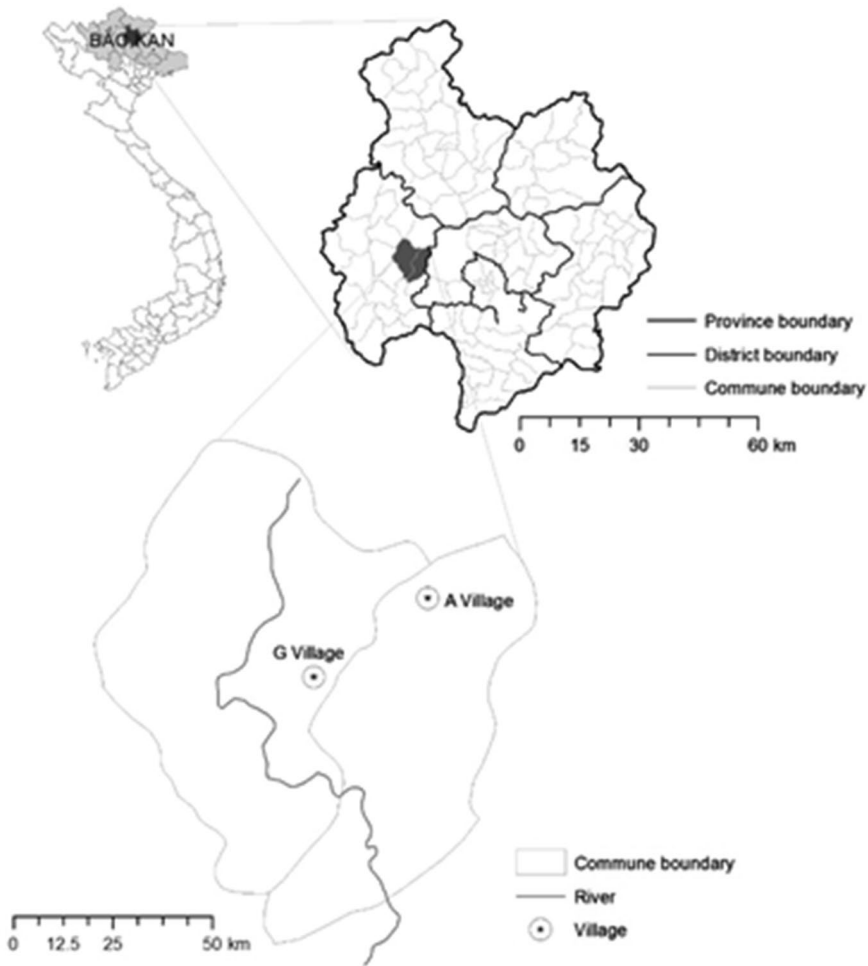


Fig. 1 Location of study sites

Village A's location is 5 km away from the A Commune center where a primary school is located. There is no secondary school in A Commune, and villagers had to attend the secondary school located in the center of G Commune. The distance between Village G and the G Commune center is around 2 km. The distance to a high school located in the center of Cho Don district is around 14 km from Village A and 9 km from Village G. All households of Village G and 37 of 38 (97.4%) households of Village A had electricity. The government provided clean water to both villages, but in the sample households who used clean water in Villages A and G were only 8.1 and 34.3%, respectively. Instead, they piped spring water from the slopes behind their settlements themselves.

Both villages were first established by Tay people; Nung people started to migrate to Village A after 1998, and Dao people migrated after 2002. The main reason for



Fig. 2 The main road connecting the village to the commune center (March 2017)

these population movements in Village A and G was paddy field shortages in the original areas. According to the wealth ranking by the commune administration, poor and near-poor households made up 39.5% of total households in Village A, but 12.0% in Village G. With respect to the livelihood activities, the major economic activity of the people in the two villages was agriculture, mainly farming and livestock raising. The products collected from surrounding natural forests were mostly used for self-consumption. Agricultural mechanization was limited to hand tractors for wet paddy field preparation and rice threshing machines, while other farming activities and forestland cultivation relied on manual labor.

Data Collection

At the national level, the MARD is responsible for forest management, while the Ministry of Natural Resources and Environment (MONRE) deals with land administration. At the district level, the Division of Agriculture and Rural Development (DARD), Division of Natural Resources and Environment (DONRE), and the Forest Protection Unit (FPU) are in charge of the FLA and supervise the law enforcement. At the lowest level of local administration, Commune People's Committees (CPCs) are responsible for forest protection and forestland utilization. We collected official documents and information of the FLA process from DONRE, DARD, and FPU of Cho Don District. Commune- and village-level statistics were collected at A and G CPC.

After a preliminary survey, face-to-face interviews with household heads and their spouses using semi-structured questionnaires were conducted from January to March 2016, and a supplemental survey was conducted in March 2017. The questions used in this study were: basic information on the households and household heads, reasons to stop shifting cultivation, farmland and allocated forestland areas, and land use patterns in the allocated forestland. Because of the small population size in Village A, we interviewed every household. In Village G, we selected odd

numbers from the resident list because a family tended to live in a plot and households in these families were assigned consecutive numbers. Due to the long absence of one household during the survey period, the sample in Village A included 30 Tay and seven Nung households, while the sample in Village G included 30 Tay and five Dao households (Table 1). We asked the same questions to all sample households, but for the questions regarding the early stage of the FLA, we received only 23 valid answers from Village A and 25 from Village G.

Data Analysis

According to the Vietnam Civil Law, each household is given a household registration book (*so ho khau*), which lists the name of household head and other household members. We used these registers to identify residents. For determinants of land use patterns, we collected data on land area, labor force of households, and the age and educational background of household heads. Education level was measured based on years of schooling; primary school consists of 5 years, which are equivalent to grades 1–5, secondary school is grades 6–9, high school is grades 10–12, and higher education is grades 12–16. Land area was confirmed by LUCs, but the land areas of those who did not have LUCs were obtained through interviews. Likewise, timber tree plantation areas were obtained through interviews. When asked about fruit tree plantings, respondents could not recall fruit tree plantation areas but could provide the approximate number of existing trees. Hence, we applied a standard density of 400 trees ha⁻¹ to estimate the fruit plantation areas. We used IBM SPSS ver. 24.0 for the statistical analysis.

Results

Sample Household Characteristics

Despite different access to secondary education, the mean years of education for household heads were similarly low in both villages: 6.0 years in Village A and 6.5 years in Village G (Table 2). All household heads were literate, but in Village A, 16 (43.2%) completed only primary education. Likewise, 12 (34.3%) household heads in Village G completed only primary education. The labor force is also

Table 1 Number and percentage of sample household (HH) by ethnicity

Ethnicity	Village A			Village G		
	Population	Absence	Sample HH (%)	Population	Absence	Sample HH (%)
Tay	31	1	30 (96.8)	61	–	30 (49.2)
Nung	7	–	7 (100.0)	–	–	–
Dao	–	–	–	10	–	5 (50.0)
Total	38	1	37 (97.4)	71	–	35 (49.3)

Table 2 Attributes of sample households in two villages (2016)

Item	Village A (n = 37)		Village G (n = 35)	
	Mean	SD	Mean	SD
Household members	4.2	1.2	4.6	0.9
Members at labor age ^a	2.8	1.3	2.9	1.0
Age of household head	42.9	8.0	44.1	10.6
Education year of household head	6.0	2.9	6.5	3.1

^aLabor age: 15–60 for males and 15–55 for females

supposed to be a determinant of land use as well as household income, particularly where most farming activities depend on physical labor. There was no significant difference in the mean of two sample villages (*t* test, $p > 0.05$). Other selected variables, namely household members, age of household heads, and education year of household heads, also had no significant differences (*t* test, $p > 0.05$).

End of Shifting Cultivation and the Start of Tree Planting

The Tay people have settled in both Village A and Village G for over a century. They have experienced a similar history of land use changes. The government started to establish collective management of farmland in the 1960s, and rice yield was distributed to each household based on a labor point system. During the cooperative period in upland communes of Bac Kan Province, it is reported that rice shortages forced people to open surrounding forests for upland rice cultivation (Sadoulet et al. 2002). According to Castilla et al. (2002), who traced landscape changes in Cho Don District using satellite imagery, new forest clearance was observed in 1990–1995, and the effects of reforestation appeared in 1995–1998.

The information obtained from our respondents corresponded closely to these forest cover changes. From the late 1970s to the early 1980s, agricultural production from collective farm management could not keep pace with the growing population. Consequently, the villagers uncontrollably rushed to clear as much upland area as possible to meet their food demands, which soon reduced available slopes for farming. When collective farms were closed in 1988, the Tay families claimed the lowland, mostly wet-paddy fields, as their ancestors' land and allocated the land to them. However, some households whose lowland areas were insufficient continued to the surrounding forests.

In Cho Don District, FLA started in 1995. The next allocation was conducted in 1998 including A Commune, and again in 2001 including G Commune. Before 1999, the FPU under the then Ministry of Forestry took full responsibility for FLA and issued LUCs, which were called Green Books after the green-colored covers. According to senior officials of the District FPU, they encouraged villagers to apply for FLA but many refused in the beginning due to fear of taxation on their LUCs. As pointed out by Clement and Amezaga (2008), another reason given by the villagers was that, under free exercise of shifting cultivation, they were not attracted to

having official approval of their rights over forestland. Most respondents indicated that there were few conflicts among villagers during the FLA process.

The answers to the questions about when and why they discontinued shifting cultivation suggest that most of them had already become stuck when the FLA was implemented. A shortened fallow period of up to 3 or 4 years and degraded forestland made shifting cultivation unrewarding. Of 23 and 25 respondents in Village A and Village G, respectively, who could recall the early stage, 17 (73.9%) and 21 (84.0%) listed soil degradation as the reason that shifting cultivation became unattractive. They became aware of soil degradation through crop yield decreases, soil hardness, and loss of top-soil. In addition, 15 (65.2%) and 18 (72.0%) answered that they started to pay attention to and concentrated more on wet paddy rice production (Table 3). Notably, the majority had ceased shifting cultivation before the FLA, and there was no significant difference between the two villages ($p > 0.05$). Prohibition of shifting cultivation by the government might not play a decisive role, but might encourage them to terminate shifting cultivation.

With the reorganization of the Ministry of Forestry into the MARD in 1995 and the establishment of the MONRE in 2002, every land-use category was standardized in the so-called Red Book issued by the DONRE. Sample households in Villages A and G were first given Green Books (*ho so giao dat lam nghiep*) issued by the District FPU for both protection forests and production forests. Later in 2000, local authorities withdrew all Green Books and replaced them with Red Books issued by the DONRE. Remarkably, Red Books were only issued for production forests with a 50-year period. The 50-year period started from the date when a parcel of forestland was allocated to a household. When several parcels were allocated to a household, a separate Red Book was issued for each parcel.

Though FLA was introduced to both Villages in the same period, government supports reached them at different times. Respondents of both villages first took advantage of collecting living wood after they cleared degraded allocated forestland for tree plantations, which would otherwise have been prohibited. Program 327 (1992–1997), and Program 661 (1998–2010) were two major subsidiary mechanisms to encourage forestland recipients to plant trees. Program 661 was replaced by Program 147 (2007–2015), with more focus on production forest recipients. Village

Table 3 Reasons to stop shifting cultivation (multiple answers were allowed)

	Village A (n=23) No. (%)	Village G (n=25) No. (%)
Reasons for discontinuing shifting cultivation (multiple free answers)		
Soil degradation	17 (73.9)	21 (84.0)
Acquirement of lowland	15 (65.2)	18 (72.0)
Prohibition by the government	6 (26.0)	4 (16.0)
Hard work	3 (13.0)	4 (16.0)
When they stopped shifting cultivation		
Before FLA	17 (73.9)	21 (84.0)
After FLA	6 (26.1)	4 (16.0)

G, with better accessibility, was given priority, where 23 of 33 forestland recipient households participated in Program 327 in the latter half of the 1990s. The remaining 10 households joined the programs later, including Programs 661 and 147. These programs provided seedlings and the cost to take care of the plantations for 3 initial years. Twenty-three households of Village G who first joined the program had already experienced timber harvest and the lands were two cycles in.

Contrastingly, forestland recipients in Village A with worse accessibility started to participate in the government programs after 2005, when an unpaved road was constructed and connected the village with the commune center. Before the support started, there was only one household who purchased and planted seedlings on their own accord. Before the support under Program 661 was initiated, forestland recipients just cultivated food crops on the allocated degraded forests, and collected wood and non-wood forest products (NWFPs) for their daily necessities.

The Current Allocation of Forestland

The MARD categorizes forest recipients into eight types: households, CPCs, management boards, SFEs, other economic entities, communities, army and other organizations (MARD 2016). As of December 2015, the forests of Cho Don District were allocated to six management entities, all of those listed above except SFEs and communities. In the past, there was an SFE in the district jurisdiction, but it was closed in 2006 after the government issued Decree 200 in 2004 and mandated that ineffective SFEs be dissolved. As of 2015, households and CPCs were the two core entities, making up 62.9 and 32.9% of the total allocated forest area in the district. Plantation forests were principally established and managed by individual households, whereas other entities played minor roles in the total allocated area and were mainly responsible for natural forest management (Table 4).

In A and G Communes, forests were allocated only to CPCs and individual households. Production forests made up 52.2% in A Commune and 59.3% in G Commune. Both production forests and protection forests were allocated to individual households, while CPCs were only responsible for protection forests (Table 5). Production forests are primarily used for timber production on a sustainable basis. Protection

Table 4 Type of forests allocated to management entities in Cho Don District. *Source:* Cho Don FPU (2016)

User group	Natural forest Ha (%)	Plantation forest Ha (%)	Total Ha (%)
Household	35,850.7 (58.7)	9545.7 (86.3)	45,396.4 (62.9)
CPC	22,261.6 (36.5)	1496.9 (13.5)	23,758.5 (32.9)
MBSF	1855.5 (3.0)	48.0 (0.4)	1860.3 (2.6)
Army	920.7 (1.5)	2.8 (0.0)	923.5 (1.3)
Non-state enterprise	174.3 (0.3)	1.1 (0.0)	175.4 (0.2)
Other organizations	11.1 (0.0)	4.0 (0.0)	15.1 (0.0)
Total	61,074.0 (100.0)	11,055.3 (100.0)	72,129.3 (100.0)

Table 5 Allocated forest area (ha) by forest category and management entity in A and G Commune. Source: A CPC (2015) and G CPC (2015)

Management entities	A Commune			G Commune		
	Protection	Production	Total	Protection	Production	Total
Household	175	1168	1343	280	1871	2151
CPC	895	–	895	1002	–	1002
Total (ha)	1070	1168	2238	1282	1871	3153

forests are maintained for water and land conservation, erosion control, natural disaster prevention, climatic regulation, and overall protection of the ecosystems. Protection forest recipients are allowed to collect limited volume of non-timber forest products, while living wood felling is prohibited unless otherwise permitted by state authorities.

All sampled households in Village A, and 33 households (94.3%) in Village G had acquired forest land through the FLA. Both the husband's and the wife's names were written in each Red Book. Two households in Village G who did not have forestland were late Dao migrants. Ten non-Tay households purchased forestland from Tay households. However, two of these households in each village did not have Red Books. The reason was that issuance of a new Red Book required authentication of both the buyer and seller, but these non-Tay households had purchased forestland from villagers who had left the village for other provinces. These purchasers without land titles were considered as forestland recipients by the local government and received the same rights and duties as the original owners.

On the other hand, as previously mentioned, the Green Books issued on protection forests were not replaced with Red Books. Protection forests allocated to individual households came to be managed under contracts with the FPU based on Decision 57/2012 about the approval of the forest protection and development plan 2011–2020. Smaller ratios of protection forests in G Commune and location of Village G—closer to the commune center—is reflected in protection forest management. Since there were no nearby protection forests available in Village G, protection forest management contractors were only found in Village A (Table 6). Those 16 households received protection work fees from the district FPU. During the survey period, the provincial government defrayed 200,000 VND (8.9 USD) ha⁻¹ year⁻¹ per contractor. Although the boundaries of each allocated parcel were specified on the contract, the villagers could freely collect dead, fallen, or diseased wood, and NWFPs from protection forests regardless of allocation.

Comparison of Allocated Forestland Use Patterns

Wet paddy fields made up only 4.7% of the territory in A Commune and 7.3% in G Commune (A CPC 2015; G CPC 2015). As all production forestland allocated to villagers were denuded hill slopes and degraded natural forests caused by shifting cultivation in the past, forestland recipients could use up to 20% of the allocated

Table 6 Land area (ha) per sample household (2016)

	Wet paddy field (ha)		Production forest (ha)		Protection forest (ha)	
	A (n=37)	G (n=35)	A (n=37)	G (n=33)	A (n=16)	G (n=0)
Min ^a	0.10	0.10	0.10	0.40	1.20	–
Max ^a	0.63	0.50	15.94	8.10	28.50	–
SD ^a	0.12	0.12	4.23	2.10	6.59	–
Mean ^a	0.33	0.28	4.55	3.43	5.13	–
Mean of LUC number issued on forestland ^a	1.8	1.8	–	–		
No. of HH who did not have forestland	–	2	21	35		

^aRefers to the sample households who had land

land for agricultural crops. In addition, they could cultivate food crops between trees in the initial tree planting stage.

The mean of wet paddy field area per sample household was 0.33 ha for Village A and 0.28 ha for Village G (Table 6). There was no significant difference in the mean of the two groups ($p > 0.05$). Wet paddy could be cultivated twice a year when water was sufficient. Otherwise, maize was cultivated before rice. Such single cropping of wet paddy made up 10.2% to the total wet-paddy fields of sample households in Village A and 9.1% in Village G.

The mean of allocated production forest area was 4.55 ha in Village A, larger than the 3.43 ha in Village G (Table 6). The higher population density in Village G likely contributed to the smaller land areas. In addition, the government took part of the allocated areas to widen the road. However, there was no significant difference between the mean of allocated production forest area between the two groups ($p > 0.05$). Contrastingly, there was a large disparity among the forestland recipients in each village. In Village A, the maximum area per household was 15.94 ha. The reason was, according to the explanation of the respondent as well as the CPC, the household size was largest when the FLA was implemented. The household that possessed 0.10 ha in Village A was a newly formed household, who got the land through inheritance from their parents in 2014. In Village G, the largest area was also allocated to a big family, while the household who had only 0.40 ha was a Dao family who recently migrated to Village G and purchased forestland from a Tay owner.

During the survey period of 2015/16, all the forestland recipient households had established and maintained timber plantations, except one single-parent household (Table 7). The female householder abandoned the allocated 0.70 ha and supported her household by seasonal wage work away from home. This household was excluded from the following statistical tests.

The species for timber plantations in the two villages were: *Manglietia glauca*, *Cinnamomum cassia*, *Canarium album*, *Chukrasia tabularis*, and star anise

Table 7 Allocated forestland utilization (2015/2016)

	Village A (n = 37)	Village G (n = 33)
Total allocated forest area (ha)	167.74	113.26
Number (%) of HH who planted		
Tree crops		
Timber trees only	18 (48.6)	19 (57.6)
Timber trees + fruit trees	18 (48.6)	14 (42.4)
No tree plantation ^a	1 (2.7)	– (–)
Annual food crops		
Cultivated on the allocated area	35 (94.6)	25 (75.8)
No food crop on the allocated area ^a	2 (5.4)	8 (24.2)
Total area (mean ^b) of each crop		
Timber trees	49.90 (1.39)	45.62 (1.38)
Fruit trees	7.75 (0.43)	5.69 (0.41)
Annual food crops	6.32 (0.20)	5.29 (0.26)
Min.–Max. area (ha) per household ^b		
Timber trees	0.10–3.35	0.30–5.00
Fruit trees	0.10–1.25	0.11–1.25
Food crops	0.05–0.50	0.05–0.55

^aIncludes one Village A household who got 0.7 ha of allocation but had abandoned it

^bRefers to the sample households who had each component

(*Illicium verum*). The first two were the most commonly planted species with 10- and 15-year standard felling rotations, respectively. All the households who planted these two species responded that they got the seedlings through Programs 327, 661, and/or 147. One household in Village A and another in Village G additionally purchased and planted seedlings of *Cinnamomum cassia* due to its high economic value.

Fruit-bearing trees were also planted. The species listed by the respondents were: orange (*Citrus sinensis*), mandarin (*Citrus reticulata*), persimmon (*Diospyros kaki*), and plum (*Prunus salicina*). Most of the fruit-tree seedlings were provided by Cho Don District in the 2010–2015 period; some were provided by Program 661, purchased, or self-produced. While waiting for the timber harvest, the forestland recipients could earn income from fruit trees that start to bear fruits after 5 years. The ratio of households who planted fruit trees was slightly higher in Village A (48.6%) compared to Village G (42.4%) (Table 6), but there was no significant difference between the two villages ($p > 0.05$).

In Village A, it was estimated that 49.90 ha (29.7% of the total allocated area, excluding one household that abandoned their land) was covered by timber trees, and 7.75 ha (4.6%) was covered by timber trees and fruit trees. In Village G, the total estimated area for timber trees was 45.62 ha (40.4% of the total allocated area), and the area for fruit trees was 5.69 ha (5.0%). The ratio used for timber trees was higher in Village G, but there was no significant difference between the mean of areas used for timber trees ($p > 0.05$) and fruit trees ($p > 0.05$) between the two groups.

In addition to tree crops, annual food crops, such as maize and cassava, were cultivated on the allocated forestland. These were mixed with tree crops when the trees were young or arranged separately from tree crops. During the survey period, a larger number of households cultivated food crops in Village A (94.6%) compared to Village G (75.8%) (Table 7), and there was a significant difference between the two villages ($p < 0.05$).

Though almost all forestland recipients planted trees, the area actually planted was less than the allocated forestland (Fig. 3). When we compared the allocated areas and the areas without tree plantations, there were high correlations in both Village A (Pearson's two-sided $r = 0.969$) and Village G ($r = 0.879$). It means that the households who were allocated larger production forestland tended to use a smaller percentage of the allocated land for tree plantations. In other words, even if larger areas were given—such disparity is particularly noticeable in Village A (Table 6), the forestland recipients planted trees in around the same areas. In the supplemental survey to households and local officers, they suggested two reasons: one was limited and balanced supports provided by the reforestation programs, and another was that the people themselves restricted the requests of seedlings due to concerns about unachievable targets.

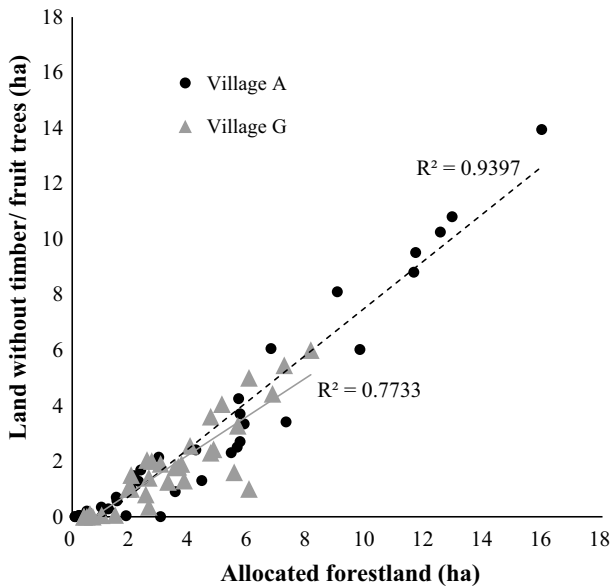


Fig. 3 Comparison of allocated forestland and allocated land without timber/fruit trees

Discussion and Recommendations

The End of Shifting Cultivation

The results of our study differ from previous studies in several aspects. Negative impacts of the FLA on traditional land and forest resource use of ethnic minorities and their hostile attitudes against the FLA were reported in the Central Highlands and North Central region (Sikor and Nguyen 2007; Sikor and Tran 2007; Jakobsen et al. 2007). After two decades, however, the respondents in the two sample villages recall the initial stage without clear complaints. With regard to the impacts on traditional land use, our case study suggests it is necessary to understand the background from a sequence of political changes from collectivization to decollectivization, which first took place on farmland and then on forestland. As already pointed by Sadoulet et al. (2002), it is likely that collectivization in farmland management resulted in excessive agricultural use of surrounding forests, but shifting cultivation had already become an unproductive practice when decollectivization of farmland started. Negative impacts of the FLA could take place if local people's livelihoods fully depended on shifting cultivation, but previous studies that emphasized negative impacts on the society and forest resource use did not indicate whether those ethnic minorities also had lowland (Nguyen 2006a; Sikor and Tran 2007).

Our cases suggest that the areas under shifting cultivation were reduced in accordance with labor concentration on privatized farmland. In our study sites, narrow stripes of flat land along a river stream were converted to wet-paddy fields, which topography is commonly observed in mountainous areas. Settlements were formed in between the lowlands and hills, parallel to the river. With clear boundaries of allocated forestland and individual responsibility on the land might encourage each forestland recipient to have an idea of a comprehensive land use strategy over a stretch of lowland and upland. However, it should be noted that it is technically difficult to restage the situation of two decades ago.

Current Situation of the Forestland Allocated to Individual Households

As in the national-level statistics, the local level statistics show a rapid increase in forest cover. Nguyen (2006b) found that, based on the database of the MARD in 2004, the largest forestland recipients in Vietnam were the SFEs. However, the progress of the FLA afterwards set back the presence of the SFEs and made individual households one of the dominant forest management entity types. In addition, statistical data suggest that there is an appropriate division of roles between the public and the private sectors. At least in our study sites, individual households engaged mainly in production forest management while the communes took responsibility for the protection forests. According to the district statistics, 62.9% of the total allocated forestland and 86.3% of tree plantations were managed by individual households as of the end of 2015 (Table 4).

Our next questions were how individual households managed allocated forests and how the conversion from degraded natural forests to more profitable plantations

were realized. From the conditions for successful farm forestry listed by Byron (2001), we focused on land use rights and market accessibility. Villages A and G had similarities in the composition of ethnic groups, household size, and age and educational background of householders, but there was a difference in accessibility. The results revealed that land title was guaranteed, not only for the original recipients but also for inheritors and purchasers.

Contrary to our assumption, road accessibility was not a direct determinant of tree planting activities. Almost all of the forestland recipients in both villages had already planted timber trees, and there was no significant difference in the mean area of tree plantations between the two villages. A difference was found in the time when tree planting started. The reason why Village G people started earlier was because of government support. As soon as the program support reached Village A, even with worse accessibility to the market, they also initiated tree planting. In both villages, it was estimated that around 40% of allocated production forests were converted either to timber tree or to fruit tree plantations.

In mountainous regions where arable land is critically limited, the government allows utilizing part of forestland allocations for food crops. However, fewer households made use of the privilege in Village G, probably because of more livelihood opportunities. Even in Village A, where most households planted food crops during the survey period, the mean area was limited to 0.20 ha, less than the permissible ratio by the government (20% of allocated barren forestland). They planted maize and/or cassava among the young trees or separately from tree plantations, mainly to feed livestock.

Determinants of Tree Planting Activities and Required Steps Towards Post-FLA

The impact of the FLA on local livelihood should not be measured just by allocated area but also by how forestland recipients utilize the allocated forestland. The most notable conclusion is that, though the allocated area differed among households and also between Village A and G, the mean tree plantation area and the standard deviation were similar between A and G (1.39 and 1.38 ha as the mean, and 1.09 and 1.01 as the standard deviation). The results suggest that the government support did not only play a decisive role in encouraging tree planting but also functioned as a determinant of tree planting area. In fact, only one household in each village spontaneously purchased seedlings in addition to what the government provided. Such similarity in planting areas resulted in a high positive correlation between the allocated areas and the areas without tree crops. This finding can be applicable to disadvantaged mountainous areas, where market pressures on raw materials from the wood processing industry is relatively low. In other words, expansion of tree plantation area largely depended on the government reforestation programs.

Apart from production forests, Village A, which is located in a more interior area compared to Village G, was once allocated protection forests, but later the policy framework was replaced with protection contracts. However, local people collected wood and NWFPs from natural forests, regardless of the boundaries. Such

diminishing boundaries of allocated protection forests and de facto free access to surrounding natural forests are also reported in the North Central region (Nguyen et al. 2016). Since the payment for protection activities can be regarded as a compensation for their labor input, the inequality observed in the area—only 16 (43.2%) households had protection contracts, and in addition, the areas vary from 1.20 to 28.50 ha—should be understood not as inequality in property but as inequality in working opportunities.

Recommendations

The FLA policy prompted mountain dwellers to change the upland management from shifting cultivation to sedentary land uses. Stop of shifting cultivation led to natural regeneration in once degraded forests, and issuance of the land title associated with initial financial supports by the government led to formation of farm forestry. What were observed from two upland villages cannot be directly generalized to the whole country; land use development after the FLA might follow different directions, for instance, in the areas where lowland is limited and the local people highly rely on NWFP collections; but the findings here can be applicable to the areas with similar geographical and economic settings.

As one of the future challenges in the FLA policy, there is a question regarding how long the government support will be needed. The third reforestation program (Program 147) was completed in 2015, and currently there is no subsequent program. If the market remains limited, whether the sample households replant trees by themselves or just abandon the land after harvesting should be monitored to find the answer to this question. Even though the current plantations are abandoned, however, it is likely not going to matter as much in terms of forest cover because natural regeneration takes place if there are no strong human pressures like shifting cultivation. A revolving cycle of farm forestry can be achieved if timber market grows steadily, but at the same time, currently uneven distribution of forestland, and future possibility of land concentration to economically powerful households or any other agents may become pronounced if tree planting activities start to expand spontaneously under market mechanisms.

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