The Expansion of Farm-Based Plantation Forestry in Vietnam

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Abstract This study targets plantation forestry by farm households (small holders), which is increasing globally and most rapidly in China and Vietnam. By use of an interdisciplinary approach on three study sites in Vietnam, we examined the trends in farmers' tree planting over time, the various pre-requisites for farm-based plantation forestry and its impact on rural people's livelihood strategies, socio-economic status, income and security. The findings indicated a change from subsistence to cash-based household economy, diversification of farmers' incomes and a transformation of the landscape from mainly natural forests, via deforestation and shifting cultivation, to a landscape dominated by farm-based plantations. The trend of transformation, over a period of some 30 years, towards cash crops and forestry was induced by a combination of policy, market, institutional, infrastructural and other conditions and the existence of professional farming communities, and was most rapid close to the industrial market.

Keywords Smallholder households · Livelihood strategies · Landscape · Land use · Policy · Market

INTRODUCTION

Over the last 50 years, the natural forests in Vietnam, as in most tropical countries, have been degraded (Koninck 1999). In recent decades, a reverse trend of reforestation by farmers has emerged. This trend has been particularly strong in some countries of the Asia-Pacific Region, such as Vietnam and China. During 1990–2005, the productive forest plantation area in Vietnam increased by 5% annually, and farm-based plantations increased significantly (FAO 2005, 2006; MARD 2006). Several broader studies

on land use, policy reforms and societal changes in the mountainous areas of Northern Vietnam have been made (Donovan et al. 1997; Sikor and Truong 2002; Ohlsson et al. 2005; Castella et al. 2006). They display rapid societal, environmental and institutional change, instilled by historical developments and socio-political changes. They also point at sub-national differences and diversity (e.g. how various provinces approach a certain policy, how different ethnic groups respond to it and how it affects the various societal strata). Studies indicate that Vietnam has been successful in its economic development and in reducing poverty, although poverty is a disputed term and the achievements in mountainous areas have been limited (Phuc 2003; The Socialist Republic of Vietnam 2004; Varis 2008).

In a regional and global context, forestry development in Vietnam since the early 1990s has undergone changes in policy and in actual achievements. The value of Vietnamese exports of wood produce increased from 61 million USD in 1996 to 1,500 million in 2005 (MARD 2006). 'Although the timber processing industry has developed rapidly, it is still unstable with the absence of a strategic vision and weak competitiveness: the linkages are weak and the production assignment is unclear, Vietnamese brand names have not been established in international markets, investment is lacking to develop and update technology, material sources are unstable and mainly depend on imported sources' (MARD 2006). Regional operators view Vietnam as a primary opportunity for fast-growing plantations and wood chips for export (Barney 2005). Barney, however, points out the difficulties in ascertaining the extent and composition of the exports. Some of them include illegal logging operations, with timber from Cambodia and Lao PDR being re-exported from Vietnam (Meyfroidt and Lambin 2009). So far, trade

with China seems to be limited, although the Chinese demand is high and the opportunities for export, for instance by using the railways, are there.

In the mountainous areas of Northern Vietnam, the landscape has undergone a stepwise change over 40 years, from natural forest, via shifting cultivation to forest plantations and other cash crops. After logging the natural forest in the 1970s, State Forest Enterprises (SFEs) established industrial plantations to supply the forest industry. The SFEs imported their own workers from the delta, while the local people, who were not involved, used the forest land for other purposes (SIDA 1987). Since 1987, the SFE plantations have been partly replaced by private, farm-based plantations, which now supply about 50% of industrial needs. The balance also comes from private farmers, who lease SFE land.

This transformation occurred at a time when economic and forest policies were undergoing profound changes (Sam and Trung 2001). Currently, the SFEs control 40% of Vietnam's forest area, but much of the forest land is leased out to farmers and entrepreneurs, and it is government policy to privatise or convert the SFEs into other management forms (Anon 2005).

Private, farm-based plantations emerged after 1987 under the new free market policy (Doi Moi) and following the allocation and privatisation of mostly barren or degraded forest land to individual households and other entities. Farm forestry is one of the several forestry and tree production systems that is supported by the government within an ambitious reforestation policy (MARD 2006). Many factors have influenced the development of farm forestry, including markets, infrastructure and economic development, increased interaction between farmers and markets, privatisation of forest land, globalisation and increased agricultural efficiency (Sikor 2001). In Vietnam, in particular in the two deltas of the Mekong and the Red River, there is a long tradition of homestead tree plantations; thus the concept of farm-based plantations is not new.

In this project, we have studied, *inter alia*, the physical progress of farm-based plantation forestry in one part of Vietnam, its production and marketing structure; and have investigated how, and to what extent, this type of forestry directly and indirectly could support, for e.g., the Millennium Development Goals and some location-specific objectives in the study area. One such goal is poverty alleviation, which at household level could be seen in two dimensions: as poverty mitigation, where forestry provides a safety net or gap, or as poverty elimination, where forestry can be used as a career out of poverty (Angelsen and Wunder 2003). The number of people defined as poor has been reduced by 50% since 1990 (The Socialist Republic of Vietnam 2004). Some groups have not benefited, such

as former shifting cultivators, who are landless or rely on allocated plots too small to provide subsistence (Castella et al. 2006; Gomiero et al. 2000), households with few labourers in relation to consumers, and female-headed (single) households (Ohlsson et al. 2005). The role of forestry in changing poor people's life is increasingly being discussed. Forests provide environmental services and carbon sequestration, non-timber forest produce, timber and other commercial assets. The value of the non-commercial produce could amount to some 22% of total income (Vedeld et al. 2004). The role of forest plantation in poverty alleviation, is ambiguous and requires special consideration, as it contains risks which are likely to affect the poorest strata, e.g. in losing access to natural forest land when it is being converted into plantations and private land (Phuc 2003; Varis 2008; Sunderlin 2005; McElwee 2009).

The study is part of a collaborative research project, involving the Swedish University of Agricultural Sciences (SLU), Center for International Forestry Research (CIFOR), and two national forestry universities, one in Hanoi, Vietnam and the other in Wondo Genet, Ethiopia. Its overall project objective is to analyse the characteristics and mechanisms for the development of viable and sustainable farm-based plantation forestry in tropical countries, based on case studies.

The study in Vietnam aims to review and examine the trends of changes in farmers' tree plantation over time (intensity, pattern and focus), the various prerequisites for farm-based plantation forestry, distance and access to the market, and its impact on rural people's life and livelihood strategies in terms of poverty alleviation, socio-economic status, income and security. The study includes three communes. One of the sites has previously been part of another research project involving the authors (Ohlsson et al. 2005; Sandewall et al. 2004).

STUDY AREA AND METHODS USED

The study area is the Upper Red River Catchment of Northern Vietnam (Fig. 1). This mostly mountainous area, stretching from the upper part of the Red River Delta to the Chinese border, is populated by a great number of ethnic groups, including immigrated Kinh from the coastal provinces. Since the 1970s, there has been significant industrial development related to forestry and agro-industry, mainly in the southern part of the area. In some parts, state forestry occupies large areas. The biggest forest industry, Bai Bang Pulp and Paper Mill, buys nearly all its annual consumption of 310,000 tonnes of pulpwood and bamboo from farmers, via traders or via state forest enterprises in the area.

Fig. 1 The study area in Vietnam, including the three sites. (©Copyright ESRI ArcWorld Supplement)

Based on the assumption that a strong market is vital for generating viable farm-based forestry or any other broad economic development, three village sites in three different provinces situated at various distances from Bai Bang, were selected for the study. The choice of communes and villages was made in discussion with district and commune leaders, and was based on diversity in land use, ethnic diversity and other official data available for all communes. The study team was given the final choice. While sampling households, a record of all households, obtained from the leader of each village, was used.

Site 1 is situated in Phu To Province, Doan Hung District, Ca Dinh Commune, only 30 km from Bai Bang. It is a predominantly Kinh village, currently of 108 households. Its population immigrated from the south in the 1950s and started to cultivate previously forested land. The area was part of several development projects on agriculture, tea and forest plantation in the 1970s and 1980s. Paddy is grown mainly for subsistence, while forest plantations and tea are the most important market crops.

Site 2 is situated in Tuyen Quang Province, Ham Yen District, Yen Phu Commune, ca. 100 km from Bai Bang. This multi-ethnic village, of mainly Kinh and Dao groups, comprises 104 households. The Dao have lived in the area for generations, while the Kinh started moving in during the 1940s. The SFEs in the district belong to the Bai Bang wood-uptake area.

Site 3 is situated in Lao Cai Province, Muong Khuong District, Ban Lau Commune. This village, with currently

41 households, is bi-ethnic (Kinh and Dao) and situated on the border to China, some 250 km from Bai Bang and outside its wood-uptake area. The Dao households have lived there since the 1920s, while the Kinh moved in during the 1970s as part of a national resettlement programme. A nearby Hmong village, which consists of re-settlers in the same commune in 1992, was studied for reference.

Several complementary methods were used during data collection and applied by an inter-disciplinary and gender-balanced research team: (i) use of secondary data and available national and local statistics, (ii) interviews with stakeholders representing, e.g. policy and market interests, (iii) participatory discussions with village key informants and households selected through income stratification. An updated household sampling survey was made at Site 1 in 2010 to clarify some income related issues (iv) Field observations in the mentioned sites (villages), using previously tested methods. The core technique was field point sampling, involving local key informants whereby systematic observations were made on geometrically distributed sample points along transect lines. Accompanying villagers provided complementary information on current and historical land use and related circumstances for each point. On the respective three sites, 49, 69 and 51 points were allocated and visited. This method, which is statistically robust, generates a complete record of current and past local land use (certain years), and provides an opportunity to relate land-use changes to other historical events (Ohlsson et al. 2005).

FINDINGS

Previous Changes and Policies which have Influenced Land Use

Over the past 50 years, Vietnam has generated many policies, which is not per se a prerequisite for change. However, in a regional context, Vietnam has been unusually successful in implementing its policies through an administration that reaches the villages, possibly and partly because the village leadership is part of the government administration. One policy was collectivisation in the 1950s and 1960s, whereby some nine of every ten households in northern Vietnam became part of a cooperative (Sikor and Apel 1998). Another policy was migration. Farmers and former soldiers were encouraged to settle in the study area. The argument was that this would release pressure on more populous regions and would introduce new agricultural skills and traditions. Management of forest land was the prerogative of the State Forest Enterprises, the SFEs. The establishment of Bai Bang Pulp and Paper Mill, coupled with the immigration of young workers and road construction, generated extensive logging in the study area during the 1970s although the Mill did not log natural forest for industrial use. Besides tree planting for the SFEs, the migrants and the local people used the logged-over land

for shifting crop cultivation, and there were no legal instruments in place to address the land-use issues properly.

In Table 1, selected significant policy statements and decrees are listed in chronological order. In some instances, the implementation of the new policies took several years to penetrate to lower levels. Some, such as the Forest Land Allocation policy, actually started before the legislation was in place. Several of the decisions and pieces of legislation have influenced and enabled the development of farm-based plantation forestry. From the beginning of the 1990s, new forest policies have been introduced. There was a shift from state forestry towards household forestry, which was formalised in the Land Law of 1993, and was further confirmed in the new forest strategy (MARD 2006). The SFEs began to contract-out forest land to individuals. The contract could be for management and reforestation of a denuded forest area to establishment of a short-rotation plantation, and support, profit sharing and compensation varied.

Following Forest Land Allocation (FLA), a mechanism and legal system implemented in Vietnam since 1983, individual households near Bai Bang started forest plantation in response to the new wood market opportunities. FLA was developed further in relation to new forest policies, and in relation to the 1993 Land Law (Decree 02/CP).

Table 1 Significant policy statements having influenced forest land management in Vietnam

Year, Statement/Decree	Implications
1981 Decree 100	Local authorities were given the right and obligation to contract the management of collective land to others who could pay back in kind to the cooperative. The official start of the demise of producer cooperatives.
1986 Doi Moi	The formal decision on the introduction of a 'free market' economy
1988 Resolution 10	Collective agricultural land allocated on a long-term lease, to individual households who pay the lease in cash. In effect the end of the period of collectivisation which started in the early 1960s.
1991 First National Forest Policy	Indicates a shift from state forest towards privatisation of some forest land. SFEs were also encouraged to lease out forest land to households.
1992 Decision 327/CT	Concerns policies on the use of bare land and denuded hills. Although initially generally integrated rural development, eventually a strong re- and afforestation component.
1993 Land Law	Allocation of agricultural and forest land to individual households through the provision of permanent land-use certificates was formalised.
1995 Decree 01/CP	Formalised the leasing-out of SFE land to individual households.
1998 Decree 661	1998–2010 The 5 Million Ha Reforestation Programme. A framework for reforestation of 5 million ha, of which 2 million ha by individual entities such as households and entrepreneurs, <i>e.g.</i> the private sector.
2003, Promulgation of Land Law, Order No 23	Defines the rights and obligations of land users, including regulations for mortgaging land and regulation of land prices.
2004, Promulgation of the Law on Forest Protection and Development	Recognition of communities, <i>e.g.</i> upland communities, as legal operators and owners of forest and forest land; specifies the rights of the owners and operators to sell, inherit, etc., the produce and the forest land.
2007, Decree No 18/2007/QĐ.TTg Promulgation, Vietnam Forest Development Strategy 2006–2020	Emphasises the move from State to social and private forestry; forestry based upon market mechanisms.

The revised Land Law of 2003 defines the rights and obligations of land users in terms of land use, transfer, concession, lease and mortgages (Jong de et al. 2006). FLA is intended for production and protection forest. The instrument for allocation of forest land during 1993–1998 was the temporary Land-Use Certificates, LUC, under Programme 327 and associated legislation (Barney 2005). However, in the studied areas, the preferred allocation instrument was the ‘Red Book’, or semi-permanent Land-Use Certificates. The Red Book certificates are for 50 years’ user rights, which can be used as collateral, can be inherited and transferred, e.g. by sale. Apart from the LUC and the Red Book system, the State Forest Enterprises leases out land to individual households or other legal units under management of protection contracts, the format of which varies. According to Barney (2005), 0.6 million ha had been allocated to 350,000 households through the Red Book, while 1.6 million ha had been assigned to 246,000 farmers through management or protection contracts. The SFEs also had 100,000 ha of production forest land under Red Book arrangements.

Land-Use Situation and Trends in the Studied Districts and Sites

The current forest land-use situation in the three districts is indicated in Table 2. The forest area in Doan Hung District, predominantly plantations, has increased from 20 to 44% over the past 20 years. According to the Forest Protection Section in Doan Hung District, 80% of the operators had less than 5 ha, and 40% less than 1 ha. This category has very small units, varying from 0.1–0.5 ha. The conclusion is that the average size of the units is small, and that there is a small number of large operators. There are some 85 registered wood traders, as well as a substantial number of unofficial traders. In Ham Yen District, most household units vary from 0.1–10 ha, the majority having less than 1 ha, and a few having up to 30 ha. The SFEs contract-out forest land management. Some of it is for plantation forestry and some is for forest protection and

management of natural forest. In Muong Khuong District, on the border to China, the main part of the forest cover of 36% and half of the plantation area is classified as Protection Forest, but the farm-based forest plantations have gradually increased. The data revealed dramatic changes in land use and planted species over the study period (Fig. 2);

- (a) On all the sites, there was a transformation of natural and degraded forests and agricultural bush fallow, into plantations of forest trees and other cash crops, established by farmers. The land-use changes coincided with rapid economic growth, introduction of market economic policies, land-tenure reforms and the emergence of new wood-consuming industries.
- (b) The transformation was strongest and occurred earliest at Site 1, closest to the pulp mill, and was least significant in Site 3.
- (c) At Site 1, there was a distinct focus on industrial tree crops and tea, while the other sites had a more diverse distribution of cash crops and food crops, including forest trees, tea, fruit trees, maize and cassava for animal production. The increase in tea and forest trees at site 1 already in the 1980s was linked to the occurrence of aid programmes that supported enterprises producing industrial crops.
- (d) The focus on tree species at sites 1 and 2 gradually changed from local trees over to various fast-growing exotics, following market requirements, new research and local experiences.
- (e) There was a trend of increasing multi-crop plantations (in particular for the ‘average’ income category) at site 1 (36%) and site 2 (25%), where forest trees were combined with tea, fruit trees and sometimes with food crops (Fig. 3)
- (f) At site 3, the women’s group of the village had acquired communal land and had established small-scale tree plantations for income generation through a *taungya* system approach.
- (g) Households in the average or well-off categories possessed much of the plantations, but at site 1 many poor households also had plantations (Table 3).

Table 2 Land and forest land in the districts of the three sites in 2005

	Doan Hung District, Phu To Province	Ham Yen District, Tuyen Quang Province	Muong Khuong District, Lao Cai Province
Total land (ha)	32,000	90,000	55,400
Forest area (ha)	13,300	52,000	19,100
Forest area (% of total)	44	54	36
Forest plantations (ha)	11,800	22,000	5,650
Plantations under SFE (ha)	3,750	15,400	2,900
Households’ plantations on allocated forest land (ha)	8,050	6,600	2,750
No of units/households with allocated forest land	6,945	Na	Na

Fig. 2 Land-use trends and distribution of cash crops at the three sites 1980–2006

There, the poor and nearly poor categories of farmers possessed 30% of the forest land of which most of it was forest plantation, predominantly acacia and eucalyptus. Poor farmers at site 1 considered pulpwood plantation to be a comparatively safe type of income (although some complained about price fluctuations). Meanwhile, at sites 2 and 3 no cash crops were observed on sample plots owned by poor farmers (however, too few sample plots to be conclusive).

- (h) The very large areas of food crops before and around 1990 at sites 2 and 3 can be traced to large areas of shifting cultivation and upland agriculture, which reflects the economic policies at that time

The Market for Plantation Forestry

The total raw material consumption of the Bai Bang Pulp and Paper Mill (2005) amounted to 310,000 tonnes (of which 45,000 tonnes was bamboo and the rest was wood

from plantations). Those figures are based on the annual production reports by the Mill management and their magnitude matches other information sources such as pulp production. Of the total consumption, 50% was produced by households and individuals who had forest land according to the Forest Land Allocation system. The balance comes from State Forest Enterprises, SFEs, which had leased out forest land to farmers and former employees. An additional 75,000 tonnes of industrial wood were produced within the study area for other markets, such as the mining industry, wood chip facilities (for export) and urban centres. The main finding is that within a period of 20 years, a farm-based plantation forestry production system has evolved, which annually produces at least ca. 265,000 tonnes of wood for the market. As indicated, the producers are small farmers, either owning the land through the Forest Land Allocation, or leasing the land from the SFE. There is also a small number of larger operators. In the 2000s, the growth and increasing export orientation of the wood processing industry in Vietnam has increased national roundwood

Fig. 3 Many middle income farmers planted forest trees in agro-forestry systems with fruit trees (*site 2*)

demand beyond the current supply (Meyfroidt and Lambin 2009).

DISCUSSION

The rapid land-use changes on the sites raise several questions. Are the chosen sites representative for the area, and what do they reflect? If so, what are the direct and the underlying causes of the changes, and their consequences for local people and the environment? Who are planting trees, why and why now? Who benefits from this development and who are the losers? Is it sustainable?

The southern part of the study area (including sites 1 and 2) is one of the core areas of industrial forest plantation in Vietnam (Barney 2005). Based on district data, on our observations and on previous knowledge of the area, the sites can well represent this industrialised part of Vietnam, while site 3, outside the core area, represents any non-industrialised mountainous part, although we did not select the remotest and least developed area. At Site 2, with a

Kinh and Dao ethnic mix, only half of the Dao villagers could be reached during our field work. In that month, they worked as guest labourers farther south. This may have caused some bias.

Using official data has its merits and disadvantages. In Table 3, official data are compared with household interview data. There is a tendency that plantation and tea areas based on interviews are higher than those of official data (although official records refer to allocated forest land and not to plantations). The discrepancies reflect difficulties to precisely explain complex ownership relations, to defining land use and minor changes over the last year, but basically the two approaches present a similar picture. Point sampling data (Fig. 2), showing forest plantations as percent of village area match the village record well and total forest land area allocated to households differ less than 5% between the two approaches.

Trends in Livelihoods and Land Use over the past 25–50 Years Among Studied Households

In villages studied in Ban Lau Commune, shifting cultivation was a dominant feature some 50 years ago (Ohlsson et al. 2005). Various government policies reached the mountain or semi-mountain villages, such as migration programmes, whereby former soldiers and other people settled. Various policy decisions concerning agricultural land, for e.g. collectivisation (1960), the contract system (1981), the Doi Moi of 1986 and the Land Law of 1993, fundamentally changed the lifestyle of the land users. The villagers went from a subsistence based, cooperative and centrally planned economy, towards a free market economy where land-use rights are a commodity to be sold, bought and mortgaged. At the studied sites, Kinh migrants, arriving from the lowland parts of the country, brought and introduced irrigated paddy technology, mosquito nets and other novelties. Having visited Ban Lau Commune regularly since 1997, we have noticed that changes have not occurred everywhere. In some of the old villages (e.g. Lang

Table 3 Major cash crops (tea and tree plantations) among sampled households in site 1 as derived from official village records and from household interviews

Wealth category of household	Poor	Nearly poor	Well off	Rich
No of sampled households	10	7	10	8
Forest land per household, village record (ha)	0.09	0.43	0.44	0.71
Forest plantation per household, interviews (ha)	0.14	0.46	0.22	1.08
Rate of households with forest land, village record	0.40	0.71	0.90	0.75
Rate of households with forest plantation, interviews	0.50	0.86	0.70	0.87
Tea plantation per household, village record (ha)	0.08	0.11	0.19	0.23
Tea plantation per household, interviews (ha)	0.11	0.11	0.13	0.17
Rate of households with tea plantation, village record	0.90	0.71	1.00	0.87
Rate of households with tea plantation, interviews	0.90	1.00	0.90	0.75

Ha), infrastructure in terms of roads, telephone, electricity and house standard has remarkably improved, while in other villages (e.g. Doi Giang in the same commune), such changes are insignificant. The differences can be traced to historical and cultural factors, as well as to leadership (Sandewall et al. 2004).

In a large study (Donovan et al. 1997) which included self assessment by 100 households in the same provinces as those covered by this study, most farmers expressed the view that the socio-economic conditions had improved significantly in the early 1990s, and they were optimistic about their future. Farmers in the southern part of the study area, and those who were more wealthy, were more positive than others. The main reason for their view was the increased availability of capital. Our impression from the three communes is of rapid infrastructural and socio-economic development over the past 10 years, and an eagerness to invest capital for the future among the majority, but not all, of the households.

The development of farm-based plantation forestry is based upon specific policies and institutions. The population in the study villages have responded to the changes—new policies, legislation, the market, their own situation, resources and limitations. It seems that the wealthy were early to respond, and were prepared to undertake the venture of private farm-based plantations, and as a result, they are now in possession of larger areas and better locations than the poorer strata who were later joining this venture.

Who are Planting Trees and on what Grounds are the Decisions Made?

Among farmers, forest plantation was generally seen as one way, among others, to generate cash. Whether it was tea, fruit trees, forest trees or pigs, the decision was influenced by opportunities, by neighbours' experiences, by the availability of labour and land, and the pattern varied among income strata. The emerging market and the supportive policies, legislation and institutions, were major general incentives.

A few wealthy households had large plantation areas, in one case over 60 ha, and had acquired land soon after forest land allocation. These forest owners had the influence, capital and initiative to take the risk of investment at the beginning of the land allocation, the FLA (Fig. 4). They saw forest plantation as an investment and employed workers or other farmers part-time for its management. It is possible that the total process actually has widened the gap between the poor and the wealthy strata, as is shown in a case study by Phuc (2003). In this study, we can show that forest plantations do play an economic and institutional role in the livelihoods of many people who live near the market. At site 1, some 38% of the households had small forest lots

Fig. 4 A few well-off farmers had small forest estates with tree plantations, tea, paddy fields and employed workers (*site 1*)

Table 4 Distribution of allocated forest land on holding size in site 1

Forest land area	No of households (rate)
Not any forest land	35 households (0.32)
0.01–0.25 ha	12 households (0.11)
0.26–0.50 ha	29 households (0.27)
0.51–0.75 ha	13 households (0.12)
0.76–1.00 ha	11 households (0.10)
1.01–2.50 ha	6 households (0.06)
2.50–5.00 ha	2 households (0.02)

of 0.1–0.5 ha (Table 4). Several of those farmers had started tree planting in the last few years by, for e.g., converting tea plantations (other did the opposite). The tenure system introduced in the 1990s has played a major role in the expansion of private plantations and was a way for farmers of securing access to forest land. It may still be an issue that makes farmers choose forest plantation instead of other crops, but this study indicates that when there is a sustainable market trees become part of a more diversified system of short term and long-term crops where farmers chose trees based on their own life situation and plans.

The economic importance of forestry and plantations to household livelihoods in Vietnam is disputed but not frequently studied. In one of the few published case studies, in Ha Tinh province (McElwee 2008), mean household cash income among 104 sampled households was 4.7 Million Dong per annum (USD 325) and 1.8 Million Dong (USD120) among 34 “poor” households. Livestock contributed 1.16 Million Dong (100 hh) of the average income and plantation forestry 0.22 Million Dong (7 households).

In our study, the communities have a different economic and market situation but a comparison may still have an interest. The forest plantations on site 1 generated a net

revenue of approximately 200 USD/ha and year. Normally, the cutting was made with about 7 years of interval. Poor households had around 0.1 ha, nearly poor and well-off households had about 0.5 ha and rich households had around 1 ha (Table 5). The contribution on an annual basis would be in the range of 20 USD per annum for poor households, 100 USD for the intermediate groups and 200 USD for the rich category. The contribution to total cash income is around 10% in all categories and higher if also forestry employment is included. This assumption is rough and could be fine tuned for variations in investment and transport capacity. 20 USD for poor households is not so much but with a sustainable market it could be seen as a way of making small savings for some years when the labour situation in the household allows it. The increased plantations within the ‘nearly poor’ category show that households may sometimes be able to use forestry in combination with other crops or income sources as a springboard out of poverty.

For many households with small forest plantation lots, the plantations coincided with a leap from subsistence to a cash-based household economy, investment in children’s education, in their own pension and in improved housing. The management intensity varied and there was often a shortage of labour or investment capital. Initially, there were various subsidies such as seedlings. The farmers tried to build on the experiences of others, but also to gain knowledge and to identify market niches. Eventually, the poorer farmers also started plantations, but they often obtained small areas or land which was marginal or located far away. Some poor farmers who did not possess forest land worked as guest labourers or middlemen for other persons or SFEs. Agroforestry and short-rotation cycles were increasingly used by medium income and marginal households in order to reduce the time needed for a return on investments.

Fig. 5 Poor female-headed households rarely possessed significant forest plots and had difficulty benefitting from the economic growth (site 3)

Fig. 6 Although under intensive land-use competition the area nearby the wood industry was also used for forest plantation

Table 5 Annual cash income among sampled households in different income strata and distributed on income sources, Million Dong (1 Million Dong was 52.5 USD in June 2010 when this part of the study was made)

Income source	Poor	Nearly poor	Well off	Rich
Employment (construction, maid, engineer)	0.47	3.29	3.88	22.6
Entrepreneur (furniture, transport, home produce)	0	1.43	7.20	15.8
Tea sales (profit)	1.26	2.20	2.85	2.91
Tea production, employment	1.40	0	0.30	0
Timber sales (profit)	0.38	1.80	1.80	3.60
Forestry, employment	0.17	1.14	1.40	0
Agriculture crop sales	0	0.29	0.60	2.60
Livestock sales (profit)	0.61	1.97	4.48	8.78
Pensions	0	0	1.90	0
Total annual cash income per household	4.29	12.10	24.41	56.29
Standard error for estimated annual cash income	0.84	1.67	3.75	8.07

Fig. 7 Tree plantations on the hills, tea and paddy fields in the valleys (*site 1*)

Farmers' Dependence on Markets, New Technologies and Knowledge of Planting Trees

A World Food Program (WFP) study found that the establishment of farm-based plantations is viable only when food security is achieved (CARE International, Vietnam 1994). Food security does not necessarily mean subsistence, but also that food is available at the market whenever a person requires it. Byron (2001) identified four factors, land and crop tenure, a viable production technology, crop protection capability and market structure and access as universal conditions for sustainable tree farming to occur.

Trees require more than one season to be ready for harvesting, and need a medium to long-term investment, which in turn requires certain conditions. Those are secure access to land and long-term control of the harvest, as well as access to markets, in terms of distance but also with regard to institutional obstacles, such as provincial check points. Fee systems designed for low volume-high value wood, as opposed to the high volume-low value wood now being produced, are another type of obstacles encountered.

In the studied areas, technology was basically available through the Bai Bang-related plantations and WFP activities. Phu Tho and Tuyen Quang provinces have different policies regarding seedling production. In the one, it was free for anybody to produce, and there was a substantial number of private nurseries along the roads. The other province had strict seed provenance control, and there were only a few nurseries, approved by the Province leadership. Seedling technology was not mentioned as a problem or an issue, and the necessary knowledge and technology were acquired from colleagues and neighbours.

In general, it appears that there were very few direct incentives. An environment enabling tree production was

provided by different actors (Arnold and Dewee 1998). The government provided a policy and legal framework for acquiring land, for e.g., a market for wood emerged; the natural forest land converted to shifting cultivation land was now available for plantations. Technologies, such as seedling production and handling, were available.

The market-oriented plantation operations have also generated a market for labour and for middlemen who trade in wood. Wood from farmers is purchased by middlemen, and there is no direct delivery by farmers to Bai Bang. The farm gate prices are about 50% of mill gate prices (BAPACO, 2006, personal communication).

How Existing Local Institutions Serve the Rural Poor

Many poor farmers had received forest land through the FLA, but their possibility to benefit from plantations was limited. They had usually received land late in the process, as they initially declined to become involved; their plantations were small and far away, which complicated management and protection; they had to harvest prematurely to secure the necessary cash flow, and they did not have the necessary finances to maintain the plantations. Although poor farmers had secure access to land through the FLA, they risked losing it if they could not maintain it properly. There were very limited credit facilities. We could not identify any special institutions which supported poor forest owners. The forest administration, i.e. the Department of Forestry and the Forest Protection Stations at District level, mainly had regulatory, supervisory and monitoring tasks.

Management and maintenance of the plantations generated employment. Employment opportunities in value-adding activities, such as carpentry, trading and supporting activities did exist. Trading requires access to some kind of vehicle, and is not always an opportunity for poor households. In Doan Hung District, there were numerous nurseries of varying sizes along the roads, which provided income-generating opportunities. The SFE system of leasing out land on contract to employers and local farmers was for the management of natural forest, and was not viewed as a significant income-generating activity, because the remuneration was perceived as low, and forest land for plantation forestry was preferred.

How Farmers Cope with the New Situation

Forest land allocation did not mean only that many households obtained investment opportunities, but also reduced opportunities for other households to use land, which previously had been used in common for grazing, NTFP collection and non-permanent cultivation. New

immigrants, former shifting cultivators and farmers who did not have the opportunity of investing in forest land, or who did not dare take the risk, and who did not possess enough paddy fields for subsistence, were losers in the process. Economic growth rarely trickles down to marginalised and socially excluded people (Varis 2008).

In this study, we have noticed that many farmers have met the new socio-economic conditions in the area by changing their behaviour and land use to accommodate the new situation. Farmers with forest land, but limited capital, often used agro-forestry or multi-crop plantations and shortened the cycles of forest trees to have a more even flow of return on their investment. Mortgaging of forest land for other investments or goods (improving the house or buying a vehicle) was also an opportunity. Farmers without forest land, and living in the industrialised areas, were engaged in forestry in various ways. Examples were those working as middlemen in the wood trade, those establishing small nurseries to sell seedlings and those working as contract labourers for other farmers or SFEs. Those farmers who in recent years had lived in remote areas, with traditional shifting cultivation as their main occupation, were worst off and had difficulty in adapting to the rapidly changing society (Fig. 5). As those people are also the most difficult to reach in a study without special efforts we cannot claim that we have fully captured the situation of the poor and landless group.

At present, we can only speculate about the sustainability of the present system. It is possible that many of the smaller operators, who joined the system last and, in consequence, acquired inferior land, often far away, will sell their land or use it for other fast-growing cash crops. Likewise, it is possible that the units will become larger as small farmers sell their plantations, in a process of leaving small farms for work elsewhere. Another development which might be necessary for the sustainability of the system, is that the trading system is changed. At present, the farmers get about 50% of the mill gate prices.

The Consequences for the Environment and the Environmental Services

The land-use changes observed in the study have not only induced a change from a subsistence based to a cash-based household economy and diversification of farmers' incomes. The trend from natural forest, through shifting cultivation and upland agriculture, to increased cash crop or forest plantation, which was observed on all sites, has also implied a different spatial distribution of the forest and changes in biodiversity (Figs. 6 and 7).

In our case, the change in ecosystem has a number of implications, both in biological and social and economic terms. In terms of biodiversity, the variation in plantation

composition, species occurrence and size, as reflected in the socio-economic status of the owner, provides for biodiversity. The conversion of natural forest to plantation forestry decreases the access to environmental goods such as non-timber forestry produce (Sjaastad et al. 2005; McElwee 2009), usually a benefit mainly of interest for the poor strata. On the other hand, the plantation forestry provides a much higher yield in terms of money as compared to natural forests. The trade-offs between higher timber yields for some and reduced access to a diversity of plants for indigenous and other use requires attention (Harrison et al. 2000). Degradation in ecosystems will generally affect the social and economic stability of the poor (Fisher et al. 2005). The ecosystem changes also occur as domestic and transnational transition when, e.g. increased plantation in one site or country result in clearing of natural forests in another (Meyfroidt and Lambin 2009).

The Farm-Based Plantation Forestry in a Regional Context

During a relatively short period of time, a farm-based plantation forestry system has emerged in Vietnam. It is part of one out of several strategies in Vietnam promoting increased forest cover for production, protection and other purposes. The area of productive plantation forests established by smallholders have increased by 840,000 ha, which in a Southeast Asian context is unique although similar developments occur in China (FAO 2006). Despite this expansion, it has only partly satisfied the growing demand of wood from the processing industry in Vietnam for export, which is increasingly reliant on log imports (Meyfroidt and Lambin 2009). Other studies indicate continuously increased wood production from planted forests in the region in coming decades (Carle and Holmgren 2009). Another aspect of the development in Vietnam is the structure of the system. It is mainly based upon a large number of small-scale farmers, who possess individual small units. The Vietnamese experience is difficult to transplant, but the principles of using existing surplus labour and forest land, in combination with the market, could be applied elsewhere, in each country's particular context. This must be, as the Vietnamese case indicates, supported by policies, legislation and institutions.

CONCLUSION

Plantation forestry in the studied area has undergone a substantial development in the past 30 years. The hilly areas, previously covered by natural forest, clear-cut by logging and eventually used for shifting cultivation, have been reforested with small-scale plantations on a large

scale. The operators are households and entrepreneurs, of whom 80%, have areas smaller than 5 ha and most of them less than 1 ha. Policies and legislation, have contributed to an enabling environment, and made it possible for at least some 12,000 households in two districts to invest in plantations and to sell their products on the market, dominated by a pulp mill.

In general, the policy, institutional and market environment for farm-based plantation forestry is supportive. In spite of this, it appeared to be difficult for the poorest people to benefit from this opportunity. As a tentative conclusion regarding the opportunities of the poorest to benefit from plantation forestry, they may need access to a credit system, which enables them to go through a cycle of plantation growth. The variety of management regimes found in the study areas, also indicates that there are models, which fit for different strata of the population. The wealthy can abstain from returns during a cycle, whilst the poor require a more continuous cash flow.

The plantations have transformed the landscape as well as the economy. The economy in the districts of Ham Yen and Doan Hung is dominated by forestry and cash crops. The plantations generate employment, both in the plantations and in value-adding activities such as carpentry and seedling production. Villagers pointed out that a family which has 1 ha or more of forest land for plantations, and which succeeds in managing it, is a prosperous family. The operators respond to external and internal needs by introducing new species which provide a better return, and by diversifying their production to generate a more even cash flow. The indirect benefits, accruing to the poor, are, e.g., employment opportunities in plantations and with wood traders.

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