

## Appendix 4: I-REDD+ WP5 Country Report: Vietnam

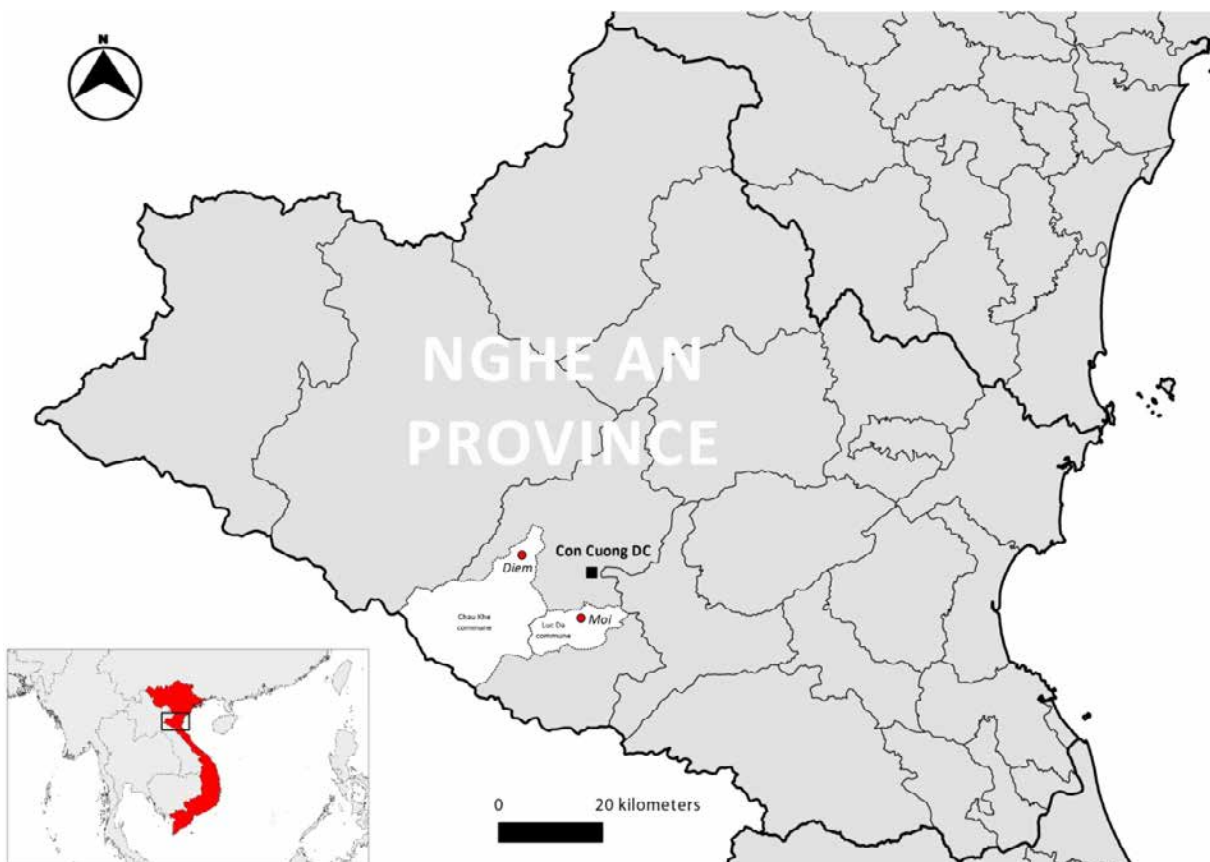
by Guillaume Lestrelin and Nguyen Dinh Tien

### 1. Context

#### 1.1. Location and history of the study villages

The study sites in Vietnam are Diem and Moi villages of Chau Khe and Luc Da communes, in the southern part of Con Cuong district, Nghe An province (Figure 1). The altitudes of Diem and Moi are approximately 80 and 120 metres respectively but parts of their land rise above 900 meters (Diem) and 1200 meters (Moi) with fairly steep slopes (Figure 2). The villages are characterised by a tropical monsoon climate with two main seasons: a hot season from April to October with temperatures reaching up to 43°C and a winter season where temperatures can drop to 5°C in January.

*Figure 1. Location of the study sites*



Located in Chau Khe commune, Diem village was established in the late 19<sup>th</sup> century by 15 men from the Kinh ethnic group. These men came from Do Luong district (about 60 km away from Diem), looking for land and better livelihood opportunities. The newcomers established families with original residents from the Thai ethnic group. Although the villagers were initially dispersed on a large area, they gathered (spontaneously) in the same site around 1989. The current population of Diem is 682 individuals (145 households), all from Thai ethnicity (Table 1). About 75% households in Diem village are officially classified as poor and about 50% of the villagers are illiterate. Nowadays, there is much more in-migration than out-migration in the village. The large dirt road passing through Diem village and linking Chau Khe commune (15 minutes drive) to the border with Laos was built in 1956. The village was connected to the electric grid in 2000.

*Figure 2. Topographic characteristics of the study sites*



Moi village is under Luc Da commune administration, which is about 45 minutes drive from Con Cuong district center to the south. The village is bordering the buffer zone of Pu Mat National Park. Moi is less accessible than Diem due to poor road condition (heavily degraded dirt road). The village is composed by households from Thai (mainly), Dan Lai and Kinh ethnicity. The village was established in its current site more than 200 years ago. Some households from the Thai ethnic group came first, others joined gradually before an epidemic disease pushed the community to leave the area. Ten years after the event, some 15 households (former residents) came back. Around 1920, the village burned entirely and was rebuilt by the villagers. The village was populated by 45 households at that time. In 1993, 4 households came from another district to join relatives in the village. Currently, the administrative village is divided into 2 hamlets: the main site is populated by 123 households while the other site, located 2 kilometers away, is populated by about 30 households (relatives in each hamlet). 97% of the village households are officially classified as poor and about 50% of the villagers are illiterate. The recent years have been characterized by significant out-migration driven by limited local economic opportunities.

*Table 1. General population characteristics in Diem and Moi villages*

		<b>Diem</b>	<b>Moi</b>
Population	Households	145	153
	Individuals	682	711
Gender distribution	Women	49%	48%
	Men	51%	52%
Age distribution	<15y	22%	35%
	15-60y	74%	57%
	>60y	4%	8%

### *1.2. Socioeconomic and land-use characteristics of the research sites*

Diem village benefits of more opportunities for economic development than Moi due to better road infrastructure and better access to markets (significant traffic between the commune and the border with Laos). Although we could not access official data on the total surface area of the village, participatory mapping exercises conducted with villagers suggest that the current village area would be around 1,500 hectares. Diem villagers have stopped shifting cultivation after implementation of forest land allocation (FLA) programme in 1999. Before that period, the main land uses were composed by shifting cultivation of upland rice, cassava and taros. Villagers were generally self-sufficient. At that time, villagers engaged in animal husbandry, including cattle, pig and poultry, for subsistence only. The FLA was undertaken through land use zoning, definition of land use plans and allocation of land (“green books” or temporary land use titles) to villagers. Since 2001, “green books” on paddy and rainfed areas are progressively replaced by “red books” (permanent land use titles). Villagers’ rights on forest land remain under a temporary basis. The villagers do not pay taxes on land. Plantations of bamboo and acacia trees have rapidly developed in the village since 2000s and are now mainly used for commercial purposes. Over the past decade, maize (hybrid variety) and cassava have become the main crops planted in rainfed areas while paddy rice is grown along to the river banks. According to the villagers, crops play a very important role for food security (mainly for consumption) and cattle (cows and buffaloes) represent the main source of cash incomes. Cattle are raised through a free roaming system in secondary forests and bush lands. Since 2006, off-farm activities have also rapidly developed. Off-farm job opportunities have in part been promoted by officials from the commune after advertizing from entrepreneurs on job offers (e.g. garment, industrial plantations). The first grocery shop was opened in 2003 and there is now a total of 8 shops in the village.

As compared to Diem, Moi has less opportunity for economic development due to poor road conditions and limited market accessibility. Officially, the total area of Moi village is estimated at 917.29 hectares. As in Diem village, shifting cultivation of rice stopped with the implementation of the FLA programme in 1999. Through this process, almost all upland fields and secondary forestlands were allocated to the 97 households residing in the village at that time. The households did not receive equal shares of forest lands because land allocation was based on geographical features (e.g. summits, ridges and valleys) with no clear estimation of the surface areas. Villagers have “red books” for both paddy and forest land. Paddy land was allocated to individual households in 1993 when each village household received 200 square meters of land. Official data shows that there is now a total of 21 hectares of paddy land in the village. According to the village leader, paddy rice is the main subsistence crop in the village. However, the production is

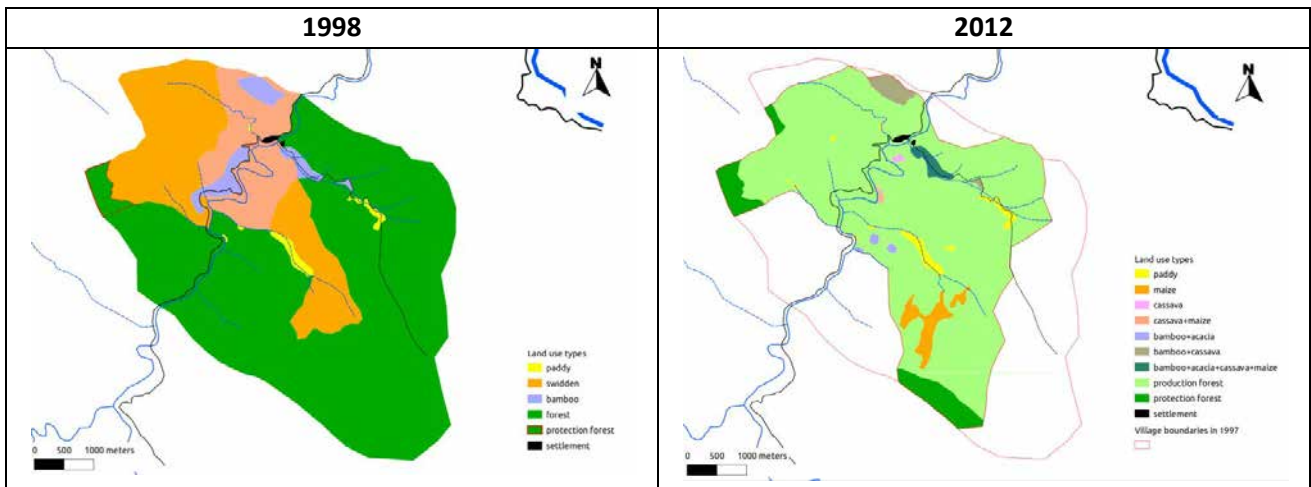
generally not sufficient (in average, Moi households have to face 6 to 8 month rice shortages). As a result, crops like cassava and hybrid maize generally serve of substitutes for rice, not as feed for livestock. Villagers rely very strongly on government-subsidized rice (10-13 kg of rice per villager in 2012), a support that they have received since the land allocation was done in 1999. Bamboo and acacia plantations have also developed in the village but, in contrast with Diem, these engage only a small share of the population (2 households for acacia and 5 households for bamboo). Limited road access and traffic result in very low incomes from bamboo and acacia plantations. The two households who have planted acacia have not been able to sell yet (no buyers) and bamboo is sold at a very cheap price (5,000 VND per stem, against 10,000 VND in Diem). Villagers do not have a lot of cattle (1 per household in average) and concentrate generally on buffalos. Forest products (mainly bamboo shoots, medicinal plants and timber) represent an important source of incomes for the villagers. Off-farm activities represent also a key source of cash incomes and about 50 villagers are working off-farm outside the village (mainly as construction and forestry workers for local companies but also for rubber plantations near Ho Chi Minh City). Households with members working off-farm have generally better incomes than others but the ability of households to engage in off-farm is strongly linked to family labor availability.

### *1.3. Land use trajectories and drivers*

Alongside locally-specific opportunities for land development (e.g. good market access favouring bamboo and acacia production in Diem), village boundary delineation and the FLA programme have played critical roles in shaping local land use trajectories. By allocating land to individual households, the government hoped to restrict villagers' access to hillsides and forested areas and, thereby, put an end to slash-and-burn shifting cultivation practices. In both study villages, land was allocated by the district authorities in 1999. Land allocation has been accompanied by a forest protection policy that limits the forest use rights of villagers to non-timber forest products (NTFPs) and firewood collection. These restrictions and, in particular, the ban on the clearing and burning of forest land had critical impacts on local livelihoods – as large amounts of land with good soils and high agricultural potential became classified as forest land.

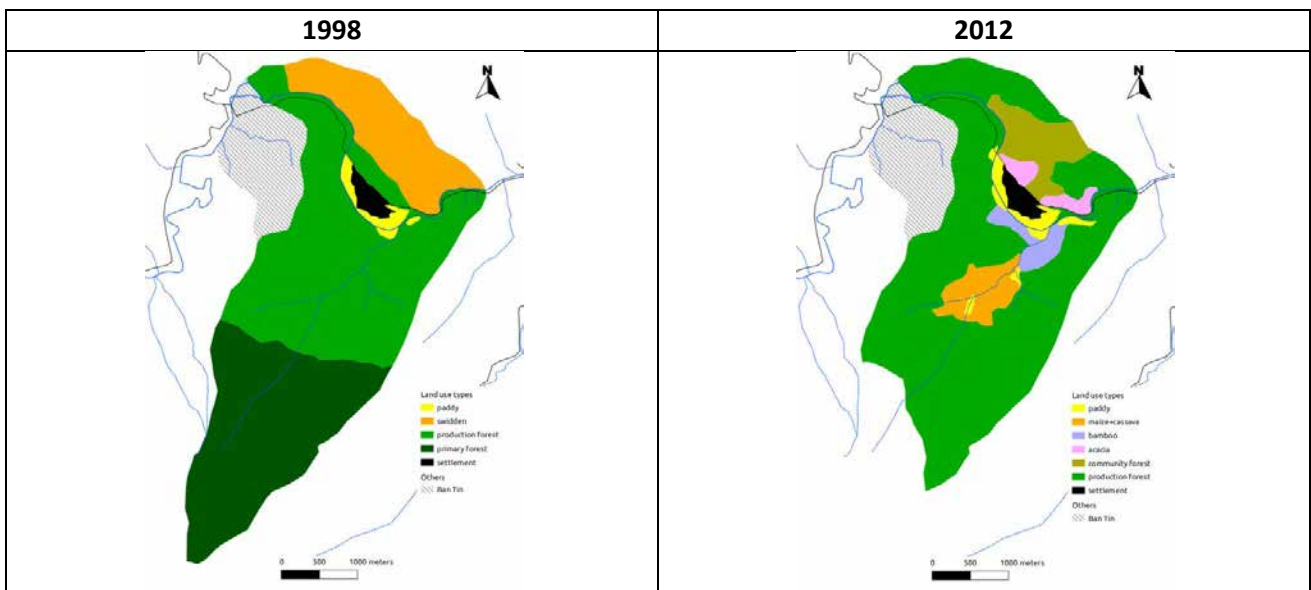
Another important driver for land use change in Diem had been the redefinition of the village boundaries. After the 1999 FLA, large tracts of land located in peripheral areas (some of them used for shifting cultivation) were redistributed to neighboring villages (Figure 3). Thus, the total surface area of Diem was reduced from 2,680 to 1,550 hectares. Most of the land previously used for shifting cultivation was allocated to individual households as forest land ("production forest") and banned from agricultural activities. Some of the existing forests at the periphery of the village were classified as protected forests. In recent years, making up for the lost agricultural opportunities, the villagers have developed a number of bamboo and acacia plantations and have terraced additional paddy land.

Figure 3. Participatory maps of land use change in Diem village (1998-2012)



Moi village has also undergone a redefinition of its boundaries when around 200 hectares of primary forest in the southern part of the village were classified as buffer zone for the Pu Mat National Park and put under the authority of the Con Cuong district forestry company (Figure 4). Thus, the total village area was reduced from around 1,230 to less than 1,000 hectares (917.29 ha according to official data). As the land reallocated was not used for agriculture, this process limited mainly the opportunities for villagers to collect forest products. At the same time however, the FLA programme resulted in the conversion of all shifting cultivation areas into individual forestland and a large plot of community forest (both land uses banned from agricultural activities). Thus, as in Diem village, some villagers engaged in bamboo and acacia plantation. Some plots of maize and cassava were also established and new paddy land was terraced in order to make up for the conversion of shifting cultivation areas.

Figure 4. Participatory maps of land use change in Moi village (1998-2012)



## 2. Profitability of land use systems

### 2.1. List and description of land use types

The following (7) land uses were selected for our research<sup>3</sup>:

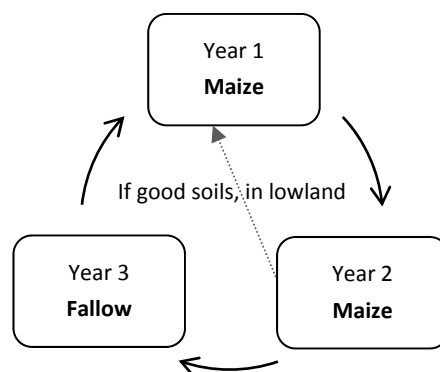
#### Paddy rice

This land use constitutes the primary source for subsistence production of rice in both study villages. While it has replaced dry (upland) rice cultivation as a main source for rice only recently in Diem (after the construction of an irrigation system in the 1990s), paddy rice production has been practiced for several decades in Moi (located in a flatland area with very good access to a large stream for irrigation). In both villages, hybrid varieties of paddy rice are grown two seasons per year, with chemical fertilization but no mechanization: the plots are ploughed with buffalos and terracing is done by hand (labor exchange). As illustrated by the results of the “pebble game”, in both study villages, paddy rice is valued by villagers as a main source of subsistence and a key element for the maintenance of traditional and cultural values (Figure 9 and Figure 10).

#### Maize

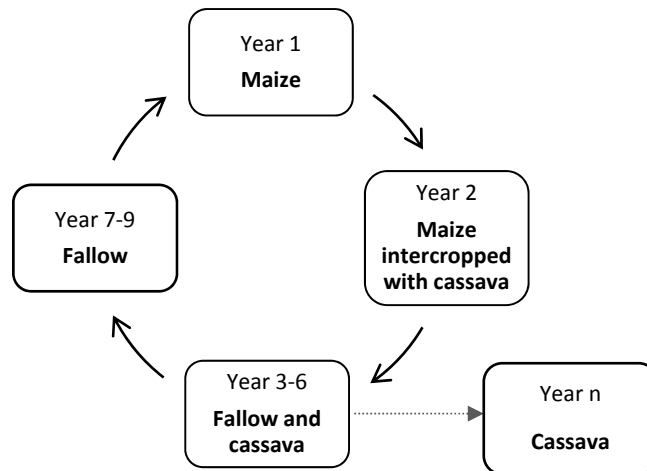
Hybrid maize is cultivated in both study villages. The crop is grown in rainfed conditions, with chemical inputs (fertilizers and pesticides) and through different land use systems applied by farmers on a case by case basis, in function of the location and level of fertility of their plots (Figure 5 and Figure 6). In Diem, it is generally cultivated 3 years in a row before a 2-year fallow. Cassava can also be intercropped in this system before conversion of the plot into perennial plantation of cassava. In Moi, maize is generally grown in low- or flatland 2 seasons per year.

*Figure 5. Rotation upland rice – maize (Diem)*



<sup>3</sup> While upland rice used to be a common land use, it was abandoned in Moi after forestland allocation in 1999 and is rapidly disappearing in Diem (only 3 households interviewed). For that reason, it is not included in the analysis.

*Figure 6. Rotation upland rice – maize + intercropped with, or leading to, cassava (Diem)*



Similar to paddy rice, maize is valued as an important source of subsistence (pig feed) and an element of tradition and culture. To a lesser extent, it also contributes to household incomes.

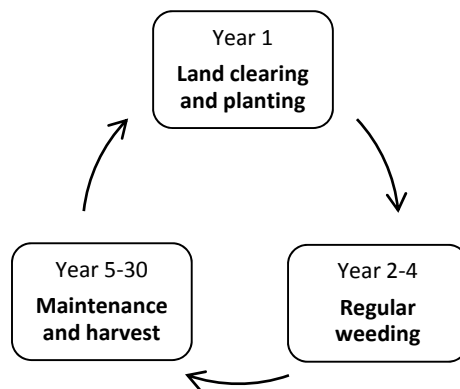
### **Cassava**

At the exception of intercropping with maize, bamboo and acacia by Diem villagers, cassava is generally grown as a monoculture, with no inputs and no mechanization. Cropping systems are different in the two study villages. In Moi, cassava is planted in year 1, harvested during the two following years and replanted in year 4. The cycle would be applied for an indefinite number of years. In Diem, cassava cultivation involves a fallow period: the crop is planted in year 1, harvested from year 3 to 5 and left in fallow during three years before being replanted. Perceptions of cassava are different in the two study villages: as a cash crop, it constitutes an important source of incomes in Diem while, as a substitute for rice during shortage periods, it contributes more significantly to subsistence in Moi.

### **Bamboo**

Bamboo constitutes one of the main sources of cash incomes in the two study villages. The development of this crop was promoted and supported between 2000 and 2004 by the authorities of Pu Mat protected area (i.e. provision of seedlings and technical training). Bamboo is generally grown on the slopes (in replacement of upland rice and maize) without chemical inputs. Cassava can be intercropped during the first 4 years of establishment of the bamboo plantation.

*Figure 7. Bamboo cropping cycle*

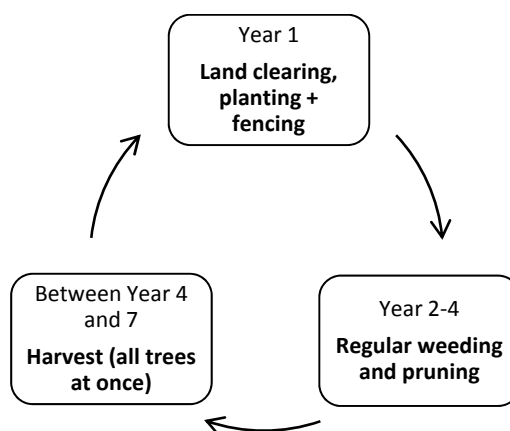


The results of the pebble game illustrate the key role of bamboo in the generation of cash incomes in the two study villages. More generally, bamboo is considered a highly valuable land use for both livelihoods (consumption of bamboo shoots, use of bamboo stems) and the environment (water regulation, soil conservation, climate regulation).

### **Acacia**

Acacia constitutes one of the main sources of cash incomes in Diem and its development was supported by the authorities of Pu Mat protected area (i.e. provision of seedlings and technical training between 2000 and 2004). In contrast, only a few households are growing acacia in Moi as the village is less accessible and no buyers have shown interest for existing plantations so far. As for bamboo, acacia is grown on the slopes in replacement of upland rice and maize. The cropping cycle lasts around 7 years and requires chemical inputs (fertilizers and pesticides) during the first 2 years. When the trees are mature enough to be harvested, timber buyers pay for the standing trees and clear the plot. Villagers can then purchase new seedlings and replant (Figure 8). As for bamboo, acacia plantations are perceived by Diem villagers as a valuable land use providing a diversity of livelihood and environmental services, in particular income generation and soil conservation.

*Figure 8. Acacia cropping cycle*





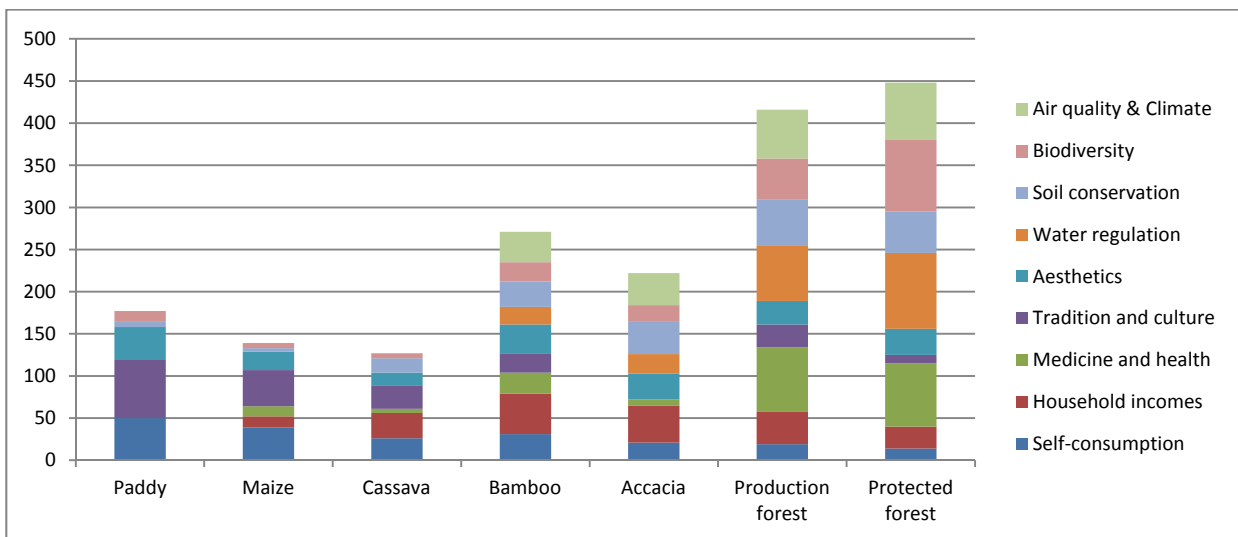
### Production (individual or collective) forest

Production forests are a key source for Non Timber Forest Products (NTFPs), including bamboo shoots and stems, firewood, medicinal plants and honey. These forests are constituted by fallows older than 5 year that have been allocated to villagers (“green books” in the two villages) or communities (collective forest in Moi) and that are left unused because of labor shortage, distance and/or government pressure for reforestation. The collective production forest in Moi is also managed as an area for extensive livestock grazing. Production forests are among the most valued land uses in the two study villages. With protected forests, they provide a wide range of livelihood and environmental services: i.e. contributing to the regulation of water and climate, soil and biodiversity conservation, provision of medicinal plants as well as subsistence and commercial NTFPs.

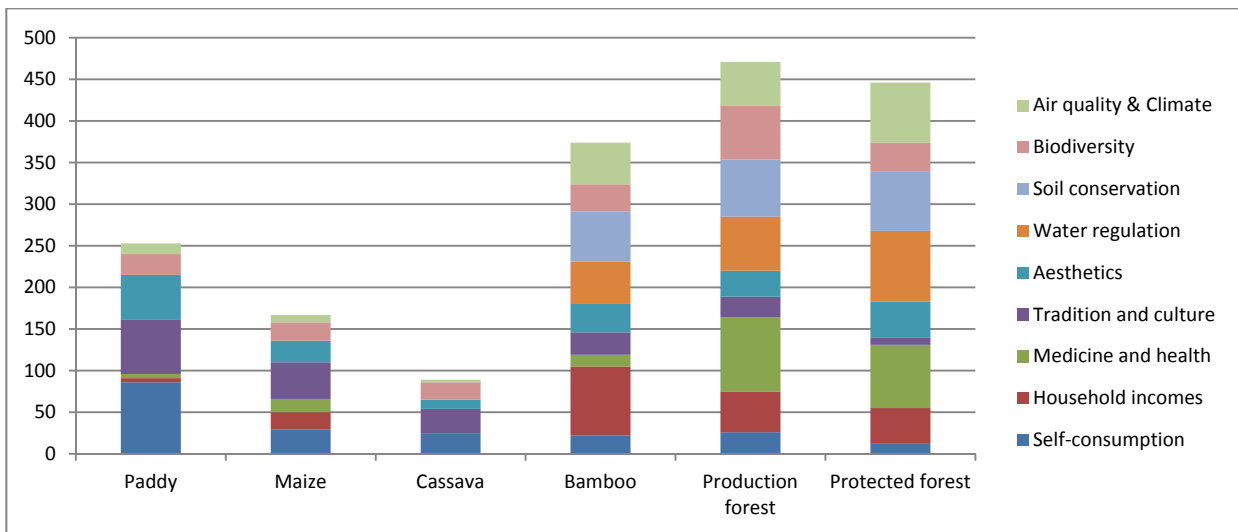
### Protected forest

Part of Diem village land (78 hectares) is classified as protected forest and constitutes a buffer zone for the Pu Mat national park. Diem villagers collect bamboo shoots and medicinal plants in this area. With authorization from the park authorities, villagers can log inside the buffer zone for non commercial purposes (e.g. house construction). 8 households have land inside the protected forest and are compensated by the Pu Mat park (100,000 VND/ha/year). As for production forests, protected forests are highly valued in both study villages for the wide range of livelihood and environmental services they provide.

*Figure 9. Perceived value of land use types in Diem (pebble game results - men and women aggregated, 1800 pebbles)*



*Figure 10. Perceived value of land use types in Moi (pebble game results - men and women aggregated, 1800 pebbles)*



## 2.2. Opportunity costs of land use

The following economic parameters were used for assessing the profitability of the different land uses:

Price data	2011
Exchange rate	VND 20,000 = 1 USD
Wage rate	60,000 VND or 3 USD/man.day
Discount rate	5%
Timeframe	30-year

The results of the opportunity costs assessment show that all land uses analysed can be considered profitable, as all NPVs are positive and return to labour values are higher than the actual wage rate in the study area. Bamboo plantations represent a very profitable and efficient land use, with high NPV and return to labour values. Indeed, the crop requires limited labour and investment for establishment and maintenance and allows for significant income once the plantation is in production. These characteristics contrast with acacia plantations which, while providing significant incomes after 7 years, require also significant investment in capital and labour during the establishment period. The economic profitability of acacia appears also strongly dependent on the accessibility of the production area. As mentioned by villagers and illustrated by differences in NPV and return to labour between the two study villages, the poor accessibility of Moi represents an important limit to the development of profitable acacia plantations. Furthermore, in order to offset some of the establishment costs of acacia, villagers in Diem often intercrop cassava during the first years of the plantation, allowing for a higher NPV but decreasing significantly the return to labour due to high labour requirements for harvesting cassava. As a matter of fact, when grown as a monoculture, cassava represents the less profitable and efficient land use in both study villages. Production forests present slightly better economic performances which suggest that their conversion to cassava plantations would represent an economic aberration. More “traditional” land uses like paddy rice

and maize, finally, tend to prove valuable options in terms of return to land but necessitate significant labour throughout the cropping cycle, which translates in fairly low return to labour.

*Table 2. Net Present Value and return to labor of land uses in Diem and Moi villages*

Land use	Net Present Value (USD/ha)		Return to labour (USD/day)	
	Diem	Moi	Diem	Moi
<b>Village</b>				
Paddy rice	3 980	2 390	4.5	3.7
Maize (3 y cropping – 2 y fallow)	2 130	-	4.6	-
Maize (2 seasons, 2 y cropping – 1 y fallow)	-	1 630	-	4.3
Cassava	590	830	3.6	3.5
Bamboo	2 890	2 890	15.2	15.2
Acacia	700	580	13.3	8.5
Production forest	630	560	4.3	4.4
Protection forest	310	-	5	-
Bamboo (cassava first 4 years)	4 040	-	9.8	-
Acacia (cassava first 2 years)	1 270	-	7.9	-

### 2.3. Trade-offs curve of different land-use systems

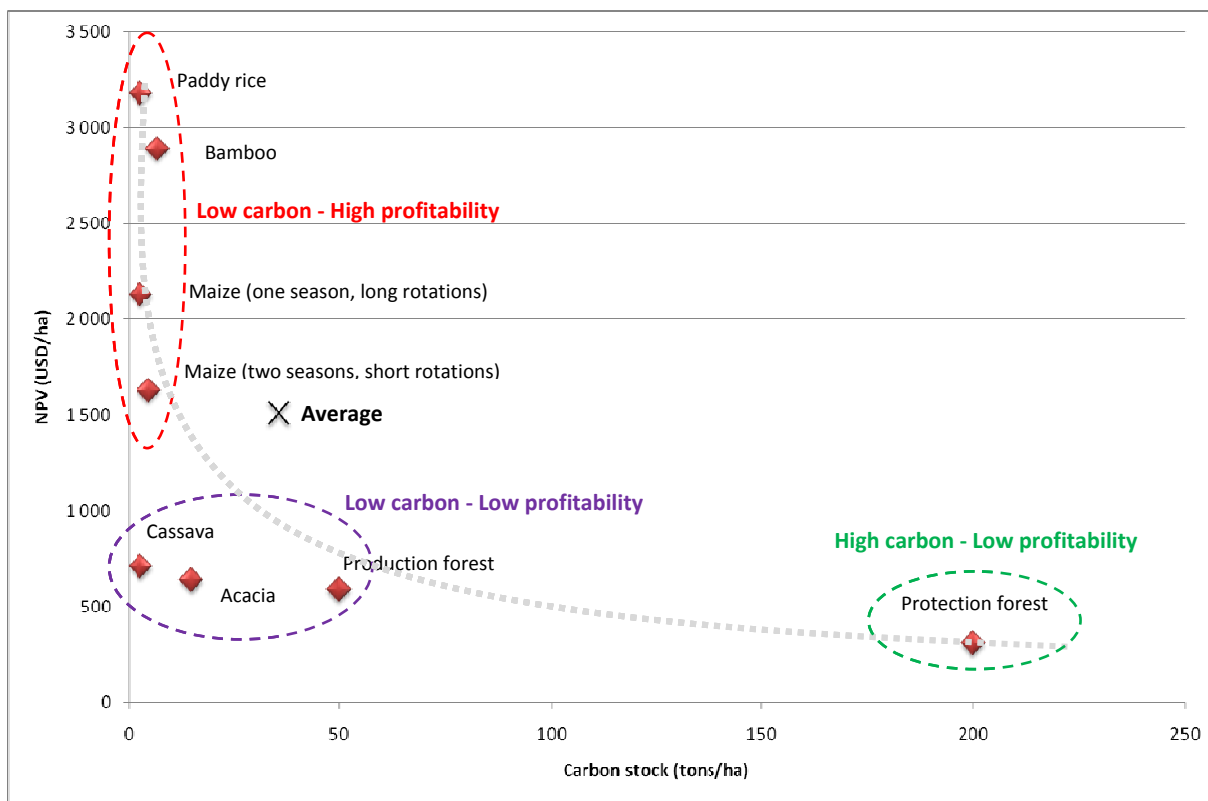
Time-averaged carbon stocks for the different land uses were estimated on the basis of previous research in the study area (Christiansen 2006)<sup>4</sup>. As shown by the trade-offs curve below (Figure 11), most existing land use systems in the study villages fall into “low carbon stock-high profits” and “low carbon stock-low profits” clusters. Protection forest constitutes the only component of a “high carbon stock-low profits” cluster. Focusing on the low profitability land uses, supporting the reconstitution of biomass and carbon stocks in production forests and converting cassava and acacia plantations (i.e. two low carbon – low profit land uses) into more profitable land uses could represent attractive REDD+ policy priorities.

*Table 3. Time averaged carbon stocks of land uses in Diem and Moi villages*

Land use	Carbon stock (ton/ha)
Paddy rice	3
Maize (3 y cropping – 2 y fallow)	5
Maize (2 seasons, 2 y cropping – 1 y fallow)	3
Cassava	3
Bamboo	7
Acacia	15
Production forest	50
Protection forest	200

<sup>4</sup> Christiansen L. 2006. *Land Use Management Projects under the CDM: A Village Case Study of Global and Local Potentials and Consequences*. MSc thesis, Institute of Geography, University of Copenhagen.

Figure 11. Trade-offs curve and clusters of land use systems in Diem and Moi villages



### 3. Livelihood typology and reliance on the different land use types

#### 3.1. Farming systems and livelihood options

Building on focus group data (wealth ranking and typology exercises) and data from questionnaire surveys, a typology was developed to characterize the socioeconomic situation and livelihood strategies of the households studied. In contrast with other I-REDD+ sites characterized by an important socioeconomic diversity across study villages (e.g. China), relatively similar typologies could be used in Diem and Moi villages. Starting with individual situations re. access to land (paddy in particular), engagement in off-farm activities, bamboo and acacia plantations, livestock farming and reliance on NTFP collection, four different types of households could be identified:

- **Type A:** These households have a very limited access to land and, in particular, no or very small paddy land. Off-farm employment is not a major source of incomes. Rather they rely strongly on NTFP collection for both subsistence and cash incomes.
- **Type B (Diem):** These households have fairly diversified livelihoods: small paddy areas, no or few young plantations (not yet productive) and some off-farm activities.
- **Type B (Moi):** These households have a very limited access to land and, in particular, no or very small paddy land. They are largely involved into off-farm activities.

- Type C (Diem): The households benefit of relatively important paddy areas, have no or very small bamboo and acacia plantations and are largely involved into off-farm activities.
- Type C (Moi): The households benefit of relatively important paddy areas, have no or very small bamboo and acacia plantations but have important livestock herds (cattle and buffalos). They do not engage significantly in off-farm work.
- Type D: These households are the largest landowners, strongly engaged in on-farm activities. They have large areas of paddy (rice self-sufficient), important livestock herds (cattle and buffalos) and they have put important surface areas under bamboo and/or acacia plantations.

As shown in Figure 12 and Figure 13, these four household types correspond also to four levels of incomes, with type A generating the lowest annual incomes and type D the highest.

*Figure 12. Average annual incomes per source and per household type in Diem*

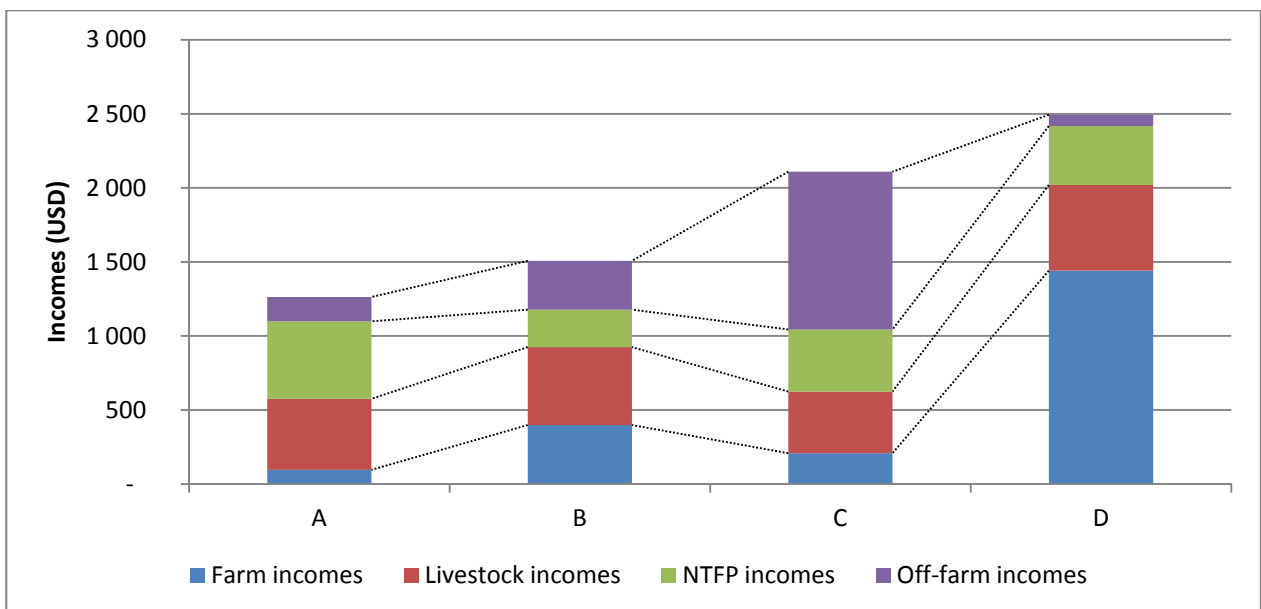
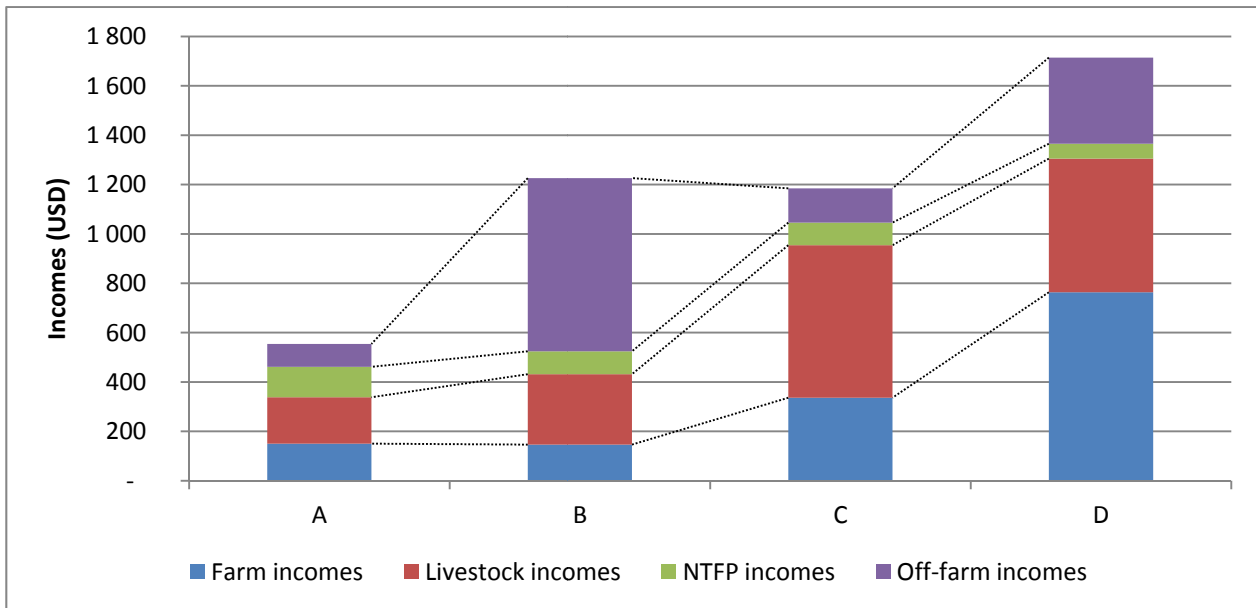
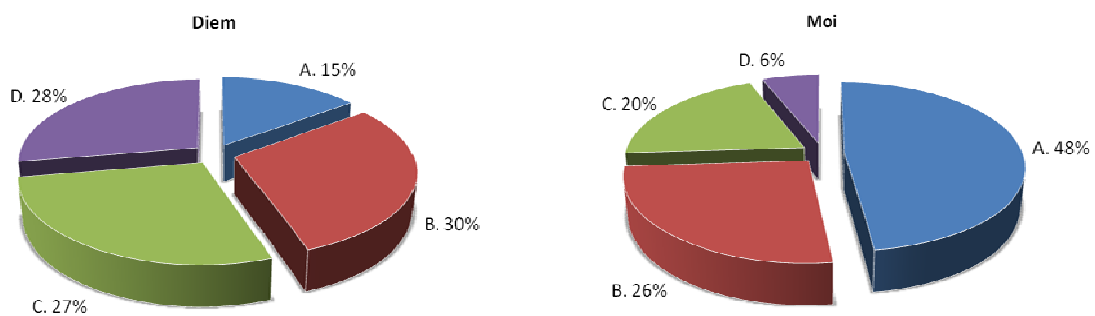


Figure 13. Average annual incomes per source and per household type in Moi



As pointed out by interviewees, type A households would be constituted either by new settlers or by new families (that could not inherit land from their parents) – both of which established in the study villages after the allocation of production forests to individual households. These households have only limited social networks and poor access to information on off-farm employment opportunities. As a result, they rely strongly on NTFP collection for subsistence and cash income generation. Type B (Diem) and type C (Moi) households correspond to “average” farming households yet with some degree of economic diversification linked to the emergence of off-farm employment opportunities (mainly off-farm wage labour) after the mid-2000s. In contrast, type C (Diem) and type B (Moi) represent emerging classes of household (most probably former types B in Diem and A in Moi) that have followed the mid-2000s wave and largely shifted toward an economy based on off-farm activities. Finally, type D in both study villages correspond to households that have built on their significant land resources to accumulate (capitalization in livestock), develop large plantations of bamboo and acacia and, for some, develop off-farm activities as collectors/middlemen. The distribution of the different household types in the two study villages is presented in Figure 14.

Figure 14. Distribution of the different household types in the study villages.



### 3.2. Landholdings

As indicated in the description of the typology above, type A and type B (Moi) households are characterized by a very limited access to land when compared with other household types (Figure 15 and Figure 16). They have no or very small paddy and plantation areas. In Moi village however, these households have a relatively good access to production forests, with an average tenure (individual “green books”) of 1.5 to 2 hectares. While type B households in Diem village have some land used for plantation of bamboo and acacia, the largest surface areas planted remain with type D households. More generally, the latter are by far the largest landowners with an average land tenure of 9.3 and 10 hectares in Diem and Moi respectively.

Figure 15. Average household land tenure and tenure per land uses in Diem

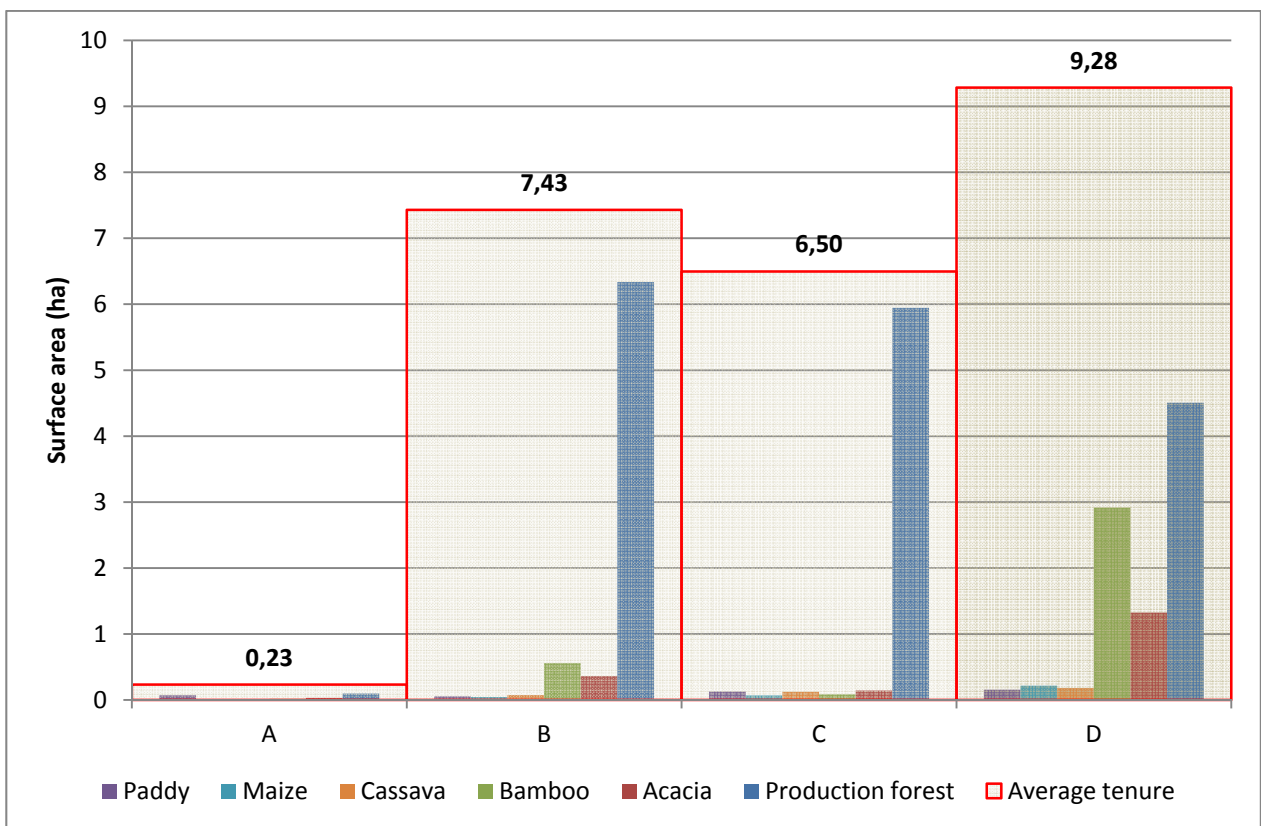
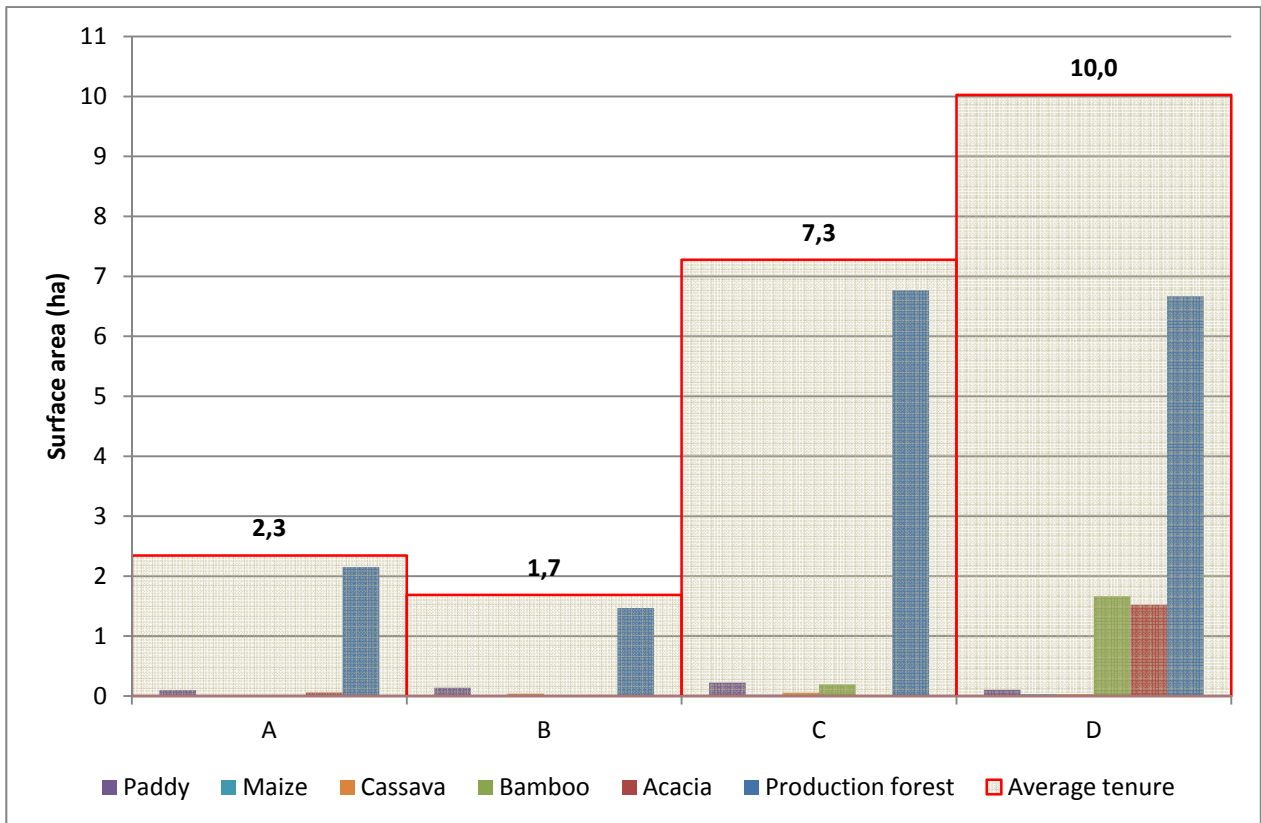


Figure 16. Average household land tenure and tenure per land uses in Moi



### 3.3. Poverty and equity

Focus groups were organized in both study villages aimed at identifying indicators of poverty and socioeconomic differentiation commonly used by local populations. The results of these focus groups showed significant concordance between the perceptions of interviewees in Diem and Moi villages (Table 4). According to these indicators, a poor household would be:

- living in a temporary house,
- have no transportation means or mechanical agricultural equipment,
- have no or very small plantations (bamboo and acacia) and livestock herds (cattle and buffalos),
- limited family labor and access to off-farm employment, with subsistence as main objective (as opposed to accumulation).

As described above, some of these indicators were then used to build a household/livelihood typology in the two study villages.

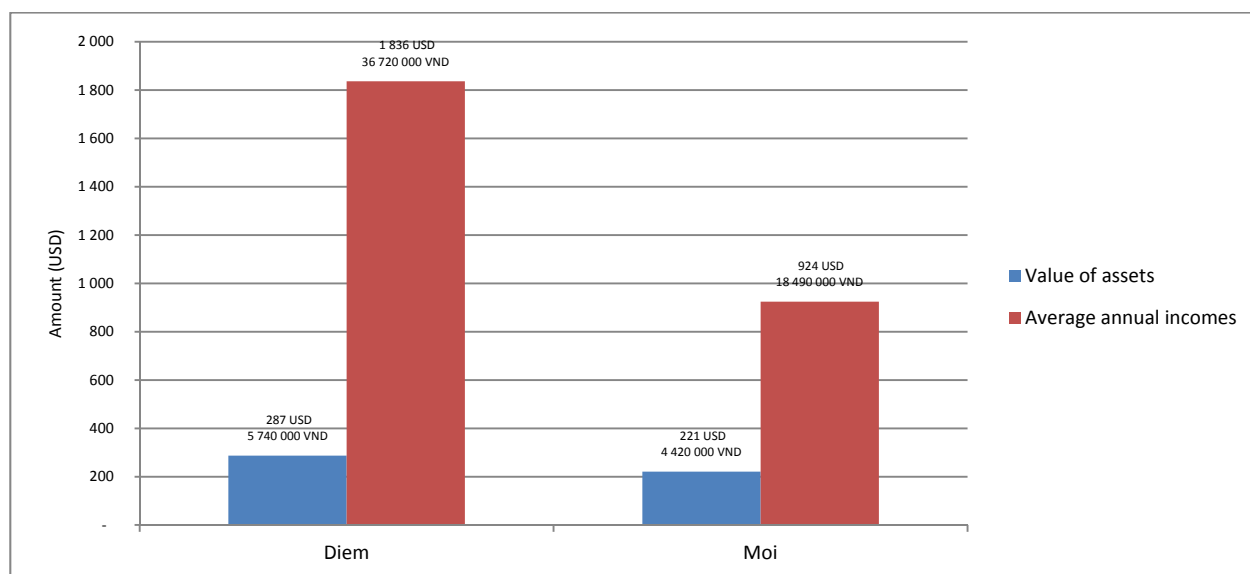


Table 4. Qualitative poverty indicators identified by local populations

Category	Moi	Diem
Housing & Assets	Temporary housing (bamboo, thatch), absence of transportation means and mechanical equipment	
Land tenure	No differences in land tenure (government policy)	
Land uses	No plantations	Plantations < 10% of total tenure
Off-farm	Lack of access to off-farm opportunities	Off-farm incomes used only for subsistence
Labour	Limited family labor	
Livestock	No cows and buffalos	No or very few (subsidized) cows and buffalos

Data on household incomes and assets (production/transportation tools and housing equipment) collected through questionnaire survey were also used as quantitative indicators to assess poverty. At the household level, the results show similar levels of capitalization in the two study villages but much lower annual incomes in Moi than in Diem (Figure 17). The difference between the two study villages appears also clearly when looking at incomes per capita per day. With 1 USD/capita in average, Diem village is just at the limit of the international poverty standards while Moi is clearly below the poverty line with 0.6 USD/capita.

Figure 17. Households' average assets and annual incomes in the two study villages



In order to analyse the equity of incomes (per capita), a decomposition analysis was applied using the Gini coefficient that ranges from 0% (equal distribution of income) to 100% (total concentration of income). Again, clear differences emerge between the two study villages with a relatively balanced income distribution in Diem (*Gini* = 37%) and marked income inequalities in Moi (*Gini* = 65%).



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**I-REDD+**

**Impacts of reducing emissions from deforestation and forest degradation and enhancement of forest carbon stocks**

**2011-2014**

**SP1-Cooperation**

**FP7-ENV-2010**

**Deliverable 5-1**

**Opportunity costs associated with land use transitions**

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# Opportunity costs associated with land use transitions: a nested “Land use – Landscape – Livelihoods” (3 Ls) approach for REDD+ impact assessment

## Table of Contents

Executive summary .....	3
1. Introduction: A conceptual and operational framework for opportunity cost analysis .....	4
2. Methods .....	7
2.1. Data collection .....	7
2.2. Data processing and comparative analysis across study sites .....	8
3. Land use transitions in the study sites .....	9
3.1. Shifting cultivation at the outset of the transition .....	9
3.2. A decade of rapid and radical changes in land use and livelihoods .....	9
4. Opportunity costs of the observed land use transitions (2000-2012) .....	18
4.1. Carbon vs. profitability trade-offs curves .....	18
4.2. Abatement cost curves .....	21
5. Impact of land use changes on local livelihoods .....	25
5.1. Household typology and reliance on the different land use types .....	25
5.2. Perceived value of landscape changes .....	27
6. Conclusions .....	30
7. References .....	31
Appendix 1: I-REDD+ WP5 Country Report: China .....	33
Appendix 2: I-REDD+ WP5 Country Report: Indonesia .....	46
Appendix 3: I-REDD+ WP5 Country Report: Laos .....	63
Appendix 4: I-REDD+ WP5 Country Report: Vietnam.....	79