

Differentiation in Benefits from Forest Devolution: Empirical Study from Dak lak province, Central Highland of Vietnam.

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1. Introduction

In Dak lak province of Vietnam, degradation of forest resources, overloaded costs for the state to protect forests, and increasing recognition of the role of local population in resource management have stimulated an experimental program to devolve forest management to local people. This forest devolution program, known as forest land allocation or FLA, aims to involve local people in resource management by recognizing their rights to forest resources. Long term (50-year) land use titles for forested land are granted to local people as the evidence of state's recognition of all the legal rights (to *exchange, transfer, mortgage, lease, and inherit* land title) vested in the right holders, which can be used as pledge against loans. Title holders may be individual households, groups of households, or a whole community, depending on the form of forest management. Other benefits offered to people, from state's point of view, include recognized rights to harvest timber¹ and non timber forest products, and legal access to (limited) cultivable land in the devolved forest.

To understand whether local people are sufficiently motivated to manage the forest resources, the questions remain how and to what extent local households have benefited from the (favorable) conditions made available by FLA. In other words, the state is concerned about whether the intended incentives offered by FLA are economically and socially interesting enough for local households to manage forest resources.

This paper presents results from a study about the impact of FLA on local households in two villages. It aims *to understand the differentiated benefits that Dak lak's program on devolution of forest management has brought to farm households in the study sites.* Generally, concerned benefits that local households may derive include immediate material benefits, (timber, land, and NTFPs), future material benefits, and spiritual benefits. Due to the heterogeneity of local conditions, the foci of study in each village also differ. In the first village, the study gives more attention to the issues related to FLA upland conversion while in the second village the focus is on the issues related to extraction of timber. In both villages, NTFP and other benefits are of secondary importance due to their insignificance in the local conditions.

The study took place from March to September 2002 and I spent three months in each village. During the time in the village, both qualitative and quantitative data collection techniques were applied. The data set used for quantitative analysis comes from household census in both villages conducted by myself by the end of each stay.

After this introduction section, a brief discussion about related literature and proposition of main questions discussed in the paper will be presented in section 2. Section 3 will

¹ withdrawal of timber products is, however, subject to prior approval from juridical (forest) authorities.

introduce readers to the study sites. In section 4 and 5, the research questions will be discussed for each of the study villages, respectively. Section 6 will conclude the paper. Results of statistical analyses can be found in the annex.

2. Theoretical background

This study adopts the environmental entitlement framework by Leach, Mearns, and Scoones (1999) as its analytical framework. The environment entitlement framework describes the interaction between people, as social actors, and the environment through embedded systems of property rights. In this interaction, both social actors and the environment influence and are influenced by each other. Entitlement framework was first introduced by Amartya Sen (1981, 1988), who uses the theory of property rights to explain how poor command over food causes famine. Leach, Mearns, and Scoones (1999) later extend this framework to explain how the consequences of environmental change are socially differentiated. The environmental entitlement framework by Leach, Mearns, and Scoones (1999) gives attention to both the way how people transfer their endowments into entitlements (entitlement mapping) as well as how these endowments are acquired (endowment mapping). The framework starts with the environmental goods and services. People get rights to these goods and services through different ways, which are governed by institutions at different levels. The mapping of entitlements from endowments for each social actor is also influenced by set of rules and regulations at different levels. These entitlements are used to improve the capabilities of the social actors, which have feedback influence on the environment.

Basically, it is expected that as a social actor has more endowments, his/her entitlements (and thus capabilities in the long run) may as well increase. However, this expectation is not always met as there are other factors that may influence the entitlement mapping. Using environmental entitlement framework, Post and Snel (2003) try to understand the impacts of decentralization of forest management on charcoal production in Eastern Senegal. The study looks at how people can turn their new endowments into entitlements and under what conditions people with endowments can get entitlement and improve their capabilities. The study result shows that insufficient strength and legitimacy are among factors that hinder the entitlement mapping of the local councils.

Besides, entitlement framework signifies a potential differentiation in benefits derived from a policy program among different actors in a community as their ability to generate such benefits depends on their endowments, entitlements and capabilities. White (1989) argues that differential control over production resources and, often but not always, unequal access to land cause some groups to gain the products of their own or other's labor, which constitutes the differentiation process. The effects of policy programs on local people, thus, are differentiated among different households and individuals according to their status and resources (Berry 1989).

Factors influencing the differentiation can be permanent or temporary. Hart, Turton, and White (1989) are of the idea that differentiation process is linked to changes in institutional arrangements governing access to and control over resources and people, which are connected to larger economic and political forces. Sara Berry (1989) argues that differences in social and economic status create the differences in access to and control over resources among local people, which are the potential causes of rural differentiation. Using examples from Southeast Asian countries, Hart (1989) shows that state policies influence and are influenced by local level arrangements; consequently, state policies

unintentionally become source of agrarian changes. On the other hand, through field study about effects of decollectivization on differentiation in three Thai villages in the Northwest of Vietnam, Sikor (2001) finds out that changes in political economic structures altered the differentiation among but not within villages, and that household wealth followed family cycle. In other words, findings from Sikor's (2001) study show that differentiation is caused by factors less permanent than that discussed in other works.

In the context of forest endowments for individual households, power relation shows a positive link to the use of forest resources due to the political elite and usual abundance of capital and resources of households in this kind (Byron and Arnold 1999). Byron and Arnold (1999) also explicitly point out the roles of off-farm income (or 'wage employment' in their term), opportunity for intensive farming, and poverty as factors that influence the derivation of forest products.

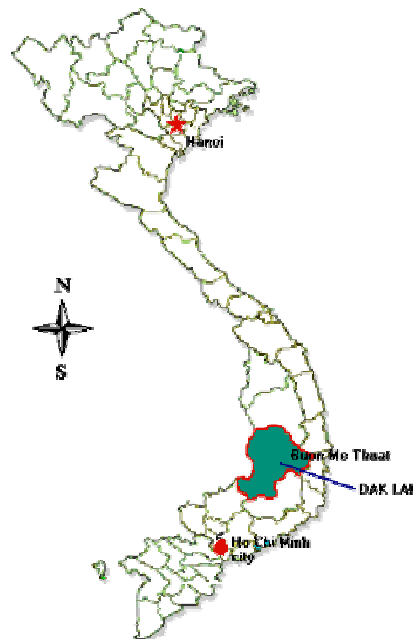
In short, related literature poses three major questions to the current study about the differentiation in benefits generated from forest devolution program in Daklak: 1) how benefits differ between and within study villages, 2) what factors of differentiation aggravate and what factors diminish the rural differentiation in the study area, and 3) do people with (new) endowments really get entitlements. These three questions will set up the major topics of discussion in this paper.

3. The study sites

For this study, two villages with different, and to certain extent opposite, characteristics were chosen with the purpose to draw up a picture of what effects FLA has brought to local people, how people react to policy intervention, and who benefits from FLA. village A² was selected as remote access village, almost no migration, abundant forest resources, FLA to group of households, and Ede ethnic people. The other village, village B, is on the other hand a pretty easily accessible village with high pressure on forest from illegal logging of timber for pepper poles, migration in the nearby villages, forest allocated to individual households, and Jarai ethnic group.

In both villages, the most important source of household income for local indigenous people is agricultural based. Cropping on rain fed upland fields is the main source of income. Most of the fields are located in close vicinity of the village. In mid 90s when coffee market was booming, coffee was largely planted in the area and provided an important cash income for household

Figure 1: Location of Dak lak in the map of Vietnam



² Actual names of study villages are omitted for confidentiality reason

economy. As coffee price went down in late 90s and early 00s along with loss of investment in coffee, coffee has been gradually replaced by other crops, maize in village A and pepper in village B. Upland rice and paddy cultivation is only for household self-sufficiency purpose; no cash income from paddy or upland rice is observed. Livestock holding, particularly for large animal like cattle and buffalo, is considered a means of capital accumulation rather than long term commercial investment.

In terms of forest land allocation program, village B is among the first 4 villages in Daklak where FLA took place. The process of field allocation started in early 1999 and completed by end of the same year with ~298ha of dipterocarp forest allocated to 20 individual Jarai households, each receiving between 12-20ha. It is also important to note that 3 other villages in the same commune also had FLA at the same time with village A and the FLA forest for all 4 villages is in one block. Forest land use certificate (also known as red book) was handed over to recipient households in early 2000. The FLA forest was originally under the stewardship of local state forest enterprise (SFE), who played the key role in the allocation process. Local people's participation in the process was pretty limited. Despite of the fact that several meetings were held in the village, most of the talking was done by district FLA work team or village cadres. In addition, the selection of FLA recipients was not very transparent and households who were rejected did not know why they were not selected.

FLA in village A started a year later than in village B, at the beginning of 2000. By 2/2001, field allocation of land was completed and forest land use certificates for the allocated forest handed over to recipient groups in June 2001. A total of ~569ha of ever green forest were allocated to 5 recipient groups with 38 Ede households in the village. Unlike the situation in village B, people in village A had more chance to talk in FLA meetings held in the village. At the same time, the selection criteria for forest recipients was pretty clear; all existing Ede households in the village at that time were included and all migrant Kinh households excluded. At the same time of FLA in village A, another village in the same commune also had FLA, sharing the same forest block with village A. An important note for FLA in village A is that the FLA forest was traditionally claimed by Ede people in village A and another village, village A1. These two villages had formerly been one and only split up in 1988 under an assisted resettlement program. Thus, even FLA gave people in village A the legal rights to this forest and excluded people in village A1, the latter resist and still claim their traditional link to this forest area.

Table 1 presents a brief overview of information about the study villages.

Table 1: Brief summary of information per village

Criteria	Village A	Village B
1. Demography and ethnicity		
▪ Population	278	337
▪ Number of households (HHs)	42	53
▪ Major ethnic group	Ede	Jarai
▪ Percentage of major ethnic group (HH)	90%	81%
2. Local livelihoods and forest use		
▪ Average cultivable land per HH (ha)	2.82	1.61
▪ Number of HH with paddy land	25	38

▪ Number of main laborer per HH	2.8	2.6
▪ Average labor force (incl. sub laborer) per HH	4	3.7
▪ Major cash crops	hybrid maize, coffee	pepper, coffee
3. Forest land allocation (FLA)		
▪ Size of allocated forest (ha)	569	298
▪ Form of allocation	individual household	group of household
▪ No of HH receiving forest	38 ³	20
▪ Major resource taken from FLA forest	cultivation land	timber for pepper pole

(Source: Field surveys)

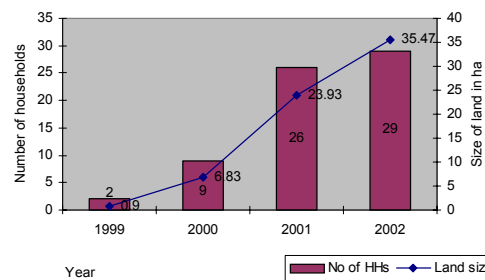
Since the completion of FLA in the study area by 1999-2000, forest resources have been tapped by both recipients as well as non-recipients in the same village. The most vividly recorded effect is the use of forest land for agriculture purpose in village A and extraction of timber for pepper pole in village B. Since little effect has been observed on the use of other resources in both villages, this section will focus on the acquisition of new field in FLA forest in village A and of timber (for pepper plantation) in village B.

4. Clearing of forest land in allocated area for cropping in village A

4.1. Differences in benefits between and within villages

Historically, quite a few number of Ede people in village A were cultivating and living in nowadays FLA forest during the American War⁴, from early 60s to mid 70s. However, from after the war until 1999 when the whole forest was under the control of local SFE, few households started going back to their old fields in this area. By the time FLA started, some 9 households in village A reportedly had some field in FLA forest. After FLA was completed, people started rushing to get a share of upland in the allocated forest area. By the time the study was conducted (mid 2002), 29 out of 42 households in village A have new field in allocated forest with some having more than one plot and opening new field in more than one year. Land size cleared by each household during the last several year ranges between 0.3 to 3ha. Over four years (1999-2002), an average household in village A village has opened around 1.27ha of FLA upland with an average plot size of 0.68ha (see Figure 2).

Figure 2: Land clearing in FLA forest by village A



Source: key informant interviews and village census

An econometric tool is applied to estimate the potential factors of differentiation in size of land cleared by local households in village since the completion of FLA. It is hypothesized that the size of FLA field is a function of a number of factors. Let FLA FIELD be the dependent variable of the model, its function can be mathematically presented as followed:

³ by the time of the study, 3 recipient households had already moved out of the village

⁴ which is known as Vietnam War in the other part of the world.

$$y_{(FLA\ FIELD)} = f_{(WR, PRESENT\ POST, PAST\ POST, MALE\ LABOR, FLA\ RECIPIENT, NONFLA\ FIELD, FAMILY\ SIZE, D\ PADDY, MONTHLY\ OFF\ FARM, CAPITA\ PER\ LABOR, PAST\ FIELD)}$$

where FLA FIELD is size of field in FLA forest in ha; WR is ranking of household wealth; PRESENT POST and PAST POST are dummies for HH head currently or used to holding a political position, respectively; MALE LABOR is the number of male laborer in the HH; FLA RECIPIENT is dummy for HH receiving forest; NON FLA FIELD is farm size excluding FLA field; FAMILY SIZE measures number of heads (or capita) in the HH; D PADDY is dummy for HH having paddy land; MONTHLY OFF FARM is dummy for HH having monthly off farm income; CAPITA PER LABOR measures the ratio of capita per working person or consumers/laborer; and PAST FIELD is dummy for HH having cultivated in FLA forest before (see more details in Table 3, page 12).

The FLA field model is regressed with Ordinary Least Squares (OLS) method, using PROC REG in SAS version 8.02. Regression results are presented in Table 4, page 12. In general, six of the estimates are statistically significant and the others, including the intercept, are not. Significant estimates are for *WR(+)*, *PAST POST(+)*, *NON FLA FIELD(-)*, *FAMILY SIZE(+)*, *D PADDY(-)*, *CAPITA LABOR RATIO(-)*. Of which, *NON FLA FIELD* is significant at 1%, *PAST POST* and *FAMILY SIZE* at 5%, and the others at 10% (see Table 4). Statistically insignificant estimates are for *PRESENT POST*, *MALE LABOR*, *FLA RECIPIENT*, *MONTHLY OFF FARM*, and *PAST FIELD*. In other words, the correlation between these variables and the size of FLA field is too thin to be proven statistically.

4.2. Factors of differentiation

Power relation appears to be an interesting factor in the derivation of FLA field benefits. Households with political position know when and how to use their power and access to information on their own benefits. At the same time, they have a tendency to withdraw themselves wisely when necessary so that the immediate benefit does not spoil their status. Since land clearing is easy to be noticed and traced, people with current position withhold themselves from clearing a (large) area in FLA forest. On the other hand, past political position seems to be an aggravating factor of differentiation, i.e. factor that widens the differentiation in rural economy. People who used to hold a position but have retired or are off from the job grasp the situation quick and turn the ‘ambiguous land’ into their holdings. The same holds true for wealth. As indicated by Byron and Arnold (1999), wealth also plays a part in this entitlement mapping. Analytical results show richer households are more likely to have a larger FLA field entitlement than poorer ones due to their better access to capita (and labor).

Also of importance in the derivation of benefits from FLA forest is household and farm characteristics. Existing non FLA field helps diminish the existing gap in the village as it significantly and negatively influences the field size a household may open in FLA forest. This fact is well explained by the possibility frontier. Given the existing market conditions and his access to capital and working instrument, a small farmer in such a self sufficiency production is limited by his available labor force and can open up the area of FLA field to the level that he can manage. Similarly and in line with Byron and Arnold’s (1999) point about the relationship between the possibility for intensive agriculture and upland farming, a household with some paddy land is more likely to have smaller field in FLA forest than the one without paddy land as the former may want to focus on the paddy instead of upland crop. As for human resource, the fact that the number of male laborers

in the household does not significantly influence the derivation of benefits from FLA forest can be explained by the practice of work-exchanging in the village. Local farmers organize working group of several households for gender specific work. To be more exact, a group of men may go to forest for timber or new field while the women team takes care the weeding or seeding. This help-another-out tradition has eased off the problem of lacking work force of either sex in the household.

Of the regression result, a small surprise is that a household having cultivated in FLA forest in the past does not significantly have larger FLA field than the one that has not cultivated in this forest before. Observation during the study is that more than half (17/29) of the households that has new field in FLA forest cultivated there before (in 60s-mid 70s). OLS regression analysis, however, does not return a statistically significant estimate. A possible cause is that history with FLA forest may have significant influence on the decision whether or not to clear land in FLA forest but may not have influence on how much forest a household would clear. Also interesting is that along with people in village A, some 10 Ede households from village A1 (who formerly were in one village with people in village A) also had field in FLA forest before FLA and this number least doubles by the year 2002. This fact necessarily supports the argument that forest link is important to the decision to open up FLA forest for cultivation land.

4.3. From endowments to entitlements

To check whether FLA field size for villagers in village A has statistically increased after FLA, a simple statistic test to compare the FLA field size in 2002 and that in 2000 (before FLA field allocated started). Results show a very statistically significant difference for recipient households; a recipient household is likely to have opened up large area of FLA field since 2000. For non recipient household, however, results show a statistically insignificant difference between the FLA field size they have in 2002 and in 2000. This necessarily implies a large area of the FLA field in the possession of recipient households have been cleared very recently, i.e. in 2001 and 2002 while for non recipient households the size of FLA field between 2002 and 2000 slightly changes (see also Table 2, page 12).

However, in OLS regression results the difference in terms of benefit derived by a non recipient household comparing to that of a recipient doesn't show up to be statistically significant. An explanation for this is that the small number of non recipients in the village (7 out of 42 households, only one of the non recipients has field in FLA forest) may not be sufficient to show up the difference in multivariate analysis with 12 variables as discussed in section 4.1.

5. Logging of pepper pole in village B

5.1. Differences in benefits within village

Since the completion of FLA in 2000 only one new timber house has been built whose owner logged timber from forest, both allocated and non allocated, without having applied for an official permit. In general, the need of timber for housing is not very urgent. By contrast, timber for other use has proved to be a far more urgent issue. Since 1998-1999, the bust in the coffee market has stimulated the widening of area under pepper crop in village B as well as the neighboring villages. With good price of pepper during the last couple of year along with low price of coffee in the market, pepper has become a substitution crop for coffee in many farms. Only in 2001-2002, 34 out of total 53

households in the village derived some timber from forest for pepper plantation. Of whom, some 6 households are known within village for frequent selling of pepper pole. Most households got timber for their own use, and some have to buy or hire people to log for them.

Similar to the case of FLA field in village A, an econometric model is set up to define factors influencing the derivation of timber benefits. It is hypothesized that the amount of timber benefit derived from forest is a function of different factors. Let TIMBER CASH be the dependent variable, the model can be mathematically presented as:

$$Y_{(\text{TIMBER CASH})} = f_{(\text{CROP INCOME, TIMBER 99, MALE LABOR, FLA RECIPIENT, FARM SIZE, D PADDY, WEALTH-POST})}$$

where TIMBER CASH is the amount of cash equivalence in thousand VND of timber logged in the year 2001-2002; CROP INCOME: cash equivalence (in thousand VND) of crop harvest; TIMBER 99: cash equivalence (in thousand VND) of timber logged in the year 1999; MALE LABOR is the number of male laborer in the households; FLA RECIPIENT is dummy for whether household received forest or not; FARM SIZE measures total land size (in ha) of the HH; D PADDY is dummy for whether HH has some paddy land; and WEALTH-POST is dummy for HH having either wealth (i.e. rich HH) or present position or both (see more details in Table 6, page 13). It is to be noted that due to strong correlation between rich households and those having present political position, these variables are not statistically able to present individually in the model. Therefore, variable WEALTH-POST is used in the model.

OLS method is also used to estimate this model with the help of PROC REG in SAS version 8.02. Regression results are presented in Table 7, page 13. In general, four estimates are statistically significant and the others, including the intercept, are not. Significant estimates are for *CROP INCOME*(+), *FLA RECIPIENT*(-), *FARM SIZE*(+), and *WEALTH-POST*(+). Of which, *CROP INCOME* is significant at 1%, and the other three at 5% level (see Table 7). Statistically insignificant estimates are for *TIMBER 99*, *MALE LABOR*, and *D PADDY*. This necessarily implies that the correlation between these variables and the amount of timber taken during 2001-2002 is too thin to be proven statistically.

5.2. Factors of differentiation

Generally, power relation appears to dominate the derivation of timber benefits. A household with political position or wealth is more likely to derive more timber than an ordinary and not rich farm household. Contrary to the case of FLA field, a timber tree taken from forest is more difficult to be traced and noticed than a patch of forest cleared for cultivation. Thus, people with political power in village B allow themselves to tap more benefits from forest than other people. In addition, since pepper planting is an investment activity whose return cannot be expected within 3 years, as Byron and Arnold (1999) also pointed out richer households with access to capital find it easier to do this investment on a larger scale than poorer ones. As a results, the former is more likely to take more timber (or have more timber taken) away from forest than the latter, making power relation a factor that widens the rural differentiation in this case.

Also of importance is the role of household and farm characteristics in the derivation of benefits from FLA forest. Contrary to the case of FLA field, farm size appears to widen the differentiation in derivation of benefit from timber. Since pepper planting in an

investment activity that takes up land and requires a couple of years before it can be harvested, larger farm is likely to plant more pepper (and thus need more timber for pole) than smaller one as the former still has land for short duration staple crops.

Similarly, farm production also plays a role in pepper plantation. Farmer with larger income from his farm can nurture his household's future by investing in pepper for later harvest while farmer with smaller farm income has to focus on his food production. As for human resource, same to the case of FLA field in village the number of male farmers in the household does not significantly influence the derivation of benefits from FLA forest. Again, this can be explained by the practice of work-exchange team, which is very common in this village as well.

5.3. From endowments to entitlements

For FLA recipient in village B, from legal endowment to entitlements has proven so far a long way to go. Interestingly, a non recipient household is likely to have benefited more from FLA forest than a recipient. An explanation is that in this ambiguous situation where state control forestry is in the transition to people control regime, inflated by market conditions, legalized forest users (i.e. forest recipients) are not sure what user rights they have and how to enforce them. At the same time, there is an absence of legal system to back up forest recipient in the realization of their newly granted rights. In village B, FLA only gave forest to a bit more than one third of the households in the village, excluding more than half of the village officially from using a forest which they had been using before, and creating a sense of unfairness among these non recipients. As a consequence, the non recipients resist and appropriate more resources (Peluso 1992; Bruce et al. 1993). This fact puts up the question of how people with endowments can get entitlements. Obviously, the ambiguity of FLA recipients and the absence of a state backup system make the entitlement mapping a long process for FLA recipients.

The six households in village B known for their frequent extracting and selling of pepper poles are among the non recipients. These households were already known for their 'overuse' of forest resource at the time of FLA. Being not selected to receive forest they still maintain their practice as woodcutters, though not very frequent nor open. These households do not have political power, yet their household economy falls among medium to rich range in the village.

A simple statistic test is also used to check the difference between before and after FLA situation. For this case, amount of timber in cash equivalence of 2001 and 1999 is used (it is not possible to use data of 2002 because the study was conducted by mid 2002). Test results show a very thin difference between amount of timber extracted in these two years for both recipient and non recipient groups. The difference is not statistically significant enough (see Table 5, page 13).

6. Summary and conclusions

To conclude, this study tries to understand the derivation of benefits from FLA program and looks for the cause of differentiation in these benefits among local farm households. Study shows interesting findings about the difference in terms of what kind of benefits people in different geographical locations may derive, the important role of power relation in terms of wealth and political power in the process of acquiring and benefiting from access to devolved forest resources, equity in devolution process and the enforcement of

the newly endowed rights to create incentive for people involved in the devolution, the role of household male labor force, and the relation between forest link and derivation of benefits.

First of all, results show a wide difference in kinds of benefits that households in each village can derive from FLA forest. Due to differences in natural and socio-economic factors, people in first village are more engaged in the derivation of cultivable land from FLA forest while in the second village timber for pepper planting becomes the most important product from FLA forest for local people. Within the village, there is also a profound difference in terms of how much people get from forest for specified product. Study shows that power relation, farm size, access to paddy land, and access to capital are among important factors that influence this differentiation process.

As for factors influencing the differentiation, power relation plays different role in different cases. In the first village, present political position reduces the rural differentiation while post position increases it. On the other hand, political position unambiguously widens the gap in rural economy in the second village. In both cases, household wealth functions as factor engraving the differentiation in the study villages. Similar to power relation, household and farm characteristics play different roles in different cases. The existing farm size has significant influence on both the derivation of timber and land but in different directions. In the first village case, existing (non FLA) farm size is likely to reduce the differentiation while farm size aggravates it in the second village. Results also verify Byron and Arnold's (1999) point about the linkage between access to intensive agriculture and slash and burn cultivation practice. Access to paddy land appears to lessen the gap in the rural economy. As for human resource, contrary to the common belief that households with more male laborers will derive more benefits from forest study results show that due to the common practice of working exchanging group in both villages, lack of labor of either sex is no a problem for local households. Contrary to the common belief that people with closer forest link would gain more from forest than those without any link, study shows that this is not the case in village A where the size of FLA field is not significantly influenced by forest link. Nevertheless, forest link may necessarily influence on the decision whether or not to clear land in FLA forest.

Third and lastly, study shows that endowments may not always automatically be transformed into entitlements. It is very interesting to see how much benefits from FLA forest a recipient household derives comparing to non recipient one as in village B. Fact shows that the situation in the village is ambiguous and that recipient households have significantly smaller share of benefits than the non recipients. To help the entitlement mapping for the recipients, improved clarification for forest recipients in terms of rights and conditions as well as an operational state system to backup the realization of newly endowed rights are needed.

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ANNEX

Table 2: Test of difference between 2002 - 2000 FLA field size in village A

	No of observations	Mean difference	Std error	t value	pr > t
Non recipient households	7	0.1429	0.1429	1	0.3559
Recipient households	35	0.8297	0.1590	5.22	<.0001
Whole village	42	0.7152	0.1399	5.11	<.0001

Table 3: Variables in FLA field model for village A

Variable and Explanation	Min	Max	Mean	Variance
FLA FIELD: Size of field in FLA forest	0	3.3	0.7152	0.8216
WR: Ranking of household wealth	0	2	0.6429	0.6254
PRESENT POST: Dummy for HH head currently holding a political position	0	1	0.1905	0.1580
PAST POST: Dummy for HH head used to holding a political position	0	1	0.3333	0.2276
MALE LABOR: Number of male laborer in the HH	0	3	1.3810	0.4855
FLA RECIPIENT: Dummy for HH receiving forest	0	1	0.8333	0.1423
NON FLA FIELD: farm size excluding FLA field	0.2	4.49	2.1833	1.1224
FAMILY SIZE: Number of heads (or capita) in the HH	3	11	6.6429	4.7718
D PADDY: Dummy for HH having paddy land	0	1	0.5714	0.2509
MONTHLY OFF FARM: Dummy for HH having monthly off farm income	0	1	0.4286	0.2509
CAPITA PER LABOR: Ratio of capita per working person in the HH	1	6	1.8439	0.6330
PAST FIELD: Dummy for HH having cultivated in FLA forest before	0	1	0.4524	0.2538

Table 4: Regression results of FLA field model for village A

Variable	Estimate	Std error	t-value	Pr> t
Intercept	0.2484	0.5607	0.44	0.6610
WR	0.3026*	0.1624	1.86	0.0722
PRESENT POST	-0.0831	0.3416	-0.24	0.8093
PAST POST	0.7617**	0.2973	2.56	0.0157
MALE LABOR	0.1055	0.2395	0.44	0.6627
FLA RECIPIENT	0.3104	0.4244	0.73	0.4702
NON FLA FIELD	-0.4669***	0.1428	-3.27	0.0027
FAMILY SIZE	0.2196**	0.0901	2.44	0.0209
D PADDY	-0.4877*	0.2405	-2.03	0.0516
MONTHLY OFF FARM	-0.0492	0.2582	-0.19	0.8501
CAPITA LABOR RATIO	-0.3488*	0.1781	-1.96	0.0595
PAST FIELD	0.2941	0.2696	1.09	0.2841

R²: 0.53 White test: $\chi^2_{46} = 41.21$ (0.6728)
 F Value: 3.08 (0.0071)

Note: *, **, *** represent the significance level of 10%, 5% and 1%, respectively.

Table 5: Test of difference between timber derived in 2001 – 1999 in village B

	No of observations	Mean difference	Std error	t value	pr > t
Non recipient households	33	529	643	0.82	0.4169
Recipient households	20	660	743	0.89	0.3853
Whole village	53	579	484	1.19	0.2378

Table 6: Variables in timber logging model for village B

Variable and Explanation	Min	Max	Mean	Variance
TIMBER CASH: cash equivalence (in thousand VND) of timber logged in the year 2001-2002	0	16000	1904.53	9868856
CROP INCOME: cash equivalence (in thousand VND) of crop harvest	0	48500	6033.62	70546767
TIMBER 99: cash equivalence (in thousand VND) of timber logged in the year 1999	0	5400	769.8113	2055994
MALE LABOR: see description in Table 3	0	4	1.3962	0.7823
FLA RECIPIENT: see description in Table 3	0	1	0.3774	0.2395
FARM SIZE: total land size (in ha) of the HH	0.2	6.7	1.6811	1.6813
D PADDY: see description in Table 3	0	1	0.6981	0.2148
WEALTH-POST: dummy for HH having either wealth (i.e. rich HH) or present position or both	0	1	0.2264	0.1785

Table 7: Regression results of timber logging model for village B

Variable	Estimate	Std error	t-value	Pr> t
Intercept	-7.4139	565.6925	-0.01	0.9896
CROP INCOME	0.2013***	0.0392	5.14	<.0001
TIMBER 99	-0.0723	0.1717	-0.42	0.6756
MALE LABOR	156.9714	309.849	0.51	0.6149
FLA RECIPIENT	-1252.7280**	569.027	-2.2	0.0329
FARM SIZE	557.4133**	265.213	2.1	0.0412
D PADDY	-491.5535	615.035	-0.8	0.4284
WEALTH-POST	1823.5771**	780.873	2.34	0.0240
R ² :	0.74	White test: $\chi^2_{32} = 34.60$	(0.3448)	
F value:	18.40 (<0.0001)			

Note: *, **, *** represent the significance level of 10%, 5% and 1%, respectively.