

Land allocation policy and conservation practices in the mountains of Northern Vietnam

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Abstract

In Vietnam, a quasi-private property regime has been established in 1993, with the issuance exchangeable and mortgageable land use right certificates. Using primary qualitative and quantitative data, this paper investigates the role of the titling policy in fostering the use of soil conservation practices by upland farmers in the northern mountains region. There, population growth and growing market demands have induced farmers to intensify agricultural production onto steep slopes. While poverty has been reduced, environmental problems such as soil erosion, landslides, and declining soil fertility have become severe over the past years. Our findings suggest that soil conservation technologies although relatively well known are perceived as being economically unattractive. Focusing on agroforestry, we estimate household and plot level econometric models to empirically assess the determinants of adoption. We find that the possession of a formal land title influences adoption, but that the threat of land re-allocations in villages creates uncertainty and discourages this type of investment. We conclude that more efforts are needed from decision-makers to promote and support the adoption of conservation practices and also to clarify objectives of the land policy in order to secure land tenure and initiate a more sustainable development in fragile areas.

Keywords: Land titling, technology adoption, upland agriculture.

1. Introduction

Beginning with the *Doi Moi* reforms in 1986, Vietnam has engaged in important institutional reforms to lead its economy from a centrally-planned to a market-oriented system. In rural areas, reforms were designed to empower farmers as decision-makers as a way to boost agricultural production and alleviate poverty. In this perspective, the land allocation policy, and the issuance of long-term land-use right certificates (LURC) to households have been among the most important measures taken by the state.

Our research focuses on the Northern Mountain Region (NMR). There, the rapid population growth, and the increasing demand for food and feed from urban areas have led to the intensification of maize production on the hillsides, an erosion-prone crop, leading to deforestation and the scarcity of arable land. Consequently, soil erosion and landslides have become important issues leading to reduced soil fertility in the uplands, sedimentation of lowland irrigation channels and paddy fields as well as severely damaging road infrastructure. Unchecked, these practices could affect the greater population as they threaten the sustainability of agricultural production in mountainous areas and, at a larger scale, the quality of drinking water in the lowlands. Soil conservation technologies (SCT) represent therefore a major tool for sustaining livelihoods and agricultural production in the NMR.

While techniques limiting soil erosion on cropped fields are numerous and diverse, most of them share two common features: they incur opportunity costs in terms of land and labor that are not available for cropping activities any longer; and second, SCT enhance soil fertility only in the medium to long run. It is clear that the adoption decision of SCT involves intertemporal utility tradeoffs (Grepperud, 1997, McConnell, 1983). Farmers in developing areas facing consumption risks, living in environment of incomplete labor and credit markets, insecure land tenure, and having short planning horizons are unlikely to invest in such technologies although they are often among the most exposed to environmental risks linked to

soil erosion (Lutz, et al., 1994, Shively, 2001). State interventions that secure land tenure, and lower farmers' discount rates via formal credit supply in rural areas are thus expected to reduce poverty and encourage the conservation of natural resources (Lutz, et al., 1994).

There is consensus in the development community that land titling policies, by securing land tenure, improving access to formal credit, and increasing land transactions, generate higher investment incentives and foster development have lead numerous countries to implement large titling programs (de Soto, 2000, Deininger and Feder, 2001). Notwithstanding this, the empirical studies conducted in different countries have often not found evidence of large effects of land title on investment incentives (see Bromley (2009) for a review of empirical evidences). Rather, it seems that the issuance of formal titles has not always led to increased tenure security and to higher investments. Legal pluralism or the co-existence of formal and informal institutions has been identified as a source of inefficient land institutions leading to high enforcement costs, and /or inefficient allocation (Platteau, 1996). In addition, the imperfection of rural financial markets attenuates benefits of formalized property rights. Recent empirical studies have found that land titles may benefit some households more than others, the least credit constrained in Paraguay (Carter and Olinto, 2003) or the powerful ones in Ghana (Goldstein and Udry, 2007). Regarding soil conservation, Soule et al. (2000) find that land owners in the United State have higher propensity to adopt conservation practices than cash or share-renters. Shively (2001) concludes that land tenure is an important determinant of SCT adoption in the Philippines. In Vietnam, using national data Do and Iyer (2008) found that the 1993 land law has significantly increased the allocation of land to perennial crops.

Using primary quantitative and qualitative data on SCT, and on the implementation of the land titling policy in the mountainous region, we investigate in this paper the determinants of farmers' decision to invest in SCT, in particular, the role of the land titling policy in fostering

such adoption. After outlining the implementation of land reforms in Vietnam in Section 2, we describe the research area in Section 3 and the sampling procedure in Section 4. The estimation strategy is described in Section 5, and results are presented in Section 6, Section 7 concludes.

2. Reforms of land institutions in Vietnam

Prior to 1981, agricultural land, means of production, and production output in Northern Vietnam were fully managed by village cooperatives. The decollectivization process was initiated with the Directive 100 (1981) and the following reforms on land taxation made to increase production levels and overcome food insecurity (Que, 2005). The collective farming system officially ended with the land law of 1988 (resolution 10) and the distribution of land to households with use rights for fifteen years.

Pursuing this effort, the 1993 land law granted land users five rights: the right to exchange, transfer, mortgage, inherit, and lease out the land. LURC (or Red Books) were issued to users for a period of 20 years for annual crops and for 50 years for perennial crops, hereby establishing a quasi-private land management system (the land being still publicly owned). This policy was assessed by observers and researchers as being fairly egalitarian (Ravallion and van de Walle, 2001).

Its implementation has been a long process and achieved unevenly among regions. In 1998 less than half of the total area in NMR had been allocated with titles (Do and Iyer, 2003). Beside the considerable administrative costs involved in measuring land, issue and register the certificates and the lack of qualified personnel (Haque and Montesi, 1996), in NMR, the enforcement of the law has been contested by ethnic groups which returned to traditional land management systems when the collective farming ended (see Corlin (1997) on land relations in H'mong communities; and Mellac (2006) and Sikor (2004) on Thai communities).

Nowadays uncertainty persists on whether land will be reallocated at the end of the use right term (20 years). Although the government has ensured that use rights will be prolonged, a large share of farmers believes that reallocation will occur, and are reluctant to operate land transactions¹.

3. The research area

The study region is Yen Chau, a mountainous district inhabited primarily by ethnic minorities². The Thai, (55% of the population) were with the Kinh (13%) the first settlers in the area (Neef, et al., 2002). They occupied mainly the lowlands, while later comers, the H'mong (20%) settled the highlands. Lowland villages located along the highway have greater access to markets, paved roads, and irrigation systems and are relatively better-off than upland villages. Farmers cultivate two main crops: rice, grown on paddy fields as a subsistence crop and maize, the predominant cash crop, is grown on the sloping uplands. The rapid development of the livestock sector accompanied by rising maize prices have pushed farmers to intensify maize production and abandon rice cultivation in the uplands. About 71% of arable land is nowadays cropped with maize from April to September, and left uncovered the rest of the year, exposed to wind and rain. Consequently, the area is subject to important erosion problems: reduced soil fertility and the increasing incidence of landslides during the rainy season.

¹ In an interview in August 2007, Mr. , Dang Hung Vo, Vice Minister of Natural Resources and Environment acknowledge the confusion of peasants regarding the renewal of use rights in 2013, and the consequences on the land transactions. He formally ensures in this interview that use rights will be extended and not redistributed [available online in Vietnamese: <http://www.agro.gov.vn/news/newsDetail.asp?targetID=2128>]

² The Vietnamese ethnic, the Kinh, represent about 82 % of the country's population, the rest of the population o the "ethnic minority" group.

4. Sampling and data collection

A survey was conducted in 2007/2008 based on a random sample of 300 households selected in a two-step procedure: (1) 20 villages were first randomly selected using the Probability Proportionate to Size (PPS) method (Carletto, 1999); (2) 15 households were randomly selected in each of these villages using updated village-level household lists. In total the database consists of 300 households and 2279 agricultural plots, among which 1190 are upland plots operated by farmers. Both the household and plot samples are representative at the district and village levels. Information on village land management history was collected during focus group discussions with members of the current and former village boards of each sample village.

5. Empirical strategy

After depicting the main steps in which the implementation of the land policy has taken place in Yen Chau district, and exploring the current status of diffusion (knowledge and adoption) of SCT in the area, we estimate econometrically an adoption model of agroforestry³. We focus on agroforestry, because aggregating different technologies that imply different costs and benefits over time may be misleading. Agroforestry is one of the best known SCT and perceived to be one of the most effective (Table 1).

Table 1 displays awareness and adoption rates of different technologies in the study area. Agroforestry was mentioned by 42.5% of respondents. The estimation of adoption determinants of a technology in a population where diffusion is incomplete may produce biased estimates (Diagne and Demont, 2007). Selection bias (named exposure bias in the adoption literature) arises when exposed and unexposed farmers differ initially in their

³ “Agroforestry is a collective name for land-use systems in which woody perennials are deliberately grown on the same piece of land as agricultural crops and/or animals” Lundgren (1982). In this paper agroforestry refers to the planting of trees and/or shrubs on a cultivated land as a way to limit soil erosion.

propensity to adopt the technology. This may be the case for two reasons: knowledge acquisition is part of farmers' adoption decision and therefore endogenous; and second, for efficiency reasons agricultural extension may target farmers with high innovative capacities.

Our problem can be written as follow:

$$y_{1i} = \begin{cases} 1[\beta X_{1i} + u_i > 0] & \text{if } y_{2i} = 1 \\ = 0 & \text{otherwise} \end{cases} \quad \forall i \in [1, N^k]$$

$$y_{2i} = 1[\delta X_{2i} + v_i > 0] \quad \forall i \in [1, N]$$

where: N is the total population, and N^k , the subpopulation of households exposed to agroforestry; y_{1i} and y_{2i} are binary dependent variables indicating the adoption and knowledge status of the i^{th} household respectively; X_{1i} and X_{2i} are vectors of regressors; (u_i, v_i) the error terms are assumed to be jointly bivariate normally distributed. The

covariance matrix is: $\text{cov}(u_i, v_i) = \begin{pmatrix} \sigma_u^2 & \rho \\ \rho & \sigma_v^2 \end{pmatrix}$.

We use a Heckman full maximum likelihood procedure to jointly estimate the probability of knowing and adopting the technology (Heckman, 1979). The model predicts household's probability to adopt and maintain agroforestry on at least one plots conditional on variables X_{1i} and on knowing agroforestry⁴ (Table 2).

Explanatory variables include measures of human and social capital, soil and farm characteristics, and geographic location. We control for the fact that some households have received material support (labor, in-kind inputs or cash support) to implement agroforestry⁵.

⁴ The probability $P(y_{1i} = 1 | y_{2i} = 1, X_{1i})$ is derived in Wooldridge (2002): pp.477-78 and 570-71.

⁵ Households can be targeted for three reasons: they have low investment capacity and are selected in the context of poverty alleviation program; extension organizations may target exemplary farmers in order to disseminate technologies; finally, it may be intended to enforce adoption in areas of strategic importance. Statistical tests show no systematic differences in human, social, and financial capital between those that have been supported,

We also hypothesize that improved access to credit is conducive to the adoption of agroforestry based SCT because it relaxes liquidity constraints and reduce farmers' discount rates. This will lead to a higher value being attached to future benefits from reduced soil erosion (see Pender (1996) for theoretical considerations). We use as a proxy of credit access a binary variable indicating whether a household is credit constrained on the formal financial markets⁶. A variable measuring the share of upland operated under title, is included to test the hypothesis that tenure is perceived to be more secure when operated under title, and is associated with a higher probability of adoption of agroforestry. Following our observations on the policy implementation, i.e. the occurrence of reallocations in the study area (cf. section 6) we also test for the effect of perceived reallocation threat on adoption decision. The share of villagers believing that a reallocation is likely to occur is used as a measure of the uncertainty prevailing in the household's village.

If the use of a selection model allows to test and control for selection bias, it does not allow to estimate the land tenure effect at the plot level (because the selection equation is at the household level). We find important heterogeneity in land tenure between but also within households: almost half of our sample households operate both titled and untitled land. In such condition, a household level model does not inform whether the technology is adopted *ceteris paribus* on the titled plot rather than untitled ones. We therefore estimate a plot level model using plot data of households that are aware of the technology. We are comforted in this approach by the fact that the Wald test on ρ concludes in the household model concludes that the selection bias is inexistent or of limited magnitude (cf. Table 2). In the plot-level

and the rest. Results are not shown here, but are available upon request. We conclude that attribution of support is exogenous to adoption capacity.

⁶ Following Zeller (1994), we consider households to be credit constrained (i) if they did not apply for credit for fear of rejection; (ii) if they applied for a loan but were fully or partially rejected by formal lenders (i.e. banks) over the past 5 years.

model we control for soil characteristics, slope, or plot size; factors expected to strongly influence adoption decisions.

The plot-level model is written as:

$$y_{3ij} = 1 \left[\alpha X_{3ij} + \beta X_{1i} + \varepsilon_{ij} > 0 \right]$$
$$j \in [1, T_i], i \in [1, N^k]$$

where y_{3ij} is the adoption status of agroforestry by farmer i on plot j ; T_i is the number of upland plots operated by household i . The model is estimated by Probit. Standard errors are clustered at the household-level to account for heteroskedasticity and the non-independence of observations within households (Wooldridge, 2006).

6. Results

Implementation of the land policy in Yen Chau district

The application of the 1993 law and the issuance of LURC in Yen Chau have followed a long process, summarized here in three waves:

1991-1996: village and commune officials, supervised by provincial staff carried out the first land allocation in some of lowland villages. Land was mostly allocated to the actual users, without being properly measured. Some Thai village refused to register the paddy fields under title preferring instead the traditional land rotation system.

1998-2000: in front of these irregularities a second wave of allocation was carried out by provincial officials. Upland villages where allocation had not yet taken place were issued the first LURC, and in other villages land was reallocated and land titles reissued. Agricultural lands, including paddy fields, were allocated by family size, formally measured and recorded into cadastral maps. A village land fund was constituted in each village for the newly established and landless households.

2003-today: a third allocation of land is taking place: in 5 sample villages: rights have been transferred although title had not been reissued in 2007. The official rationale for this reallocation is to provide land to landless households and secondly, and to increase farm productivity by combining scattered small plots⁷.

In spite of their 20-year LURC, some households have seen their land reallocated two times at five year intervals. Whereas a minority of farmers has been directly affected by reallocations (35% of our sample farmers), most farmers live in or close to villages where a reallocation has occurred or is going to occur. Consequently, 80% of interviewed farmers believe that a reallocation is likely to take place in their village before the end of their 20-year use right, an expression of the low trust households currently have in land institutions. While the issuance of a land title was supposed to empower farmers as decision-makers over the use of their land, the successive reallocations send the signal that the state remains the primary decision-maker, creating uncertainty.

Knowledge and adoption of soil conservation technologies

Descriptive results in Table 1 indicate that three-quarters of respondents could mention at least one SCT, showing their awareness of the erosion problems. Apart from agroforestry, the government extension service is a secondary source of diffusion for SCT, while media and social networks are predominant in this matter. Looking at adoption rates, it is clear that methods requiring a relatively high input of labor or take up a considerable portion of land (terraces, vegetative contour strips, agroforestry and cover crops) are adopted the least although they are found to be effective. Short-term and low extra-input technologies (contour ploughing or ditches) are more attractive to farmers but are deemed to be less effective. For most SCT, the lack of land and the lack of labor were mentioned as important adoption

⁷ In light with the current situation this reallocation appears to be linked to a larger scale plan to introduce rubber plantations in the district.

constraints. In the case of agroforestry however, respondents emphasized lacking access to seedlings, and, with regard to ditches, their lacking effectiveness against erosion. Farmers' perception of constraints (and of the costs and benefits incurred over time) differ significantly between SCT, and so does their adoption decision.

Table 1: Knowledge and adoption of SCT

	Knowing SCT (N^k)	Knowledge source	Currently using SCT	Effectiveness score	Adoption constraints	
	(% of N)		(% of N^k)	(0: no effect; 10: very effective)	(1)	(2)
Ditches or channel	56.2	Rel/Neighb ^{a/}	61.0	5.7	Not effective	Lack of labor
Agroforestry	42.5	Extension	27.4	6.7	No access to seedlings	Lack of land
Terrace	20.9	Rel/Neighb	9.8	7.0	Lack of labor	Expensive
Contour ploughing	20.2	Rel/Neighb	88.1	6.1	No erosion	Lack of Equipment
Cover crop	12.7	Media	10.8	7.3	Lack of land	Lack of labor
Vegetative strips	5.8	Media	11.8	6.0	Lack of land	
Mulching	3.4	Media	20.0	5.7	Lack of labor	
TOTAL (At least one)	74.7		53.4			

$N=292$ ^{a/}Relative/Neighbor

Determinants of adoption of agroforestry

Table 2 reports estimation results of the household-level model (column (1)). We find that adoption decision is significantly influenced by the quality of the soils. The model predicts that, ceteris paribus and conditionally on knowledge, receiving material support increases the probability of practicing agroforestry by 70 percentage points. The share of titled land has no significant effect, however the threat of a future reallocation has a negative effect significant at the 15% level.

The likelihood-ratio test of selection bias on the parameter ρ does not reject the null-hypothesis ($\rho = 0$), indicating that the estimated parameters of adoption determinants on the exposed subpopulation are not affected by exposure bias.

Estimation results of the plot-level probit model are presented in column (2). The low predictive quality of the model is due to the important number household-level regressors, and to the low plot-level adoption rate.

Farmers' human and social capital such as age, education or the relation for a household to its village head are found to be significant influencing factors of adoption in this model. These effects remain small in magnitude. As in the household model, soil characteristic is an important factor of farmers' choice. Agroforestry is rather used on poor and medium soils than on fertile ones, as well as on relatively large plots: 62% of adopters chose the first or the second largest of their plots to implement the technology. In agroforestry, space is a constraint as both trees and hedgerows lead to shading of the crop, and compete for nutrients. However, the overall households' land availability is not found to be significant, but households' endowment in upland relative to their village land availability has a positive effect, an indicator of relative wealth, significant at the 15% level only.

Support is a major determinant of adoption decision: A plot belonging to a household that has been supported by an external organization has a probability of being covered by agroforestry higher by 17 percentage points than others. In contrast, access to formal credit is found to have no significant effect on adoption probability. These two results point a lack of motivation of farmers to undertake such investment on their own.

Finally, we find that plots operated under land title have higher probability of being covered by agroforestry by 1.4 percentage point. The effect of the share of villagers expecting a reallocation of land is highly significant and negative on adoption. As such information is being picked up through the gossip in the village, farmers use this information to decide on whether the formal land titles for their plots are safe, and whether to invest in agroforestry.

Table 2: Determinants of adoption of agroforestry – Household and Plot-level estimates.

	HH ^{a/} means	Plot means	(1) Household-level Probit with selection ^{b,c/} $P(y_{1i} = 1 y_{2i} = 1)$ Marginal effects	(2) Plot-level Probit ^{c/} $P(y_{3ij} = 1)$ Marginal effects
<i>Dependent variables:</i>				
y_{2i} : household knows agroforestry as SCT+	0.42			
y_{1i} : household uses agroforestry on at least one plot+	0.12			
y_{3ij} : agroforestry is used on this plot+		0.08		
<i>Household characteristics</i>				
Age of household head	43		0.004 (0.27)	0.005 (1.94)*
Age-squared of household head	2022		-0.0001 (0.47)	-0.0001 (2.29)**
Number of adults	3.04		0.006 (0.25)	0.003 (0.73)
Highest educated member has a high school certificate+	0.05		0.340 (1.63)	0.001 (1.75) *
Number problems for which village head's help is easily obtained ^{d/}	3.74		0.025 (1.58)	0.004 (2.22)**
<i>Soil and plot characteristics</i>				
% area with poor soil	30.91		0.004 (2.64)***	
% area with medium soil	56.09		0.003 (2.43)**	
Plot has poor soil+		0.30		0.172 (4.78)***
Plot has medium soil+		0.54		0.061 (3.69)***
Plot is very steep+ ^{e/}		0.38		0.008 (1.07)
Plot size relative to farm size		0.21		0.074 (4.57)***
<i>Farm characteristics</i>				
Land availability (ha/capita)	0.35		-0.103 (0.59)	-0.032 (1.19)
Area of titled upland per capita > village average+	0.41		0.068 (1.07)	0.013 (1.55)
<i>Support and credit</i>				
Household received support+	0.07		0.702 (5.70)***	0.140 (4.27)***
Household is credit constrained in formal market+	0.27		0.087 (1.18)	0.014 (1.25)
<i>Land policy</i>				
% area operated with title	70.56		0.044 (0.52)	
Plot operated under title+		0.80		0.014 (1.74)*
% villagers expecting a reallocation	79.28		-0.003 (1.56)	-0.001 (3.29)***
Observations	292	567	292	567
Log likelihood			-221.67	-99.46
Estimated- ρ (p-value of Wald-test ($\rho=0$))			-0.45(0.487)	
Correctly predicted(%) cut-off: $p>0.50$			91.4	92.6
Adopters correctly predicted(%) cut-off: $p>0.50$			61.8	22.2
Adopters correctly predicted(%) cut-off: $p>0.25$			85.3	62.2

^{a/} HH=Household

^{b/} Estimates of the selection equation are not shown due to space constraint. Regressors X_{2i} are: age, education+, possession of television+, radio+, telephone connection+, participation in organizations, easiness to get help from village unions^{c/}, off-farm income (%), participation in farmer union+, access to extension service, farm size, elevation, and distance to city.

^{c/} Elevation and distance to city included in but not shown here.

^{d/} Problems listed to respondent were: borrow money for (i)education; (ii)health expenses; (iii)any positive event; (iv)any negative event; (v)borrow water buffalo; (vi)ask for labor.

^{e/} Slope was assessed by respondents on a scale from one (=level) to five, using a graph for illustration.

+ indicate dummy variables

Robust z-statistics in parentheses: *,[**],[***] significant at 10%, [5%]; and (1%) level.

7. Conclusion

The reforms of land institutions by the state in the 1990s were intended to increase tenure security, establish a real estate market, and thereby increase investment incentives and boost agricultural production while fostering natural resource conservation. Its implementation of has been a long process, especially in the mountainous regions where the enforcement has been opposed by ethnic minority communities. We find that in Yen Chau the state still maintains a substantial control over land resources by carrying out land reallocations, sending contradictory signals to farmers and raising uncertainty.

Although the majority of farmers are aware of soil erosion and know methods to mitigate the problem, adoption rates remain very low. Farmers perceive these techniques to be economically unattractive, as they compete with the main cropping activities for scarce land and labor resources. Focusing on agroforestry, we find that adoption is influenced by human and social capital, and especially by attributes of farmers' land. Credit access is not a significant determinant of adoption, but material support received from external agents strongly influences farmers' decision, underlying a low initial motivation by land users to undertake such investment. We conclude that interdisciplinary research is needed to identify land use options that are economically competitive with the prevailing cropping activities and also serve as soil conservation.

In line with previous works, we find that land tenure matters, but find little evidence that the tenure of land operated and registered under a formal title is perceived to be more secure and stimulate long-term investments in soil conservation. Rather, we find that the threat of future reallocations and the low trust in land institutions discourage such investment.

If credit does not appear as an important instrument to foster soil conservation in Northern Vietnam, changes in land institutions, and particularly the clarification and the strengthening of land rights may have a positive (although limited) effect on those practices. Soil

conservation is a public good as long as its benefits extend not only to the land users but to the society as a whole. Our findings suggest that in order to address societal issues of water safety, food security, and sustainable rural development, decision-maker may have to put more effort not only to promote but also to actively support the adoption of SCT by farmers.

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