How do farmers make decisions in a land degradation context? A case study from Northern Vietnam

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Abstract

Stemming from a three villages case study in Northern Vietnam, this paper examines how farmers have coped with and adapted to land degradation in the uplands. It assesses how policies and research programs implemented in the area have affected local determinants, namely farmers' perception of the environment and local rules, and how in turn the latter impacted individual and community behaviour. Following a qualitative approach that draws from ethnography and institutional analysis, it hopes to contribute to the current literature by testing the effectiveness of this approach in understanding farmers' decisions in a land degradation context and by highlighting new determinants that have not been so far much considered in the analysis of land use change.

Land degradation has attracted the attention of donors, researchers and policy-makers in Vietnam over the past two decades. Deforestation and soil erosion were identified as the key issues to address, and officially justified the design of new national policies and research programmes.

Since the 90s, specific policies have targeted uplands management in Vietnam, including forest land allocation, sedentarisation and reforestation programmes. Improving (or substituting) ethnic minorities' land management systems and reforesting barren hills have been two major goals for these government initiatives. If some of these objectives (such as reducing significantly shifting cultivation practices) have been reached, their success in improving people's livelihoods and uplands' environmental attributes has been largely challenged. On the contrary, social and economic inequities between mountainous and deltaic areas have increased over the last decade.

At the same time, considerable research effort has focused on developing soil conservation and sustainable land management practices. However, although some results were technically promising, very few of them have been adopted by farmers. Recognition for this shortcoming emerged within the scholars' community in the late 90s. Main causes were identified as a non integration of socio-economic determinants within the development of technical solutions and a focus on the plot level with no consideration of how upscaling results. Stemming from this recognition, a new research paradigm emerged, guiding new research and development projects on land degradation in tropical countries. The latter have adopted a participatory, interdisciplinary, community- and catchment-based framework. Several research projects have been implemented in Vietnam following this new line of scientific enquiry. However, research techniques are still hardly transformed into farmers' practices.

This paper aims to highlight new key determinants for successful policies and research projects addressing land management issues by analysing farmers decisions regarding land use in three villages of Northern Vietnam, including one village in which research programmes on soil erosion have been implemented. In these three villages, farmers have practised shifting cultivation in the uplands for a few decades, cultivation annual crops such as cassava, arrowroot and taro. Annual cropping has been pointed out both by local authorities and researchers as highly soil erosive. Policies modifying land tenure, restricting land use and encouraging reforestation have been implemented nationwide since the late 90s. At the same time, researchers have organised in one village farmers' field schools and have proposed soil conservation practices to limit land degradation. Recently, all farmers stopped annual cropping and have planted monoculture tree plantations or let land under fallow. This research work analyses to which extent policies and research works have contributed to land use change in the area, by examining farmers' perception of land degradation and farmers decision-making process. It is not a research project or policy evaluation, in the sense that it doesn't seek to systematically identify the necessary and sufficient factors for the adoption of sustainable land management practices. It rather seeks to link observed farmers' decisions with a range of factors and assess the relative contribution of these factors in farmers' behaviour.

Data collection and analysis rely on an approach drawing from ethnography and institutional analysis. Semantic realism is used as an ontological basis to address farmers' perception of uplands and soil erosion. It distinguishes 'brute facts' and 'institutional facts' to examine the

social function of the term ‘land degradation’ and study how these meanings are shared by different social groups. Then institutional analysis is applied to decrypt farmers’ decisions and behaviour, using a refined version of the Institutional Analysis and Development (IAD) framework developed by Ostrom. The refined version proposed by the present research work integrates an historical perspective and pays a special attention to the social constructions of land degradation by local actors.

Results suggest that the research projects have had little impact on farmers’ perception of uplands and land degradation in the study area. Narratives brought up by policies were much more powerful in impacting farmers’ beliefs. However, institutional analysis showed that the shift from annual cropping to tree plantations in the area was rather an accident than the result of farmers’ new beliefs on forests and reforestation incentives provided by national policies. Narratives on forest benefits carried out along with policies, even if assimilated into individual’s imagination have had little impact on final farmers’ decision. The collapse of local rules, due to a combination of soil fertility decrease and change in land tenure, was the decisive factor in land use change.

This study defends that, when natural resources are managed by local users, local studies integrating acute models of individual behaviour have marked assets over meso or macro scale studies. Though powerful to analyse the contribution of aggregated or macro-scale factors at the regional or national level, the latter might miss decisive factors that are only observable at the community level. It argues that, when seeking to explain human behaviour, using a socially constructed view of nature is a necessary approach to assess the relative impact of external forces on individual decisions. Lastly, it showed that when examining commons management, individual decisions should be analysed together with community dynamics. In the present case study, collective determinants were as much responsible for land use change as individual strategy.

1 Introduction

Land degradation has attracted the attention of donors, researchers and policy-makers in Southeast Asia over the past two decades. Deforestation and soil erosion were identified as the key issues to address, and officially justified the design of new national policies and research programmes. Means to address these issues have been similar over different countries. Policies have focused on the eradication of shifting cultivation practices and the development of fixed cultivation, on uplands allocation, and on the implementation of ambitious reforestation programs nationwide. Considerable public efforts and funding – e.g. China has allotted US$1.7 billion in subsidies for fast-growing plantations to be distributed by 2015 (American Forest & Paper Association 2004) – have been devoted to restore "barren land" and improve uplands communities livelihoods. At the same time, research has devoted much attention to developing soil conservation and sustainable land management practices. Despite of technically promising results, very few of them have been adopted by farmers. Recognition for this shortcoming emerged progressively within the scholars' community and started to be integrated within new research agendas in the 90s. Main causes were identified as a non integration of socio-economic determinants within the development of technical solutions and a focus on the plot level with no consideration of how upscaling results (2001). A new research paradigm (Greenland et al. 1994) emerged to guide future research and development projects on land degradation in tropical countries. It combined the use of a participatory approach with an interdisciplinary, community- and catchment-based framework (Maglinao et al. 2001). However, still today, the implementation of research techniques is limited. Generally, the results of several decades of political and academic efforts directed towards improving the livelihoods and the environment of uplands communities in this region of the world are deceiving (Dupar and Badenoch 2002; The World Bank 2005).

In Vietnam, political and research effort has specifically targeted uplands management since the 90s. Improving (or substituting) ethnic minorities' land management systems and reforesting barren hills have been the two major goals of these government initiatives. If some of the policy objectives (such as reducing significantly shifting cultivation practices) have been reached, all observers challenge the impact of government policies on reducing social and economic inequities between mountainous and deltaic areas over the last decade (Gomiero et al. 2000; Swinkels and Turck 2004). Research projects on uplands agriculture and rural development in Vietnam have had mixed success as well. Promising techniques or practices have been developed and had some success at a small scale level but most research

results have hardly been transformed into farmers' practices at a significant scale. These deceiving outcomes in uplands area contrast with impressive improvements in agricultural productivity and livelihoods in the lowlands which have been largely due to policies (land allocation) and national or international research (e.g. improved seed varieties). This paper aims to highlight some factors that have been not much considered so far to examine why policies and research in Vietnamese montane region have hardly attained the pursued objectives. Based on the case study of three villages in Northwest Vietnam, it uses an ethnographic approach and an institutional analysis to identify decisive and enhancing factors in farmers' decision-making process regarding land management. This study examines to which extent policies and research efforts have contributed to reforestation in these three villages, where both policies and research projects have been implemented since the late 90s. It underlines the prominence of local factors over national policies, with a particular attention to the role of local rules and highlights the importance of shared perceptions among different actors in resulting outcomes.

2 Methodology

Issues covered in the present study have been tackled by two main strands of literature: the analysis of land use change and of the adoption of soil conservation practices. On the one hand, the land use change literature has often relied on spatial modelling and quantitative analysis (McCusker and Carr 2006). Most analyses have studied the influence of aggregated macro-scale forces on land use change. Some have integrated household level data (Geoghegan et al. 2001; Muller and Zeller 2002) but all modelled farmers as rational actors responding to a priori defined explanatory variables according to a utility maximizing process. Despite of their contribution to analyse the impact of driving forces and proximate causes of land use change (Geist and Lambin 2002), they haven't really addressed why are these factors the driving forces for land use change (McCusker and Carr 2006).

On the other hand, the adoption of soil conservation practices has attracted much attention from scholars. There has been a wide range of local level studies that have examined under which conditions farmers adopt soil conservation practices. Factors such as education level, household size, income level, cultivated area were identified as critical in farmers' adoption of soil conservation practices. Farming conditions (fallow systems versus continuous cropping) were also proved to be important whether farmers would consider soil erosion as a

problem (Cramb et al. 1999). More recent studies have integrated local perception of farmers (Amsalu and de Graaff 2006; Mbaga-Semgalawe and Folmer 2000; Okoba and de Graaff 2005) and have brought up interesting conclusions: results have shown that farmers are usually aware of soil erosion but have not adopted proposed soil conservation practices because they have already developed their own land use practices, or because they think the practices proposed have little impact compared to natural conditions (also read Fujisaka 1994). However, these studies have rarely attempted to understand how these perceptions have formed and evolved, how farmers' perceptions differ from researchers' perceptions, and how these differences might affect adoption of research practices.

Generally these two strands of the literature have not much considered the role of local rules in farmers' decisions, limiting the institutions they analysed to land tenure. This study aims to address these gaps by an ethnographic approach and an institutional analysis coupled with an historical perspective exploring thoroughly farmers' perception of their environment and farmers' decision-making process. This approach expects to provide new lights on understanding and predicting land use change, and more generally farmers' decision-making process.

The term "institution" is used in this context as the usually accepted academic definition, which distinguishes institutions from organizations – although, in the common language, institutions are often assimilated to organizations such as the National Assembly, government agencies, etc. Here institutions should be understood as the "rules of the games" (North 1990, p.3) and will be distinguished from organizations which are compared to the "players" of the game who will use the rules in a way to win the game (ibid). Institutions will presently encompass rules governing access and use of natural resources in the uplands.

The Institutional Analysis and Development (IAD) framework developed by Elinor Ostrom and her colleagues (e.g. Kiser and Ostrom 1982; Ostrom 1990; Ostrom et al. 1994) was found particularly efficient at untangling complex human decisions that both refer to the household and to the community level. The IAD framework has been used for a wide range of institutional settings, notably as a basis to develop a theory of common-pool resources management. It was presently selected for the current study on the basis of its long term use and refinement that has allowed a rigorous and reliable assessment to be made.

Institutional analysis emphasises on the role of institutions in human decisions and interaction but other factors than rules are also considered to impact on the action arena (Figure 1): the

material conditions are the physical state of the environment where actors evolve; the attributes of the community can be broadly assimilated as cultural determinants; and lastly, the rules are the "shared understandings that refer to enforced prescriptions about what actions (or states of the world) are required prohibited or permitted" (Ostrom 1999, p.50). This framework doesn't presume of the prominence of one factor over another, all factors are given an equal role.

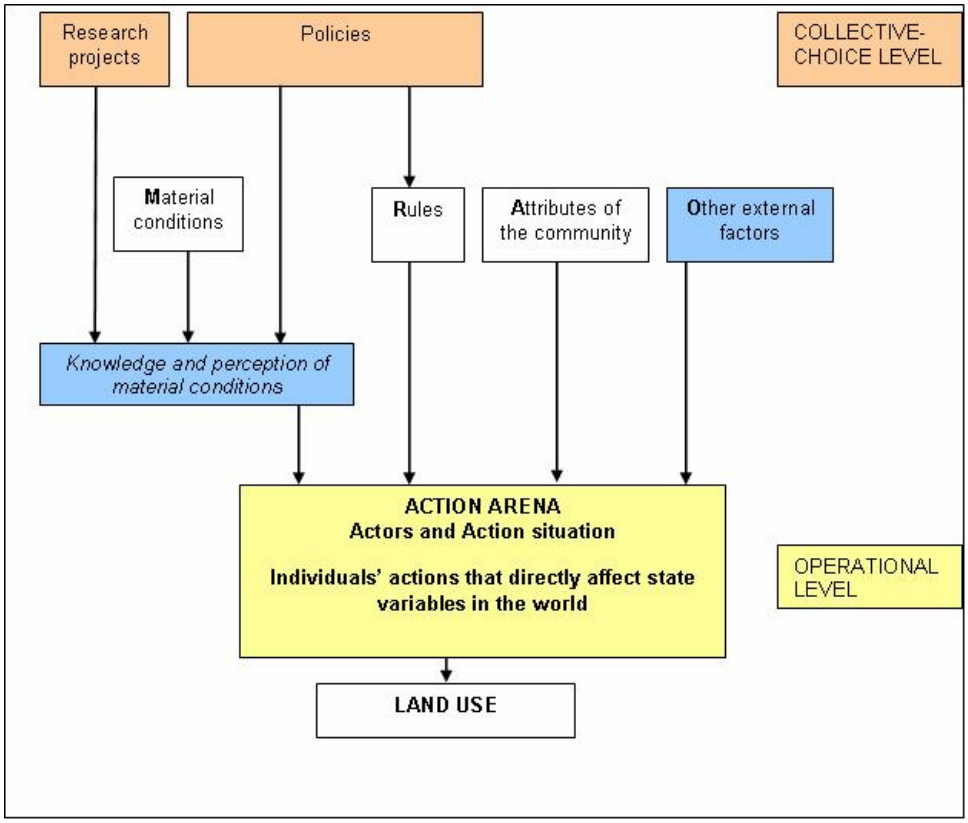

FIGURE 1.

Framework used for this analysis, adapted from the IAD framework (Ostrom 1999)

Furthermore, this paper proposes a refined version of the framework proposed by Ostrom (1999) and three additional factors were added (in blue in Figure 1): at first, it was needed to take into account external elements impacting on the action arena including macro-scale socio-economic factors (e.g. selling prices of agricultural products, off-farm work availability, etc). Moreover, the importance of social framing was emphasized by considering that, more than the material conditions themselves, their perception was a key determinant in actors' decisions. I consider here that farmers' perception of material conditions has been influenced

by the state of the material conditions themselves, by the information, knowledge and narratives[1] spread by national and local authorities and by research projects.

Located in the action arena, actors are the central variable in the analysis. It is thus essential to select a relevant model for actors' behaviour, as this will determine whether actors respond weakly or strongly to different external factors. Some Vietnamese cultural characteristics (as underlined by Tran Duc Vien and Rambo 2001) led me to consider actors as following a rational behaviour under the condition that this behaviour was conform to prevailing norms. Whether norms and perceptions are shared or not by actors thus becomes particularly important.

Fieldwork was carried out in three villages in a northern province of Vietnam. The first village, Dong Cao, is the place where the Management of Soil Erosion Consortium (MSEC) research activities, within which this study is integrated, have been carried out. The two other villages, Dong Dau and Que Vai, are neighbouring villages. The aim of this fieldwork stage was to construct a general picture of farmers' activities and use of natural resources, to understand how and why they had evolved over the past 50 years and to assess which incentives farmers had responded to when making decisions affecting their local environment. Transect walks, participatory exercises (participatory map, wealth ranking, historical and classification matrixes) with focus groups, 32 key informants interviews at the village, commune and district level[2], and 82 household interviews were carried out over a six week period in the three villages.

3 Different knowledge and perceptions of land degradation

The term soil erosion is usually embedded with a negative environmental connotation within scientific, public and political debates. However, soil erosion is not always a problem for local communities (Forsyth 2003, pp. 31-32). Its impact greatly depends on local contexts and farmers' coping practices. In this section, I defend why it is necessary to explore indigenous knowledge and more particularly indigenous perception of land degradation. I then compare the perceptions of two groups of actors: policy-makers and researchers.

1. The term narrative refers to a message that tells a particular story. It establishes causal links between a set of events or a particular environment with human action. See Roe, E. (1994). Narrative Policy Analysis, Theory and Practice. Durham; London, Duke University Press.

2. Administrative units in Vietnam are respectively from the higher to the lower level: province, district, and commune.

Perception is the acquiring of knowledge by means of our senses (Armstrong 1961). It is a form of knowledge that has usually a strong weight in our decisions, as human beings tend to give more importance to information directly acquired from the subject we observe than to information indirectly provided by a tier person or device. Apprehension of biophysical reality depends on socially constructed representations that are formed at several stages. First, the perception of biophysical changes differ according to how they are actually experienced (Blaikie 1995). A now famous example provided by Fairhead and Leach (1996) in Guinea illustrates this very vividly. Forest islands surrounding the villages of the studied area were seen both as a symptom of land degradation by the authorities – who identified them as remnants of an extensive forest – and as an evidence of their good land management practices by villagers – who claimed they had been created by themselves or by their ancestors. These two groups had a diametrically opposite perception of one environmental process. Considering one perception rather than the other has of course significant implications for designing policies or research projects. Advocating the inability of local communities to manage land has been a recurrent argument to restrict and / or control land access and land management (Committee on the Human Dimensions of Global Change et al. 2002). Another stage when social construction occurs, and which is of interest in this study, is the interpretation and appropriation of environmental issues by political communities upon scientific evidence. Indeed, scientists from different disciplines have different foci for analysing environmental change leading to different interpretations and sometimes very different recommendations. The scientific and political debate on climate change is a clear illustration. Proponents and opponents to the Kyoto protocol ratification use scientific evidence from different scientific communities to defend their respective position. I will consider these two particular stages of social framing in the present paper.

The methodology I use to analyse actors' perception of land degradation draws on semantic realism. This approach examines how “brute facts” and “institutional facts” (Searle 1995) can be perceived differently. Brute facts have a relatively neutral meaning as they are basic descriptions of the biophysical process. On the contrary, institutional facts carry a strong social meaning that is not equally shared by all social groups in the society (negative connotation for scientists, policy-makers, etc. but not necessary for local people). For example, “soil movement” has a neutral meaning. Because “one farmer’s soil erosion is another soil’s fertility” (Blaikie and Brookfield 1987), the institutional fact “soil erosion” can be interpreted both as “soil fertility” or “soil degradation”. Indeed, redeposition of eroded

particles from one site might bring nutrients to agricultural land and, in some cases, what might be experienced as a problem by uplands communities might be regarded as positive by downstream people.

3.1 Policy-makers perception of land degradation

I have identified two major underlying narratives as highly influential regarding land and forest policies in Vietnam[3]. Following a discourse-analysis and an historical perspective, I examine here how they have impacted policies in the specific case of Vietnam.

3.1.1 The responsibility of ethnic minorities

Ethnic minorities' culture and agricultural practices have been perceived for a long time as backward by the *Kinh*[4]people in Vietnam (Rambo and Jamieson 2003). Many local cadres and policy-makers believe that ethnic minorities, because of low education, don't know what is good for them (Jørgensen et al. 2001). This deeply rooted and sometimes unconscious perception has had great impacts on the elaboration and the implementation of several policies.

For instance, the *Kinh* have viewed shifting cultivation, which is a traditional agricultural system adopted by many ethnic minority groups in this region of the world, as economically inefficient and as the primary cause for deforestation and soil erosion. Figures given by the Ministry of Forestry estimated that about 50 % of the forest area loss was due to shifting cultivation (Do Dinh Sam 1994). As a result, large settlement and migration programmes were implemented: migration programmes didn't only aim to revitalise the heavily densified lowlands by bringing a labour force to manage natural resources, but they were also designed to integrate the *Kinh* culture in the highlands and change land-use practices. At the same time, the government promoted new farming technologies and rice varieties with the hope of improving agricultural systems and enhancing agricultural productivity.

However, the assumptions on the links between shifting cultivation and forest cover decrease haven't relied on any robust scientific evidence. A national study conducted in 1994 in Vietnam examined twenty years data on slash-and-burn area and forest cover in the whole

3 These are actually also largely present in other countries in the world Forsyth, Tim. 2003. Critical Political Ecology. The politics of environmental science. New York: Routledge, Ives, Jack D, Bruno Messerli and Libor Janski. 2002. "Mountain Research in South Central Asia: An overview of 25 years of UNU's Mountain Project." Global Environmental Research 6(1):59-71..

4. The Kinh form the majority ethnic group in Vietnam and represent 80% of the total population. Contrarily to ethnic minorities groups they have traditionally settled in lowland areas and usually hold power positions at the provincial and national level.

Northwest region and in three north-western provinces and found that shifting cultivation was responsible for significantly lower percentage of forest loss – around 20-40% (Do Dinh Sam 1994). Furthermore, many scholars have provided scientific evidence supporting that rotational swiddening, the traditional form of shifting cultivation practised by most nomadic groups, allows long fallow cycles that enables the cleared parcels of forest to regenerate (DiGregorio et al. 2003; Forsyth 1996; Rerkasem and Rerkasem 1995). Although national authorities have recognised the advantages of shifting cultivation systems (Ministry of Forestry 1991), shifting cultivation is still banned. The article 29 of the Law on Environmental Protection "strictly prohibits" burning of forests (National Assembly of Vietnam 1993). Settlement programmes and forestland allocation have greatly impacted on land use systems and farmers have found themselves with production systems no more adapted to these new constraints and with few alternatives for developing new land use practices (Castella et al. 2002). Today scientific studies suggest that shifting cultivation practices are in many places no more adapted to the environmental and economic conditions because of higher population pressure and increased access to market, however non adapted policies have played a great role in transforming traditional sustainable practices into non sustainable land use systems (Bass and Morrison 1994).

3.1.2 Forests: from wasteland to an omnipotent remedy

The second beliefs linked to land degradation in Vietnam relate to the importance of forests for watershed's health. Policy-makers presently emphasise the importance of the uplands' forests in the whole watershed health and in the economic development of the delta plains and coastal areas. Loss of forested areas is associated to increasingly severe floods, reduction of rainfall and accentuated soil erosion with negative impacts on irrigation waters for paddy fields and on the productive life of dams. These statements are clearly identifiable in the discourses of the Ministry of Agriculture and Rural Development (MARD) of Vietnam. As an example, the MARD review on the rural development situation states that:

> *"Regarding forestry resources, the over exploitation of natural resources have caused bad consequences to the climate in recent years, especially draught and storm in the South in 1998, big flood in the Centre in 1999 and flood in Mekong River Delta in 2000."*

(Ministry of Agriculture and Rural Development (MARD) Last accessed on the 27/01/05)

International research works (Bruijnzeel et al. 2005; Calder 1998; Hamilton and Pearce 1988) and domestic publications using local evidence (Forest Science Institute of Vietnam (FSIV)

and International Institute for Environment and Development (IIED) 2002) have challenged the universality of these beliefs and have argued that much of the folklore, though taken today as granted, has been exaggerated or relies on false assumptions. For instance, the impact of forests on floods has been largely overestimated. If forests can reduce volumes of flood downstream in a small water catchment, climate is a prominent factor over land use in large-scale floods (Calder 1999). The impact of forest loss on soil erosion is also highly dependent on site conditions (Walker 2002). Forests are a precious resource to protect and conserve, but one shouldn't mix goals with objectives. Reforestation shouldn't be considered as an aim *per se* because forest is not an environmental panacea. Tree plantations might have also adverse environmental impacts such as reduced stream flows and soil acidification (Jackson et al. 2005). However, new scientific evidence has so far hardly entered the policy-making arena. The reliance on these exaggerated beliefs has had consequences in Vietnam policy-making on land classification criteria (which are mostly based on slope) and on the design of uniform reforestation programmes.

3.2 Researchers perception of land degradation

Research on land degradation has progressively evolved from studies focusing on the biophysical process to more integrated farming system approaches of land degradation and then to livelihood approaches. Research studies have also increasingly adopted participatory approaches to involve farmers in the research projects and integrate farmers' knowledge. Soil erosion on-site and off-site impacts are greatly dependent on local contexts and so the impact of soil erosion should be carefully considered before addressing soil erosion *per se*, as there is a real risk of overlooking the actual problem. For instance, a study conducted in Northern Vietnam showed that soil degradation on cultivated sloping fields was due to enhanced mineralisation and crop export rather than the result of soil erosion (Wezel et al. 2002). A few research studies have critically analysed soil erosion following a pragmatic approach. A work in Nepal showed that soil loss might have positive impacts on-site under specific circumstances (Kienholz et al. 1984): in the study area, farmers deliberately triggered landslides to improve soil fertility and facilitate the construction of terraces. From a broader perspective on land degradation research, Blaikie (1985) questioned the universal use of the Universal Loss Soil Equation (USLE) and Morse and Stocking (1995) further warned on applying general assumptions on soil erosion in different environmental contexts and farming conditions. Recent works have underlined the importance of filters and redeposition (Van

Noordwijk et al. 2004; Walker 2002) in ecological processes and how their non consideration might lead to policy fallacies.

Research interest on soil erosion and land degradation started in Vietnam in the end of the 1950s (Thai Phien 2006). In 1981, the Rational Utilization of Natural resources and Environmental Protection project, which gathered national researchers from leading research organisations, identified forest loss as the most critical environmental issue to address in Vietnam (Le Trong Cuc 1996). From the start of the 1980s till the end of the 1990s, research on uplands land degradation and soil erosion expanded. It primarily focused on the development of new techniques to control erosion or on the testing of how different land use impact on erosion and runoff, and progressively recognised the need to incorporate socio-economic factors. In this period, many national or international research projects have been implemented. International efforts encompass (this is not an extensive list and there is no rational order): the Management to sloping lands for sustainable agriculture in Asia Network (ASIALAND), the Mountain Agrarian Systems (SAM) project, , the Management of Soil Erosion Consortium (MSEC), “The Uplands Program” (Deutsche Forschungsgemeinschaft funded) and various research projects funded by ACIAR (Australia), SIDA (Sweden) or IDRC (Canada). Participatory and farming systems approaches have been widely used.

I give here some more details on the MSEC programme, as my research work is linked to MSEC research activities, and as MSEC was implemented in the case study area where I did my fieldwork. MSEC was launched in 1998 by the International Board for Soil Research And Management (IBSRAM) as a component of the Asian Development Bank (ADB) supported project "Catchment Approach to Managing Soil Erosion in Asia" (ADB-RETA 5803). Recognising the failure of conventional soil conservation techniques to halt erosion and land degradation in the Southeast Asian uplands, the MSEC programme proposes a new research paradigm based on participatory, interdisciplinary and catchment based framework (Maglinao et al. 2001). Now coordinated by the International Water Management Institute (IWMI), it has been implemented since 1999 in six Southeast Asian countries including Vietnam. MSEC collaborating research institutes in Vietnam – the French Institut de Recherche pour le Développement (IRD) and the Vietnamese National Institute for Soils and Fertilizers (NISF) – have been collecting soil, hydrological, and land use data in a 50 ha watershed in the northern uplands of Vietnam for six years (Tran Duc Toan et al. 2003).

MSEC objectives are based on the assumptions that (a) farmers’ land use practices in Southeast Asian uplands have become environmentally unsustainable (Maglinao et al. 2001)

(b) local people are not aware of this degradation or/and (c) they don't know how to make their practices sustainable. However, a recent IWMI report stemming from MSEC research activities already strongly challenged some of these assumptions (Lestrelin et al. 2004). I chose to take a critical look at these statements by considering the social constructions that frame land degradation.

4 Presentation of the case study area

In this study, the action arena considered as the unit of analysis include the uplands area of the three studied villages and farmers' decisions regarding upland management. It does not infer that other action arenas (lowland activities, husbandry, etc) on which farmers rely are ignored. Indeed, many action arenas overlap and it is difficult to draw sensible boundaries between them. Actors refer here to every person who has access, use or control over uplands.

The three villages, Dong Cao, Dong Dau and Que Vai, are located in Tien Xuan commune, Luong Son district, Hoa Binh province, 40 km west from Hanoi (Figure 2). The commune lies at the edge of the Red River delta and at the bottom of hills and mountains and is constituted of seventeen villages.

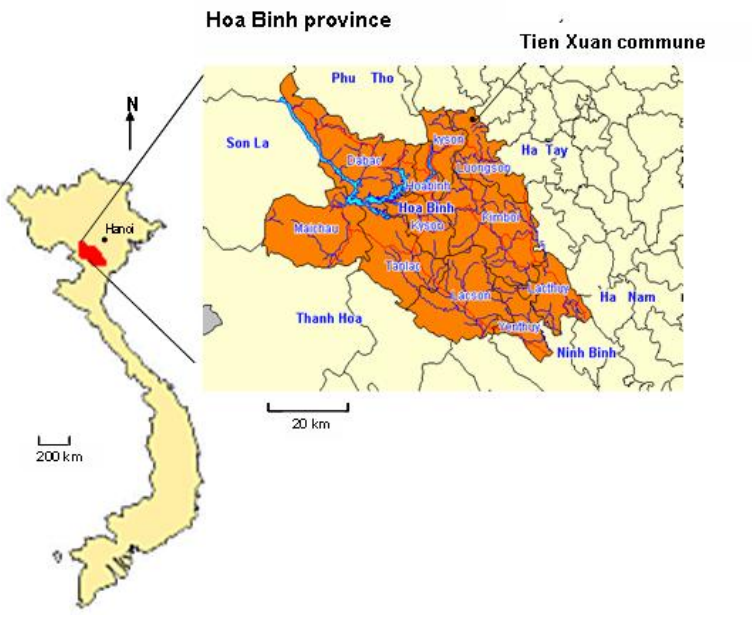

FIGURE 2
Location of the case study area

Uplands represent large areas compared to the local population (Table 1).

TABLE 1.

Some general characteristics of Tien Xuan commune

Location of Tien Xuan administrative centre	Population in 2004	Yearly average temperature and rainfall	Lowlands area	Uplands area	Main upland soil types	Slope[a]	Elevation[a]
20 58'N 105 29'E	6300 inhabitants	25ºC; 1800 mm	320 ha	978.12 ha	Ferralsols and Acrisols	15 to 60 %	125 to 700 m above the sea level.

a. These figures are measured only from Dong Cao experimental watershed but are representative of the landscape in the whole study area.

According to farmers, the three villages were created approximately a century ago by a few Muong[5] families. Villagers have traditionally cultivated irrigated rice in the lowlands as the main activity and have also relied on husbandry (pigs and buffalos breeding) and aquaculture as a means of living. Under the New Economic Zone government program of the 1960s, a few Kinh families migrated into the three villages (Table 2). Regardless of ethnicity, farmers are today all engaged in a wide range of activities from rice cultivation and husbandry to forestry and aquaculture. Non-farm based employment has also increased over the last few years, especially construction work.

TABLE 2.

General data on the villages' population

Village	Number of households	Ethnic groups living in the village	Proportion of Kinh households in each village
Dong Cao	42	Muong, Kinh	36%
Dong Dau	64	Muong, Kinh	5%
Que Vai	78	Muong, Kinh	7%

Rainfall is unevenly distributed: about 85% of the rainfall occurs between May and October (Figure 3).

5. The Muong form one of the largest ethnic minority groups in Vietnam.

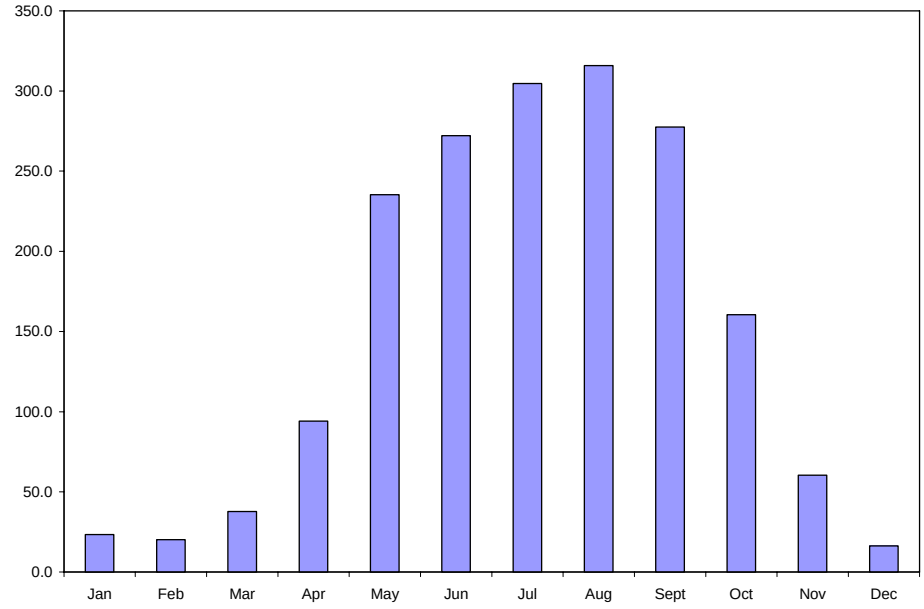

FIGURE 3.

Average rainfall (mm/month) in Hoa Binh province from 1969 to 2005

Source: Statistics department, Hoa Binh

The dominant upland soil types in this area are Ferralsols and Acrisols (Tran Duc Toan et al. 2001). Both are acid soils, inherently infertile with low resilience, which means it is hard to restore their capability, and moderate sensitivity, which implies that they are quite easily subject to change (Stocking and Murnaghan 2001).

Research studies indicate that there were serious problems of soil erosion in the uplands area during annual crops cultivation. Scientific results from MSEC programme indicated that there was a high annual variability in soil loss (from 1 to 15 t/ha/year) and that this variability depended both on rainfall characteristics (amount and intensity) and land use (Tran Duc Toan et al. 2003). Another research project carried out in the area, LUSLOF, applied notions of scales and filters in soil erosion (Hoang Fagerstrom et al. 2005) and found out significant differences between the level of erosion at the catchment scale and at the plot level. Off-site impacts of soil erosion haven't been assessed by research studies. During interviews, no farmer has mentioned sedimentation downstream as a problem.

Most farmers (40%) have mentioned a decrease in crop yields and in soil fertility in the uplands over the past few years. Natural soil fertility is low, and cultivation techniques like tillage are likely to have had a significant impact on soil fertility. However research works in

the area suggest that cassava cultivation in rotation with long fallow didn't lead to aggravated erosion (Hoang Fagerstrom et al. 2005). It is suspected that the change from shifting to fixed cultivation, forced by land allocation policy has led to aggravated soil fertility decrease, or has dramatically accelerated the soil fertility reduction process. When practising shifting cultivation, land was cultivated 2-3 years and then let under fallow for 10-15 years. The fixed cultivation system hindered farmers to use long fallow periods as they couldn't move elsewhere to cultivate in the meanwhile. As underlined further, decreased soil quality was a triggering factor that led some farmers to stop cultivating. This decision of a few farmers had in turn a domino effect on the whole cultivated area.

5 Analysing land use change

5.1 The action arena: initial situation and changes

No formal rules governed upland management; work in the uplands was neither managed nor controlled by the co-operative. Farmers had designed their own rules. Everyone was free to clear up as much land as he wanted to, how much land farmers could open only depended on their will and available labor force. Uplands access was not restricted to any individuals or group of people, and included not only villagers from the three studied villages, but also villagers from further located villages with no direct access to uplands. As land was abundant, there was very little competition to open new parcels. Farmers used to simply make a mark on the area that they wanted to open up to signify other people that they shouldn't start clearing at this place.

From the time that farmers first started cultivating the uplands, they were confronted with damages from free grazing cattle. As cultivated plots were often located far from their dwellings, they either had to build a shelter and stay all day on the field or to create collective rules that could more efficiently cope with this issue. Many farmers decided to create and follow collective arrangements. Cultivated fields were regrouped and fences could be built collectively to protect the whole cultivated area. The cost of building fences to protect the fields was shared by all the farmers. Farmers could also guard the whole cultivated area when not working on their own plot in order to prevent cattle damage. Furthermore, if animals entered the fields, the costs resulting from the caused damages were divided between different owners and thus reduced for each farmer.

Common resources could be managed effectively with a minimum set of rules and no need for enforcement. Because farmers were aware of the inherent low soil fertility, they adopted shifting cultivation practices that enabled the soil fertility to regenerate. As long as large uplands areas were available, shifting cultivation practices were probably the best option in term of economic and environmental costs-benefits in this highly sensitive environment. Farmers' living standards rose significantly thanks to uplands cultivation.

From the 1990s, decisions taken at the collective-choice action level resulted in dramatic changes in rules and narratives. In 1991, the Forest Development and Protection Law divided forested land into three categories: special use forest, protection forest and production forest (National Assembly of Vietnam 1991). Procedures and guidelines for forestland allocation were provided with Decision 327-CT (1992), the new Land Law (1993, amended in 1999), and Decree 02/CP (1994, replaced by Decree 163 in 1999). Rights to use land with or without forest cover could be allocated to organizations, households, or individuals for 50 years. In 1995, the government ban for crop cultivation in the highest part of the mountains was implemented in Tien Xuan commune. Villagers were not very willing to stop their major source of monetary incomes and the commune authorities' task for enforcement and control was enormous. A team of twenty persons had to control a 978 ha territory in addition to their usual administrative tasks. Even though many villagers were fined, a large majority of farmers kept on cultivating arrowroot, taro, maize, peanuts, and cassava several years after the government ban. At the same time, forest land was allocated according to what had been cleared up by every family, and opening up more land was forbidden. There were few conflicts during land allocation process as many farmers refused to claim land. Firstly, they feared to pay more taxes if they were given land-use rights. Secondly, as uplands had previously been freely used and accessed, the advantages of getting official land-use rights for land were not very clear.

In addition, during the 1990s, reforestation programs were launched in the study area and all over Vietnam. Pertinent schemes included the United Nations World Food Program (WFP)[6], program 327 and more recently the Five Million ha reforestation program. Financial incentives were provided by the government to promote reforestation. Depending on the program, the district usually paid for seedling, fertilizer, and labor costs (which in turn were deduced from the sales benefits). Rice was even provided for each tree planted in the WFP. The district forestry organization, which managed program implementation with the local

6 This program encompassed six forestry projects and managed to restore some 450,000 ha of production forest.

support of the commune authorities, promised to ensure timber purchase to the farmers. The household had to sign a contract with the district forestry organization, with specific requirements such as the time of harvesting to cut or planting strategy.

Local authorities vaunted forests environmental benefits to justify the implementation of government policies – especially the ban of annual crops cultivation that was quite unpopular – and encourage villagers to follow the reforestation programs. Over-simplified or false "laws" such as "forests reduce erosion" and "forests increase runoff" were assimilated as new narratives in villagers' imagination.

Progressively from the 1990s to 2003, farmers stopped swidden cultivation. In 2003, most upland area was under fallow or reforested.

5.2 Understanding farmers decisions

5.2.1 The importance of local factors: biophysical conditions and rules

The time when farmers have stopped annual cropping coincides with the implementation of national policies encouraging reforestation. It would be tempting to conclude that they were prominent factors in farmers' decisions. Household interviews shed a contrasting and different light on the reasons why farmers stopped cultivating annual crops (Table 2).

Table 2. Causes for the end of annual crops cultivation

Reasons given by farmers why they stopped cultivating the uplands[a]	**Percentage of respondents**
Damage caused by cows and buffaloes to crops	51 %
Soil was poor	40 %
It was forbidden (government ban)	22 %
They sold the land	13 %
It is what others did	9 %
Not enough labour force	8 %
Low cassava selling prices / cultivation not profitable	8 %
Work was too hard	2 %
They wanted to plant trees	2 %

a. Figures from a 45 household interviews sample

Firstly, results suggest that very few farmers (2%) stopped cultivating because they preferred to reforest. When reviewing the above data, one would thus probably revise the previous conclusion. Instead table 3 might suggest that: farmers stopped cultivating because (1) they were not able to cope with cows and buffalos and (2) their agricultural practices were not sustainable and had lead to soil fertility depletion. Further assessment of the data reveals that none of these explanations are correct.

The examination of the data from a chronological perspective shows that farmers didn't stop cultivating annual crops in the uplands altogether. The end of cultivation ranged from the mid 1990s through to 2003, and the first farmers stopped for different reasons than the following ones. The first group of farmers did so because they observed – through a decrease in yields, soil hardness, loss of the fertile top-layer of the soil and emergence of stones and rocks – that the soil had become very poor. Some farmers decided to stop cultivating and let the land revert to a natural fallow. In 1995 and 1998, when program 327 was launched, farmers were encouraged to plant trees because of government subsidies. Few farmers decided to plant trees. The primary driver for land use change was thus a decrease in soil fertility, and the resulting decrease in productivity. But, later on, of more significance was the way informal rules changed, in turn affecting costs and benefits of annual cropping systems.

The changes caused by these few farmers ceasing cultivation of annual crops impacted upon the informal collective arrangements governing cultivation and grazing cohabitation. From the 70s, farmers had adopted institutional arrangements to conciliate grazing and cultivation activities in the uplands. They grouped their field's together and built fences collectively to protect them from free grazing cows and buffaloes. Costs to prevent cattle from entering the fields were also reduced through these collective rules as one farmer could watch all neighbours' fields when working on his own field. Lastly, even if animals entered the protected area, damages were shared between the fields and land owners. The decision of a few farmers to stop annual cropping created a domino effect with dramatic consequences on land use practices of all farmers. Farmers who stopped cultivating no longer needed to prevent cows and buffaloes from entering their plot. Neighbouring fields were damaged by marauding livestock with losses of up to 60% of the crop being incurred. Costs to protect one's individual parcel of cultivated land increased as land owners had to build fences individually and became too high compared to expected benefits from agricultural product sales. Farmers couldn't move their fields as land had been allocated. As a result all farmers progressively stopped cultivating annual crops. Changes in material conditions and

reforestation incentives together with changes in rules governing land access affected costs and benefits of annual cropping. Behind this rational choice, one can also speculate how much farmers were tempted to imitate others who were considered as the most innovative in the area.

As shown in table 2, the end of cassava, taro and arrowroot cultivation was a first step in land use change, and should be distinguished from the next step: reforestation. The reasons why farmers chose to plant trees were distinct from the factors that led to the end of annual cropping. During the interviews, farmers in the three villages were also asked why, once they stopped uplands cultivation, they decided to plant trees. They provided the following reasons: the soil was poor, so nothing else could grow; it provided fuel wood; it was subsidised through a government program; and they had no other choice. As underlined by some farmers, no other land-management option than monoculture tree plantation was available, except fallow. Fallow was an important component of the former rotational cultivation system, but in the current private system, where each farmer had been allocated a small parcel of land (1.1 ha on average in Dong Cao), farmers tend to consider it as "wasted land". Reforestation has thus appeared as the "least bad solution".

5.2.2 Farmers' perception of uplands and land degradation

In the study area, local perception of uplands has significantly evolved. Firstly, uplands were covered with primary forest until the 70s, and were populated with wild animals (e.g. tigers and wild pigs) that threatened livestock and crops in the village. Progressively, forest was cut to collect and sell wood and then to expand cultivated area. Uplands area for cultivation became a major source of income and households from the three villages could equally increase their living standards from cash crops cultivation in the uplands. Uplands were seen as unlimited and land had no economic value. Progressively the ecological value of mountains gained consideration in villagers' imagination. Some of these beliefs have been spread by local authorities to justify the implementation of government policies restricting land use and foster local people to reforest. For instance, in Tien Xuan commune, villagers were told that the uplands allocation program was implemented by the government for ecological reasons (as stated by one Dong Cao villager):

> *"because villagers have too much destroyed the mountain. Now we have to reforest to keep water in the mountain and to reduce soil erosion".*

The link between forest and water constitutes a very strong belief that prevails in the three villages. Scientific studies have demonstrated that a reduction in forest cover increases yearly runoff and has unclear impacts on dry season runoff (Bruijnzeel et al. 2005; Calder 1998; Jackson et al. 2005). However, farmers strongly believe that runoff from the watershed increases with forest cover. The positive relationship between forests and water is so entrenched in people's minds that some farmers use it to explain all land management problems. As an example, when asked why cassava yields had decreased in the uplands, a farmer replied that it was because there wasn't enough water in the soil because the forest had been cut. On the contrary, research has demonstrated that tree plantations tend to reduce soil moisture. Poor inherent soil natural fertility and further soil fertility decline due to soil loss are more likely the primary and prominent factor for yield decrease in this area. It highlights that today, farmers in the study area rely more on narratives spread by local authorities than on their own observations. One can wonder to which extent ecological arguments on uplands management and reforestation impacted on farmers' decision. Farmers were accused of being responsible for a supposedly ecological disaster: destroying the mountain. They were pointed out as the guilty ones and, following this argumentation, it was logical in people's collective consciousness that they had to atone for their faults by reforesting the hills. Even if it is likely that ecological arguments alone will not be a decisive factor in individual behaviour and reforestation, this belief has obviously had an impact on collective norms, i.e. about what is collectively considered as good and bad.

The local perception of land degradation and soil erosion was also explored. When they started cultivating uplands area, villagers were aware of the inherent low soil fertility and of the steep slopes sensitivity to top-layered soil loss: "when there are heavy rains, water flows with humus". They also knew that cassava cultivation was an aggravating factor for soil loss:

> "*when we plant cassava we have to weed. But when we cultivate on steep slopes, soil runs with water and there are only stones left*".

Because farmers were aware of the inherent low soil fertility, they had adopted shifting cultivation practices with long fallow periods that enabled the soil fertility to regenerate. As long as large uplands areas were available, shifting cultivation was probably the best environmental option in this highly sensitive environment.

When discussing about land management with the farmers, the word “soil erosion” only came up in six household’s interviews out of 84 interviews in the three villages, which represent 7% of interviewed households:

- three people mentioned it as a justification to plant trees;
- three people mentioned it as a cause of soil fertility decrease.

Out of 84 households interviewed, 57 stopped annual cultivation in the uplands (most of the others are new couples and have never owned uplands) from the end of the 90s to 2003. Out of these 57, 45 provided the reasons why they had stopped. Among these 45, eighteen households (40%) mentioned soil degradation, which was observed through visual aspects demonstrating poor soil quality or through yields decrease. Out of 57 households who stopped annual cultivation in the uplands, only three talked about soil erosion.

Fieldwork suggests that soil erosion *per se* is not a familiar concept for farmers. It was probably only recently introduced by organizations external to the village: researchers or commune authorities. The examination of different actors’ perception of land degradation suggests that there is a gap between the knowledge and perception of different actors of land degradation issue: between scientists and policy-makers’ on the one hand (cf. section 3), and between local people and scientists on the other hand.

This section has highlighted the main factors that were responsible for reforestation in the study area. The collapse of local rules, due to a combination of soil fertility decrease and change in land tenure, was the decisive factor in land use change. The establishment of trees plantations by farmers was not a direct response to government reforestation incentives. The analysis of farmers’ perception of land degradation suggested that information conveyed through research projects and policy implementation had distinct impacts. Research projects have had little effect on farmers’ perception of their environment in the study area. It appeared that there is a dichotomy between soil erosion, as the process defined and studied by scientists and used by policy-makers to justify restrictions on land use, and soil fertility decrease experienced by farmers. In the area, soil erosion is not a concept that matches farmers’ representation of reality. Narratives brought up by policies on forest benefits on water were much more powerful in impacting farmers’ beliefs.

6 Conclusion

This analysis defends the use of local studies when local users have some degree of freedom in making decisions over natural resources management. It demonstrated that when explaining land use change, meso or macro-scale studies might miss decisive factors that are only observable at the community level. Furthermore, institutional analysis proved to be particularly suited to the study of land managed under common rules. In the present analysis, the disruption of collective rules had a prominent role in individual decisions. Research works might miss a significant part of explanatory factors if considering only individual or external (but not collectively created) variables.

What is more, it argues that, when seeking to explain human behaviour, it is important to consider socially constructed views of nature. The examination of different actors' perception led to two conclusions: firstly, state-led policies disrupted considerably local traditional practices, thus leading to unpredictable outcomes, partly because they relied on unfounded beliefs – on the non sustainability of ethnic minority land management systems for instance. Secondly, it highlighted that "soil fertility" or "yield decrease" were concepts much more familiar to farmers than "soil erosion", which is the process of interest for researchers. This mismatching might reduce the success of research activities. As a general recommendation, scientists should take more attention to local perceptions at the start of their research activities. Taking for granted soil erosion as a problem may lead to non-adapted responses to biophysical processes and to farmers' needs. Even when soil erosion is the actual problem, the use of this concept, which might be not familiar to local people, can significantly hinder the adoption of soil conservation practices. The use of brute facts, such as "soil movement" or "soil loss", more familiar to farmers, should enhance a mutual understanding between farmers and researchers or decision-makers and help sharing different perspectives and knowledge.

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