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Tree-cover transition in Northern Vietnam from a gender-specific land-use preferences perspective

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ABSTRACT

Vietnam is one of the countries where a shift from net deforestation to net reforestation is taking place. This study examines the pattern of tree-cover transition and gender-specific land-use preferences and decisions in northern Vietnam. We employed a mixed-method approach that combined a land-use transition analysis, gender-disaggregated survey and role-playing games (RPG) to assess the relationship between tree-cover transition and gender. The first two methods revealed continuous conversion of protection forest to tree plantations and upland crops (dominated by swidden rice). Factors affecting conversion identified through regression analysis were elevation and labor availability. The land-use RPG revealed gender-specific preferences for annual crops and tree-based agroforestry systems, and the underlying motivation of those preferences. The overall pattern of tree-cover transition in northern Vietnam falls under the smallholder agricultural intensification path. Agroforestry potentially balances the specific land-use preferences of men and women, and helps to achieve their specific land use related livelihood objectives.

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1. Introduction

Forest- or tree-cover transition from net reduction to net expansion has been recently observed in many tropical countries (Meyfroidt and Lambin, 2011). The forest transition theory, which was primarily developed in the context of forest recovery in (industrial) temperate regions as a consequence of economic changes (Mather and Needle, 1998), has been widely explored in the tropics to better understand patterns of forest-cover transition (Mather, 2007; Meyfroidt and Lambin, 2008a, 2008b; Rudel et al., 2005). Vietnam is one of few countries where forest transition is taking place; a net increase in forest cover between 1993 and 2005 using the 2006 FAO data was observed due to increased in forest plantations, but does not say anything about the quality of the forest (cover) (Meyfroidt and Lambin, 2010).

Understanding tree-cover transition in the tropics depends on various factors and produced mixed results (i.e., different from the ones observed in industrial countries) (Lambin and Meyfroidt, 2011; Perz, 2007). Because claims regarding forest-cover transition are often based on official forest-cover estimates, forest dynamics and geographical contexts that underpin transition processes are important considerations (Perz, 2007). One novel aspect of this study relative to other forest-cover transition studies is the explicit treatment of gender-specific aspects that may affect forest- or tree-cover transition. Men and women within households often have gender-specific roles, land-use preferences and perspectives that may influence land-use transition processes (van Noordwijk and Villamor, 2014; Villamor et al., 2015). Taking into account gender-specific land-use decision making may provide important insight for future forest and agricultural initiatives in the tropics.

Vietnam underwent a socio-political process that led to more equitable allocation of land-use rights and contributed to widespread poverty reduction (Phong and Glewwe, 2002 Ravallion and Van de Walle, 2003). Kozel (2014) reported that poverty headcount fell remarkably to 14.5% in 2008 to below 10% in 2010. In spite of the positive impacts of this land-use rights allocation process on agricultural and rural development, forest fragmentation became an issue due to the emphasis on equitable land allocation. The World Bank (2003) estimated that there were about 75 to 100 million land parcels throughout the country in 2002. Consequently, between 1990 and 2005, agricultural intensification by smallholder farmers was widespread, particularly in marginal agricultural areas (Gordon MacAulay et al., 2006; Meyfroidt and Lambin, 2008b). Accordingly, this forest transition pathway is characterized by well-

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defined land tenure rights and without declines in agricultural land uses or local populations. Instead, population growth drives local agricultural intensification and diversification by increasing labor input in suitable areas, and occurs predominantly in agriculturally marginal areas (Meyfroidt and Lambin, 2008a). Linking this type of land-cover transition with gender-specific decision making and preferences is innovative and may provide insight into the socio-ecological resilience, functionality and sustainability of a landscape (Cumming et al., 2006; Meinzen-Dick et al., 2014). Thus, in this study we explored the relationship between gender-specific land-use preferences and decisions and the agricultural intensification process occurring in an agriculturally marginal forested region of northern Vietnam. The objectives of the study were to: (1) assess tree-cover transition in northern Vietnam by determining the land-use categories that were *targeted* or *avoided* between 2000 and 2010; (2) determine the factors associated with gender and related decisions that affect tree-cover area; and (3) predict the likely transition pathway for the study area under a scenario of competing options based on gender-specific preferences and decisions.

1.1. Gender and tree-cover transition

Social and ecological systems can interact in many ways and often create dynamic feedback loops through which humans both influence and are influenced by ecosystem processes (Levin, 1999). The complexity of land uses at the landscape level often results from local interactions among individuals. Such individuals may have gender-specific perceptions that affect their land-use preferences and decisions that in turn may influence tree-cover transition and landscape multi-functionality (Villamor et al., 2014b). Hence, tree-cover transition is linked to overall land-use change (Barbier et al., 2010), associated socio-ecological changes and feedback (Lambin and Meyfroidt, 2010), and by contextual factors (Perz, 2007). However, few studies have investigated gender-specific decisions, behaviors and preferences at the landscape level (Villamor et al., 2015). The main purpose of this study was therefore, to understand gender-specific land-use preferences, decisions and actual practices, and how will these influence future land-use change.

In this study, we adapted the concept of emergence by exploring gender-specific interactions that result in tree-cover patterns or trends (Holland, 1992; Holling, 1978), and explored the hypothesis posed by van Noordwijk and Villamor (2014) that appreciation of tree-cover and its associated ecosystem services varies according to gender and ecological knowledge.

2. Materials and methods

2.1. Study area

The study was conducted within the communes of Muong Do, Tuong Tien and Tuong Phong in the Phu Yen district of Son La province in northwest Vietnam. The three communes have a total combined land area of 17,523 ha (Fig. 1). The study area is located in one of the poorest regions of the country (Minot, 2006). These communes were selected because they are representative of the elevation gradient in the watershed (lowland and mid-elevation sites). Elevation criteria were an important consideration for the selection of study sites because of associated changes in tree cover. The study area is located within a watershed that is undergoing rapid tree-cover transition and the drivers of land-use change (i.e., population growth and market forces) are evident (Meyfroidt and Lambin, 2008a). We focused on lowland and mid-elevation areas because the upland areas of the landscape are completely forested and protected by law for conservation purposes due to high level of endemism of flora and fauna.

In 2013, the population in the Phu Yen district was approximately 1.2 million, a 7.8% increase from 2000, of which 86% reside in rural and mountainous areas (Son La Statistical Book, 2014). Forty percent of households were reportedly below the poverty line (Nguyen and Lund, 2012). The Moung Do commune is part of the national government's 2009–2020 Development Plan in which, lands are allocated for agro-industrial production, whereas some areas in the district are allocated for perennial fruit tree production such as tea, mango, longan and litchi.

2.2. Data collection

The study applied a mix-method approach, which combined sex-disaggregated surveys, land-use intensity analysis and role-playing games (RPG) to account the scale aspect of decision making (e.g., individual vs. group decisions). A total of 302 respondents (of which 152 were females and 150 were males) were interviewed using a survey questionnaire. The respondents were selected through random stratification (i.e., elevation and gender). The survey questionnaire explored the households' socio-economic and farm characteristics, current land-use practices and land-use preferences. Thirteen percent of the female respondents and 96% of males were household heads. It is natural to find few female household heads in the study area, so rather than headship and intra-household power relations, our study focused on understanding segregated and mixed gender land-use preferences and decisions, which could impact future land-use patterns. The survey was conducted between May and June 2013.

A land-use intensity analysis based on a simple mathematical approach developed by Aldwaik and Pontius (2012) was used to assess land-use change dynamics. We used two land-use maps of the Son la province from the General Department of Land Administration (GDLA) within the Ministry of Natural Resources and the Environment (MONRE) covering the periods, 2000–2005 and 2005–2010. These maps were based on land-use inventories conducted every five years, site visits, and annual statistical information as opposed to remote sensing information. The land use descriptions are shown in Table 1.

We employed a modified version of the land-use RPG described in Villamor and van Noordwijk (2011) and Villamor (2014). The game was designed to capture gender-specific preferences that could affect land-use patterns at the landscape level. Without ruling out the influence of power relations between men and women in land-use decision making, the objective of the game was to observe how men and women may differ in their response to land-use options and how these responses contribute to either the conservation or conversion of existing land uses. It is assumed that individual farmers consult with one another and external actors about land-use practices, or are otherwise, influenced by local land-use changes. The RPG includes a board consisting of a 5×5 grid representing a village and its surroundings with key land-uses. Male and female participants in RPG were assigned to specific roles to portray in the game, such as farmers, government officials, logging and agro-industrial companies, and conservation agencies. Each game entails five "rounds," each of which represents an annual cycle that in this case, reflected the 2005–2010 period. The detailed mechanics of the RPG are described in Villamor (2014) and Villamor and van Noordwijk (2011).

A total of 18 RPG groups were conducted with the survey respondents who were grouped into three categories: (1) three men-only and three women-only groups from the lowlands that are dominated by the Phong ethnic minority (6 groups in total); (2) three men-only and three women-only groups from the mid-elevation areas dominated by the Tien ethnic minority (6 groups in total); and (3) six mixed-gender groups from lowland and mid-elevation areas. The grouping design was intended to elucidate the effects

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