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Economic incentive and factors affecting tree planting of rural households: Evidence from the Central Highlands of Vietnam

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ABSTRACT

We examine the economic incentive and the factors affecting tree planting by rural households in the Central Highlands of Vietnam. Data are from a household survey conducted in three districts of Lam Dong province. A financial analysis is undertaken to identify the economic incentive and a Heckman econometric regression model is used to examine the determinants of tree planting. Our results show that tree planting is financially more profitable than leaving land abandoned. However, the decision and intensity of tree planting by rural households are affected by various factors representing household characteristics, farm endowment, bio-physical factors, social-institutional support, and the perception of farmers about forestland expropriation risk. We suggest these factors be considered in reforestation programs in the future.

Introduction

Despite signs of forest recovery in a few countries (Meyfroidt and Lambin, 2008), tropical deforestation remains a global challenge with negative consequences for environmental sustainability and forest-dependent human communities (see Parvathi and Nguyen, 2018). Tree planting is thus important for supporting people's livelihood and reduces pressures for additional deforestation (Angelsen, 2010). Globally, over the last few decades, a number of tree planting programs have been undertaken and have contributed in a substantial way to a reduction in global forest loss, from 8.3 million hectares (ha) in the 1990s to 5.2 million ha annually in the 2000s (FAO, 2010). In parallel, the decentralization of forest management in a number of developing countries, for example Vietnam and China, has allowed greater rural household participation in tree planting activities. However, the success of tree planting efforts of rural households in these countries remains controversial (Sikor, 2001; Clement et al., 2009). It is clear that successful tree planting by rural households requires a deep understanding of the economic incentive and of other factors affecting their planting decisions. Moreover, such factors are often site-specific, which makes the generalization of research findings difficult. Indeed, such a generalization is only possible if the findings from different site-specific studies are pooled together in order to identify common observable patterns (Nguyen et al., 2015). These issues therefore lead to the need for more empirical evidence.

Vietnam is one of the countries that have witnessed critical changes in forest management over the last several decades (Mather, 2007; Lambini and Nguyen, 2014). In response to widespread poverty and deforestation in the early 1990s, Vietnam initiated a renovation policy package known as "*Doi Moi*". The starting point of this structural adjustment policy was the distribution of the main productive asset, in this case crop and forestland, to rural households (Nguyen, 2012; Nahr et al., 2016). It is noted that in Vietnam, the term "forestland" is defined as "land designated for tree planting" and might not necessarily be covered by forest (Nguyen et al., 2013). Under *Doi Moi* about 1.2 million rural households nationwide were granted forestland for tree planting (MARD,

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2013). As a result, the country has transitioned from an annual net loss to a net gain of the national forest cover, even though forestland allocated to rural households is remote and seriously degraded (Meyfroidt and Lambin, 2008; Nguyen and Nghiem, 2016). This positive trend does not imply that forest clearing behaviors have disappeared; it nonetheless indicates that tree planting has more than compensated for the overall deforestation (Demurger and Yang, 2006; Nguyen et al., 2010).

However while a number of the previous studies show a positive effect of the forestland allocation (FLA) policy on afforestation and reforestation in Vietnam (Nguyen et al., 2014), other studies bring opposing evidence (Sowerwine, 2004; Clement and Amezaga, 2009). The overall impact of the FLA policy on tree planting by rural households in Vietnam therefore remains a subject of debate. A controversial report by the Ministry of Agricultural and Rural Development of Vietnam (MARD, 2013) indicates that approximately 70% of 'forestland' allocated to forestland users have, in fact, not been afforested or is used for other purposes. As more than 10 million ha of forestland have been allocated to different forestland users, including rural households, serious concerns are raised not only for Vietnamese government but also for scholars interested in Vietnam's forest transition.

Our study is, therefore, aimed at examining the reasons why many households have responded positively to the FLA policy while others have not used their allocated land for tree planting. More specifically, we aim to provide some answers to the following research questions. Firstly, what is the economic incentive for rural households' investment in tree planting? And secondly, what are the driving forces of rural households' tree planting?

Our contribution to the literature is three-fold. Firstly, recent evidence in Vietnam shows a high level of conflict between land users and the government (Labbé, 2016). Due to an increasing demand for land for urbanization and industrialization, farmland and forestland have been expropriated by the government either for public purposes or for commercial purposes of private investors, without sufficient compensation for smallholders (World Bank, 2011; Dao, 2015). Even though forestland has been theoretically allocated to rural households for a 50 year period, there remains the possibility that their forestland can be expropriated. However, none of the previous studies investigates how forestland users regard this land expropriation risk. Our study is the first to take into account the perception of rural households about this risk and its effect on tree planting. Secondly, based on our literature review we observe that most *ex-post* empirical economic models in previous studies ignore bio-physical factors that are essential in tree planting decision making (Mercer, 2004; Nguyen et al., 2017). We therefore include a set of bio-physical factors. Thirdly, the Central Highlands of Vietnam is characterized with features that are different from the regions considered in previous studies (for example the Northern Uplands). These features, including a massive immigration of people originally from the north of Vietnam and a large minority ethnic population, are considered in our study. Methodologically, most previous studies on rural tree planting do not take into account self-selection and endogeneity issues, thus in this study, we use a Heckman selection model to control for these biases.

Our paper is organized as follows. Section 'Forest land allocation and land grab in Vietnam' introduces briefly the FLA policy, the current debate on the effects of the FLA policy and the land grab phenomenon in Vietnam. Section 'Conceptual background and empirical evidence' reviews empirical evidence of tree planting in developing countries and establishes a conceptual model for rural households' tree planting activities. Section 'Study design' presents the study design, including data collection and analysis. Section 'Results and discussion' discusses the findings. The conclusions and policy implications are summarized in Section 'Conclusions and policy implications'.

Forest land allocation and land grab in Vietnam

Vietnam is one of the countries that have undergone a transition from net deforestation to net reforestation. Three quarters of Vietnam's territory have mountainous and hilly terrains. Approximately 30% of the population depends for some part of their subsistence on forest resources (Nguyen, 2008). Therefore, forest resources are of critical importance in terms of environmental protection, social stability, and economic development. There is also clearly a need to develop a sustainable forest stock to meet the demand of an increasing population and a rapidly growing economy (Vietnam's gross domestic product grew by 7.3% per year during 1995–2005 (Nguyen et al., 2016)). The national forest cover was 43% and 27.8% in 1943 and 1990, respectively (Wil et al., 2006). During the period 1980–1990, Vietnam lost approximately 110,000 ha of natural forests annually (Nguyen et al., 2010). Due to the steep terrain in most forest areas and concentration of rainfall in summer, poor forest sites were further degraded because of water and soil erosion (FAO, 2010; Nguyen et al., 2013). The causes of Vietnam's deforestation and forest degradation at that time were complicated and diverse, including forest conversion to farmland, forest devastation by wars, over-exploitation by state forest enterprises, illegal logging, and a deficient institutional and legal framework. However, one of the main reasons was the nationalization of all land and forests, which started shortly after the victory over the French armed forces in 1954. All forests and forestland were put under the management of a system of state forest enterprises (SFEs) established in the early 1960s and other governmental entities. While SFEs were granted extensive areas of forest, they did not have sufficient human power for effective management. In contrast, people who lived in or near forests for much of their livelihood had no legal access to forests. As a consequence, they exploited forest products for survival, in contravention of prevailing forest regulations.

In response to the problems of forest degradation, deforestation and inefficient operation of the SFEs, the FLA policy was introduced at the beginning of the 1990s. This decentralization of state control over forestland and allocation of land use rights to forestland users for forest conservation and regeneration are important components in contemporary forest policies being implemented in the developing world (McCubbins et al., 1987). In the case of Vietnam, the FLA policy allows for the allocation of forestland to rural farm households who are now the second largest forestland user group in the country (Lambini and Nguyen, 2014).

Even though various studies have examined the effects of the FLA policies in Vietnam (Sikor, 2001; Sowerwine, 2004; Meyfroidt and Lambin, 2008; Clement and Amezaga, 2009; Nguyen et al., 2010; Coe, 2013), these focused mainly on the Northern Uplands. In addition, the results of the existing studies are mixed. A positive point of the FLA policy is that forestland tenure is more secure. Theoretically, this might promote tree planting by rural households. The national forest cover increased to 39.9% in 2013 due mainly to tree planting programs (MARD, 2013). According to Mather (2007), the area of forest plantation in Vietnam increased from 0.97 to 2.7 million ha during period 1990–2005 (5% annually), bringing the plantation share up to 20.8% of the forest cover. Empirically, Nguyen et al. (2010, 2014) among a number of authors report that rural households' afforestation has been positively impacted by the FLA policy. Moreover, the FLA policy has also contributed to a reduction in shifting cultivation of ethnic minorities (Coe, 2013). However, the exact contribution of rural households' afforestation to this net

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