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Trajectories of deforestation, coffee expansion and displacement of shifting cultivation in the Central Highlands of Vietnam

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ABSTRACT

Production of commodities for global markets is an increasingly important factor of tropical deforestation, taking over smallholders subsistence farming. Measures to reduce deforestation and convert shifting cultivation systems towards permanent crops have recently been strengthened in several countries. But these changes have variable environmental and social impacts, including on ethnic minorities. In Vietnam, although a forest transition – i.e. shift from shrinking to expanding forest cover – occurred at the national scale, deforestation fronts and agricultural colonization for commodity crops – a.o. coffee – still dominated the Central Highlands plateaus. Previous studies suggested that the dominant land use changes in that region were on the one hand the acquisition and conversion of agricultural lands to perennial crops for external markets by capital-endowed Kinh households – the majority ethnic group in Vietnam – and on the other hand the corresponding displacement of poor households of ethnic minorities relying on shifting cultivation towards the forest margins. This study tested this hypothesis by using remote sensing to analyze land use and cover changes and deforestation trajectories in the coffee-growing area in Dak Lak and Dak Nong provinces over 2000–2010. Land use changes were linked with socioeconomic dynamics using secondary statistics and spatial modelling. Net deforestation reached $-0.31\%\ y^{-1}$ of the total area between 2000 and 2010. Deforestation was indeed mainly directly caused by shifting cultivation for annual crops, but this was partly driven indirectly by expansion of coffee and other perennial crops over agricultural lands. Displacement of shifting cultivation into the forest margins, pushed by market crops expansion, was the spatial manifestation of the marginalization of local ethnic minorities and poor migrants, pushed by capital-endowed migrants. This marginalization is a long-standing process rooted in the colonization and development strategy for the highlands followed since colonial times. Over the late 2000s, rapid deforestation was strongly reducing the benefits of national-scale forest recovery, and might shift the country back to net losses of natural forest. Implications for policies that may affect deforestation are discussed.

1. Introduction

Tropical forests support human livelihoods, constitute sources of raw materials, harbours of biodiversity and carbon reservoirs (Millennium Ecosystem Assessment, 2005). Tropical deforestation is a crucial part of global environmental change and a challenge for sustainability of human societies (FAO, 2010). Smallholders cultivating food for subsistence or for local markets, usually using shifting cultivation, were often held as the primary agents of deforestation throughout the 1960s to 1980s (Rudel et al., 2009). Over the recent decades, agricultural expansion to produce commodities for global markets became an increasingly important factor of tropical deforestation (DeFries et al., 2010; Lambin and Meyfroidt, 2011). Political efforts to control and reduce deforestation have recently been strengthened in several countries, e.g. in Brazil and Indonesia (Macedo et al., 2012; Edwards et al., 2011) and coordinated internationally, among others through the impulse of the proposed REDD+ mechanisms (Venter and Koh, 2012). In Southeast Asia in particular, land zoning policies that restricted agricultural activities on forestry lands have contributed to the conversion of uplands agricultural systems towards permanent crops, and to decreasing deforestation in several places (Fox et al., 2009; Meyfroidt and Lambin, 2011). But agricultural commodity booms, policy schemes to reduce deforestation and transitions from shifting cultivation towards permanent crops may have important social impacts on livelihoods of specific groups,

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including uplands dwellers and ethnic minorities (Cramb et al., 2009). These changes may contribute to raise average incomes but also to widen inequities, to marginalization of already poor communities, and increased insecurity of livelihoods through exposure to unstable global markets. Conversion of shifting cultivation mosaics to permanent crops also creates significant environmental impacts, including sometimes increasing deforestation (Ziegler et al., 2009a). If labour demand in expanding crops is small, shifting cultivators may move their fields elsewhere, possibly encroaching into forest in what is known as "indirect land use change" (Lapola et al., 2010). Thus, in order to be effective and equitable, policies to promote sustainable land uses have to be grounded on accurate understanding of the land use processes and social dynamics involved in deforestation and of their possible effects on livelihoods. Despite the vast literature on tropical land uses, surprisingly few studies focus on land sources for the different types of expanding agricultural lands (Gibbs, 2012), although this constitutes a prerequisite for understanding the land use dynamics in an area.

In Vietnam, after decades of deforestation, a forest transition – i.e. a shift from shrinking to expanding forest cover – occurred in the early 1990s at the national scale (Meyfroidt and Lambin, 2008a,b). But reforestation occurred mainly in the northeastern and northwestern mountains and midlands, the central Annamite Mountains, as well as in some rehabilitated mangroves, while active deforestation fronts still dominated the plateaus of the Central Highlands region (Meyfroidt and Lambin, 2008a). High deforestation rates were attributed to important immigration, through state colonization programmes in the 1970s and 1980s and then spontaneously in the 1990s and 2000s, and the development of market crops (coffee, rubber, pepper, cashew, and others) (De Koninck, 1999). The Central Highlands hold most of the remaining forests with high biomass and biodiversity value in Vietnam (Meyfroidt and Lambin, 2008a). Forest transitions often involved displacement of land uses from reforesting countries towards other countries through imports of agricultural and wood products (Meyfroidt et al., 2010). Such international displacement of land uses indeed contributed to the forest transition in Vietnam (Meyfroidt and Lambin, 2009). This displacement can also occur domestically, from reforesting regions towards so-called "facilitating regions" supplying increasing amounts of resources and goods (Pfaff and Walker, 2010). The potential role of the Central Highlands of Vietnam as a facilitator for the reforestation of the rest of the country remains unclear.

The main objectives of this study are (i) to measure and characterize land cover changes and especially deforestation trajectories in a study area in the Central Highlands of Vietnam for the period 2000–2010 and (ii) to understand the land use change processes in that area and their links with deforestation and socioeconomic development. Based on that, the process of marginalization of some farmers – especially from ethnic minorities – the role of the Central Highlands in the broader context of Vietnam's forest transition, and policies aiming at sustainable land uses and deforestation reduction will be discussed. Remote sensing data were used to map land cover changes, and combined with secondary statistics and spatial modelling to analyze drivers of land use changes and socio-economic dynamics.

Two main hypotheses from the literature about deforestation in the Central Highlands during the years 2000s were tested. First, several studies suggested that the dominant land use changes were on the one hand the acquisition and conversion of agricultural lands to perennial crops for external markets (coffee, rubber and others) (called "industrial crops" in Vietnam) by capital-endowed households, often Kinh – the ethnic majority group in Vietnam – and on the other hand the corresponding displacement of poor households of ethnic minorities relying on shifting cultivation towards the forest margins (De Koninck, 2000; Doutriaux et al., 2008; Fortunel, 2008; Hall, 2011). Studies explored these processes using interviews and socio-economic household surveys, but their aggregate effects on the landscape have not been quantified and mapped. This first hypothesis can be subdivided in several testable sub-hypotheses: 1.1: expansion of shifting cultivation and annual crops was the main direct cause of deforestation; 1.2: perennial crops expanded mainly over current agricultural areas rather than on forest; 1.3: areas of shifting cultivation were pushed further from the population and economic centres, and over marginal lands; 1.4: there was a causal link between changes in perennial and in shifting cultivation crops. The second hypothesis explains that land use zoning regulations, allowing to expand rubber

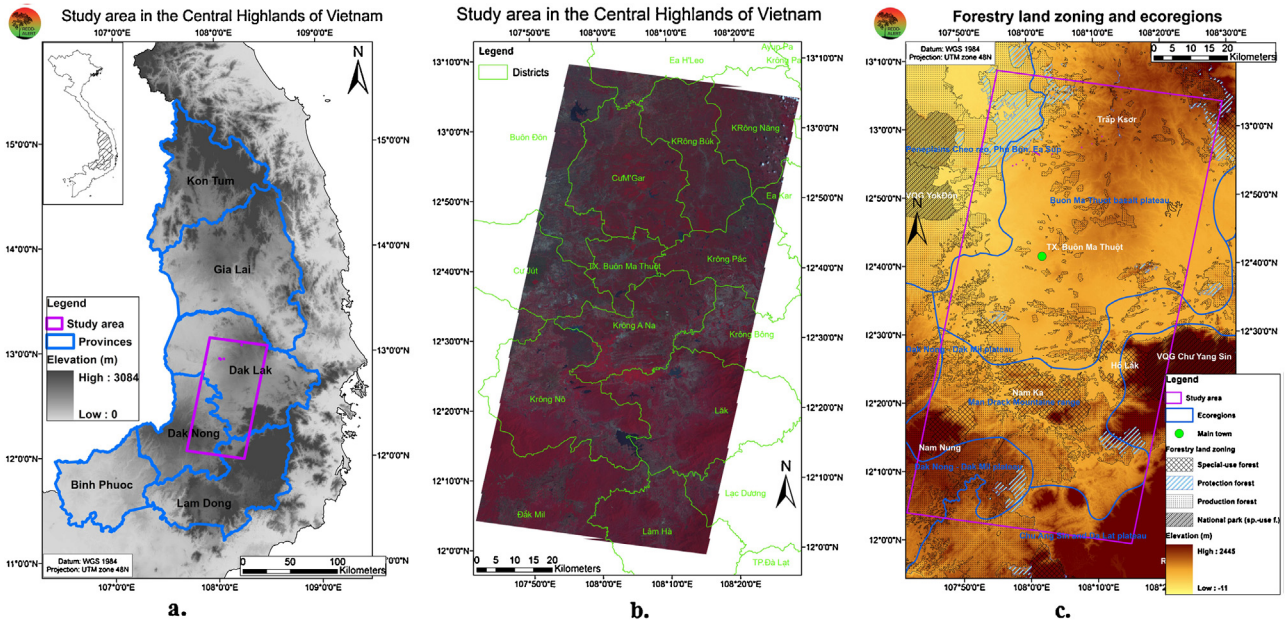

Fig. 1. Study site in the Central Highlands of Vietnam. (a) Location of the study site with identification of the Central Highlands provinces. (b) Infrared colour-composites of the 2010 Aster images, with outlines of the district boundaries. (c) Forestry land zoning, ecoregions and elevation in the study area.