



# Land tenure, asset heterogeneity and deforestation in Southern Burkina Faso



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## ABSTRACT

Deforestation in Burkina Faso is estimated to be between 0.91–1.03% per annum and displacement by croplands or rangeland expansion is identified as its main drivers. The climate and geography of the country causes its north and central regions to be exposed to drought and desertification, which act as stimuli for rural migration to southern Burkina Faso which lies in the South-Sudanian climatic zone. This zone has better conditions to support rain-fed agricultural production, wood energy supply and fodder for livestock but it also experiences the highest rate of deforestation in the country. This study analyses the drivers of deforestation in Ziro province of Southern Burkina Faso. For data collection and analysis, the area of forest cleared annually was used as the dependent variable, whereas household characteristics and local institutions (tenure and property rights) were considered independent variables. Data were collected through focus group discussions (FGD), participant observation, interviews with key informants and from 200 farm households. Tobit regression results reveal that land tenure insecurity and low agricultural production expressed in the sizes (areas) and ages of farms led to increased deforestation. In addition, the significance of tenure insecurity as a driver of deforestation indicated that migrants contributed more to deforestation than the indigenous groups. Greater rights and improved legal status might reduce the rights to limited use granted to migrants. Furthermore, supports from government to increase local community's capacity to monitor protected forests are likely to reduce field expansion.

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## 1. Introduction

The competing complex relationship between demand for agricultural land and forest resources has gained global attention among development circles for many decades. This situation results from natural and anthropogenic modifications to the landscape that interfere with socio-economic and ecological systems. The upshot of these modifications are microclimate variability, rising commodity and land prices, deforestation, loss of biodiversity and loss of the traditional livelihoods of indigenous people (Alston et al., 2000; World Bank, 2010). Agricultural expansion has been identified as the major driver of tropical deforestation. Gibbs et al. (2010) showed that between 1980 and 2000, 83% of all new agricultural land in the tropics came from either intact (55%) or disturbed forests (28%).

The depletion of the forest cover in the tropics due to these socio-economic and political factors is reflected in the changing structures and species compositions of the existing forests (Schwartz and Caro, 2003). The forests of Africa are the most depleted of all the tropical ecosystems with only 30% of the historical stands still remaining (Chidumayo and Kwibisa, 2003). Field expansion that occurs in tropical regions appears

to be related to structural features of the agricultural sector and result from such factors as low farm productivity and input use (FAO, 2003). It has been estimated that, 19% of the contribution to total crop production increases in poorer economies are likely to have been derived from the expansion of cultivated land into forests (FAO, 2010).

Two forest types are common in Burkina Faso; the Sudanian and Sahelian vegetation. The former consists of savannahs, open woodlands and gallery forests while the latter are scrublands dominated by Acacia spp., steppe shrubs and scattered trees. These forests are under two management regimes; protected and classified forests and over 70% of the country's forest is found in the southwestern region. The classified forests (25%) are the parks that are strictly protected from livestock and farming while the protected forests are the managed forest inclusive of the village forests (Kambire et al., 2015). Protected forests are exposed to deforestation and a study found that field expansion is the dominant driver of forest loss in Burkina Faso (Reenberg et al., 2003). The deforestation rate of Southern Burkina Faso is estimated at 0.96% per annum (Ouedraogo et al., 2010) as a result of forest and woodland conversion into crop and rangelands whereas the national rate per annum for the whole country range from 0.91 to 1.03% (FAO, 2010; Fischer et al., 2011).

Some studies support the view that, increases in yields per hectare of agricultural land are critical to saving the world's remaining forests

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by limiting losses of biodiversity from deforestation (Green et al., 2005) and also by limiting net greenhouse gas emissions (Burney et al., 2010). Technological change that improves productivity on existing agricultural land saves natural ecosystems from being converted and used for agriculture. According to Borlaug (2007), the intensification of agriculture that occurred between 1950 and 2000, was partly achieved as a result of the technological changes made possible by the Green Revolution, and these saved 1.2 billion hectares of forest. Unfortunately, agricultural intensification in developing countries has been an uneven process that has incurred social costs, particularly in the form of asset heterogeneity and disparate environmental trade-offs (Gray, 2005). Furthermore, poor agricultural intensification and development implies an increased pressure to convert forests and other marginal lands to crop production.

Research on the population–environment nexus in relation to deforestation, degradation and resource management has been addressed differently in relation to methods and scale. A study on land rights on investment incentives in Burkina Faso showed no significant effects (Ouedraogo, 2002). However, the existing traditional village order provides the basic land rights required to stimulate small-scale investment (Brasselle et al., 2002). Agricultural land expansion and deforestation are influenced by the biophysical, socioeconomic and institutional environment of the locality. These complex processes and factors determine natural resource management strategies in the Sahel (Reenberg et al., 2003). Past studies on deforestation in Burkina Faso have hitherto focused on land use trajectory analysis (Wardell et al., 2003; Ouedraogo et al., 2011), land cover change and population dynamics (Ouedraogo et al., 2010), rural migration and environmental degradation (Ouedraogo et al., 2009), with little focus on the role of tenure issues on deforestation.

Thus, deforestation is obviously multifaceted and understanding its drivers should go beyond changes in land uses over different time periods. Hence, in spite of this wealth of knowledge on the drivers of deforestation in Burkina Faso, a study on institutional and household determinants as drivers of deforestation is imperative. A study by Brasselle et al. (2002) concentrated on investment incentives in relation to tenure security but there are no studies that directly link household socio-economic determinants to deforestation in Burkina Faso. This present investigation on land tenure, asset heterogeneity and deforestation is the very first study that analyzes deforestation from the socioeconomic and institutional point of view. It explores the relationship between household socio-economic and institutional characteristics and deforestation in Southern Burkina Faso using annual mean area of cleared forest per household as the dependent variable over the 10 year period of 2003–2013.

## 2. Conceptual framework

Agricultural technology (Angelsen and Kaimowitz, 2001) and impoverishment (Sunderlin et al., 2008) as drivers of tropical deforestation have been cited. The neo-classical, political and ecological approach (Wunder and Verbist, 2003) focused on institutions at local, regional and national levels together with agents' reactions to incentives as some of the main factors responsible for deforestation. Barbier and Burgess (2001) showed that, four distinct broad analytical approaches can be used in the estimation of agricultural land conversion and deforestation: (a) the environmental 'Kuznets' curve (EKC) hypothesis, (b) competing land-use models, (c) forest land conversion models, and (d) institutional models.

This study focuses on institutional models. The neo-classical approach is suitable for such analysis but it doesn't fully capture the local institutions, asset heterogeneity and livelihoods. The New Institutional Economics approach (Hubbard, 1997; Clague, 1997) is more valuable in assessing tropical deforestation especially when it is based on local institutions and household socioeconomic characteristics (Wunder and Verbist, 2003) thus this approach, was used in this study. This study concentrates on open access property rights, the importance of large and small agents, and agents' reactions to incentives as these are some of the main factors responsible for deforestation. Small and poor

farmers manage risks by means of diversification (e.g. planting trees on farms or cultivating various varieties of the same species, off-farm sources) of income and as safety nets during unfavorable harvests (Little et al., 2001; Dorsey, 2008). Agricultural diversification differs according to local agro ecological characteristics and intensification is considered one of its 'multiple faces' (Le Coq and Trebuil, 2005). The process of intensification in Burkina Faso has been uneven and in some cases leads to field expansion (Gray, 2005).

Household and farm-specific variables include among others: the level of education, the farmer's age, family size, farm size (area), number of farms, farm age, resident status, tenure security, household annual income, etc. Shalli (2003) showed that, education had a remarkable positive impact on the sustainable management of natural resources. A study by Mitinje et al. (2007) considered education from the point of view being the key to the successful implementation of improvement opportunities for development and to the increased accessibility of information and services. Age of the household head was inversely correlated with deforestation and forest clearance among Ameridians, in Honduras (Godoy et al., 1997). The reasons for such an inverse association are that, the area of forest cleared reduces after a household's children move out of the house and when farmers reach the peak of their physical strength. The size of the household may also have a positive impact on deforestation as it influences demand for fuelwood and agricultural land for expansion (Vance and Geoghegan, 2004). Finally, farmers might opt for different land use options based on characteristics such as farm size and available labor (Wannasai and Shrestha, 2008).

Local institutions related to property rights (access to and control of resources), access to labor markets and technology are important determinants of reducing deforestation (Wunder and Verbist, 2003). Insecure land tenure has been identified as one of the causes of increased deforestation in sub-Saharan Africa because it leads to suboptimal incentives for investment (Alston et al., 2000; Brasselle et al., 2002; Mekonnen, 2009). Wunder and Verbist (2003) argued that secure tenure does not always support optimal natural forest management. According to those authors, secure tenure had more positive effects on tree planting and agro-forestry than on the management of natural forest. In contrast, a recent meta-analysis (Robinson et al., 2013) concluded that tenure security is associated with less deforestation regardless of the form of tenure. Thus, land tenure security can act as a crucial factor in land use decision-making (Wannasai and Shrestha, 2008).

In rural Burkina Faso, land tenure is governed by customary rules through the land chiefs and land rights differ between the indigenous and migrant groups (Ouedraogo, 2002). Ouédraogo (2006) found that, land tenure types in Burkina Faso includes one of the following; (i) rights of permanent use, granted to the indigenous group (autochthons), (ii) rights of permanent use, acquired by claiming unclaimed forested land (open woodlands without protection), (iii) rights of limited use, extended to indigenous group who need to borrow land. Depending on the group, these previous 3 may become rights of permanent use if held for more than one generation, (iv) rights of limited use, granted to 'strangers' (non-indigenous people) who are borrowing the land. These latter rights can become permanent after generations of being passed down, particularly if the borrower has improved the land (Gray, 2002). Though migration into this region have increased during the last thirty years (Ouedraogo et al., 2009), migrants have not lived for a century to hold permanent claims to land. In addition, violation of local rules governing land is tantamount to withdrawal. Thus, based on the above reasoning on tenure arrangements, migrants occupy borrowed lands and their tenure is unsecured.

## 3. Empirical analysis

### 3.1. Study area

The present study was conducted in the Cassou, Vrassan, Dao and Kou districts, which are located in Ziro province of Southern Burkina

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