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Research Article

# Assessing of Plant Cover Degradation in Dogo-Ketou Classified Forest between 2000 and 2014

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***Abstract***

*The last 14 years are subject to significant spatial disparity of vegetation cover in Dogo-Kétou classified forest (Benin, West Africa). Anthropogenic pressures associated to drought accelerated that degradation. Time tracking between 2000 and 2014 for this situation has earned to initiate the present study, The primary expectation is to characterize the state of the current vegetation cover in the period. Satellite image processing Landsat TM 2000 and Landsat 8 OLI 2014 revealed that 95.54% of gallery forests and 50.98% of wooded savannah disappeared between 2000 and 2014 in Dogo-Kétou classified forest. The land survey confirms advanced savannization and sahelisation evidenced by the proliferation of certain plant species belonging to family* ***Combretaceae*** *and* ***Mimosaceae*** *families. If no action is taken, Dogo-Kétou classified forest will shortly disappear.*


***Keywords*** *: Dogo-Kétou classified forest ; spatial disparity ; gallery forests ; wooded savannah.*

## Introduction

The world's original forest area, estimated at about 6 billion hectares, has declined steadily and about one-third of the forests have been lost during the past few hundred years (Sharma *et al*., 1992). Naoto (2006) found Africa to lead the list of countries with the highest rate of deforestation. In that light, Brian (1993) identified poverty as a primarily cause of tropical deforestation. Land-use changes are among the primary forcings of climate change, both at regional and global scales (Avissar and Werth, 2005 ; Foley *et al*, 2005), among others. Similarly, climate changes can impact the current global vegetation distribution and will further modify it in the future (Salazar *et al*, 2007). Allen and Barnes (1985) mentioned that the causes of deforestation in developing countries is driven by population growth, intensive harvesting of forests for fuel wood, in other words for subsistence and exports.

Modern tropical deforestation has been the subject of considerable academic study, much of it concluding that policy failure is usually a more important driver of tropical deforestation than market failure (Folmer and van Kooten, 2007). The need to feed a growing population and the effects of global climate change are expected to put further pressure on natural resources (FAO, 2011b). Hand-crafted products made primarily of wood and other forest products are the source of livelihoods for at least 100 million artisans and their families in rural communities (Scherr *et al*, 2004). However, as the land degrades people are forced to migrate, exploring new forest frontiers increasing deforestation (Wilkie *et al*., 2000; Amor, 2008; Amor and Pfaff, 2008). Smallholder production in deforestation and the growing number of such producers notably shifting cultivators were the main cause of deforestation (Dick, 1991 ; Barbier *et al*., 1993; Ascher, 1993; Dove, 1993; 1996; Dauvergne, 1994; Porter, 1994; Thiele, 1994 ; Angelsen, 1995; Ross, 1996). Logging does not necessarily cause deforestation. However, logging can seriously degrade forests (Putz *et al*., 2001). Fire used responsibly can be a valuable tool in agricultural and forest management but if abused it can be a significant cause of deforestation (Repetto, 1988; Rowe *et al*., 1992). The role of population in deforestation is a contentious issue (Mather, 1991; Colchester and Lohmann, 1993; Cropper and Griffiths, 1994; Ehrhardt-Martinez, 1998; Sands, 2005). Therefore poverty is well considered to be an important underlying cause of forest conversion by small-scale farmers and naturally forest-dense areas are frequently associated with high levels of poverty (Chomitz *et al*., 2007). It is essential to distinguish between microclimates, regional climate and global climate while assessing the effects of forest on climate (Gupta *et al*., 2005) especially the effect of tropical deforestation on climate (Dickinson, 1981).

## Materials and Methods

The material used consists of global positioning system (GPS), Landsat satellite image, and software (Arcgis 10.1 Envi 4.8, Excel, SPSS IBM 21). The first step was the acquision Landsat images on the site of the United States Gelological Survey (www.earthexplorer.usgs.gov ). The

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**Table I :** Correlations between forest cover units from 2000 to 2014

| | | Gallery forest | Savannah | Grassland | Bare soil |
|---|---|---|---|---|---|
| **Gallery forest** | Pearson Correlation | 1 | 1** | -1** | -1** |
| **Savannah** | Pearson Correlation | 1** | 1 | -1** | -1** |
| **Grassland** | Pearson Correlation | -1** | -1** | 1 | 1** |
| **Bare soil** | Pearson Correlation | -1** | -1** | 1** | 1 |
| ****. Correlation** is significant at the **0.01 level** (2-tailed). | | | | | |

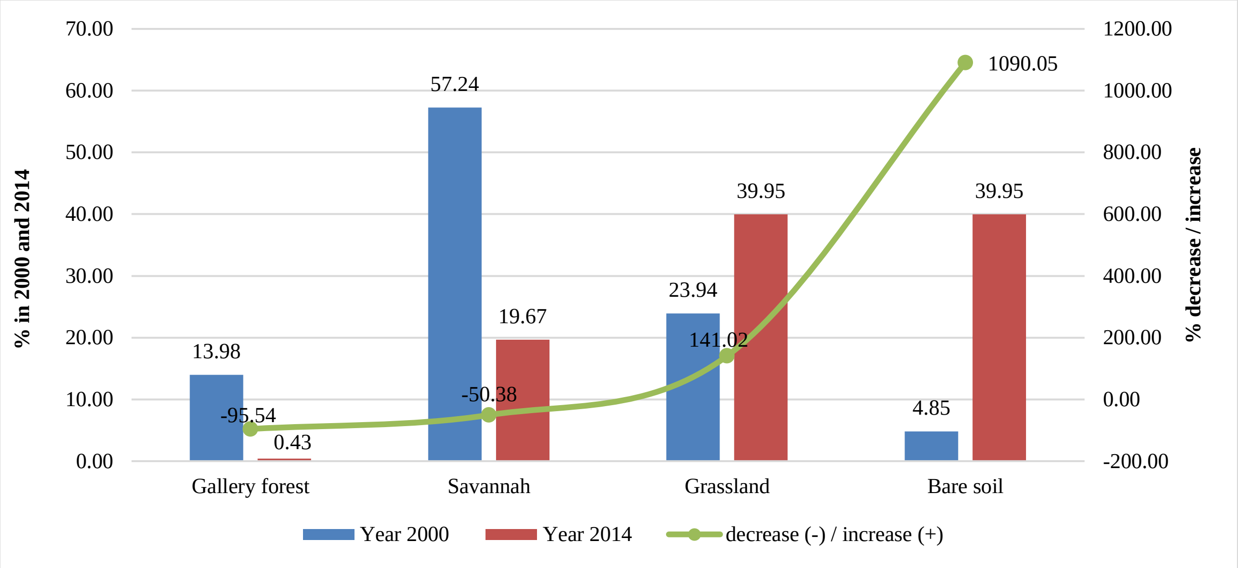


**Figure 1** : Evolution of plant cover from 2000 to 2014 in Dogo-Kétou forest

images were imported into Envi 4.8 for classification. Each cluster of observations is a class. A class occupies its own area in the feature space i.e. a specific part of the feature space corresponds to a specific class. Once the classes have been defined in the feature space, each image pixel observation can be compared to these classes and assigned to the corresponding class. Classes to be distinguished in an image classification need to have different spectral characteristics, which can be analyzed by comparing spectra reflectance curve. The only limitation of image classification is that if classes do not have distinct clusters in the feature space. Such image classification does not give reliable results. Training sites were generated on the images by on-screen digitizing for each land cover classes derived from image of different band combination. A supervised maximum likelihood classification was implemented for the two images.

The delineation of training areas representatives of a cover type is most effective when an image analyst has knowledge of the geography of a region and experience with the spectral properties of the cover classes. The image analyst then trains the software to recognize spectral values or signatures associated with the training sites. After the signatures for each land cover category have been defined, the software then uses these signatures to classify the remaining. Areas were calculated using ARC GIS 10.1 software and compared changes for both images. Corelation analysis were directly made in SPSS software.

## Results

The results are shown in Table I, Figure 1,2 and 3.

## Discussion

Moreover deforestation can lead to increase in the albedo of the land surface and hence affects the radiation budget of the region (Charney, 1975 ; Rowntree, 1988 ; Gupta *et al*., 2005). Deforestation affects wind flows, water vapour flows and absorption of solar energy thus clearly influencing local and global climate (Chomitz *et al*., 2007). Deforestation on lowland plains moves cloud formation and rainfall to higher elevations (Lawton *et al*., 2001). Thus deforestation disrupts the global carbon cycle increasing the concentration of atmospheric carbon dioxide. Tropical deforestation is responsible for the emission of roughly two billion tonnes of carbon (as CO2) to the atmosphere per year (Houghton, 2005). Release of the carbon dioxide due to global deforestation is equivalent to an estimated 25 per cent of emissions from combustion of fossil fuels (Asdrasko, 1990). Deforestation, in other words, is an expression of social injustice (Colchester and Lohmann, 1993). In this study, the satellite images were classified using supervised classification method. The combine process of visual image interpretation of tones/colours, patterns, shape, size, and texture of the imageries and digital image processing were used to identify homogeneous groups of pixels,

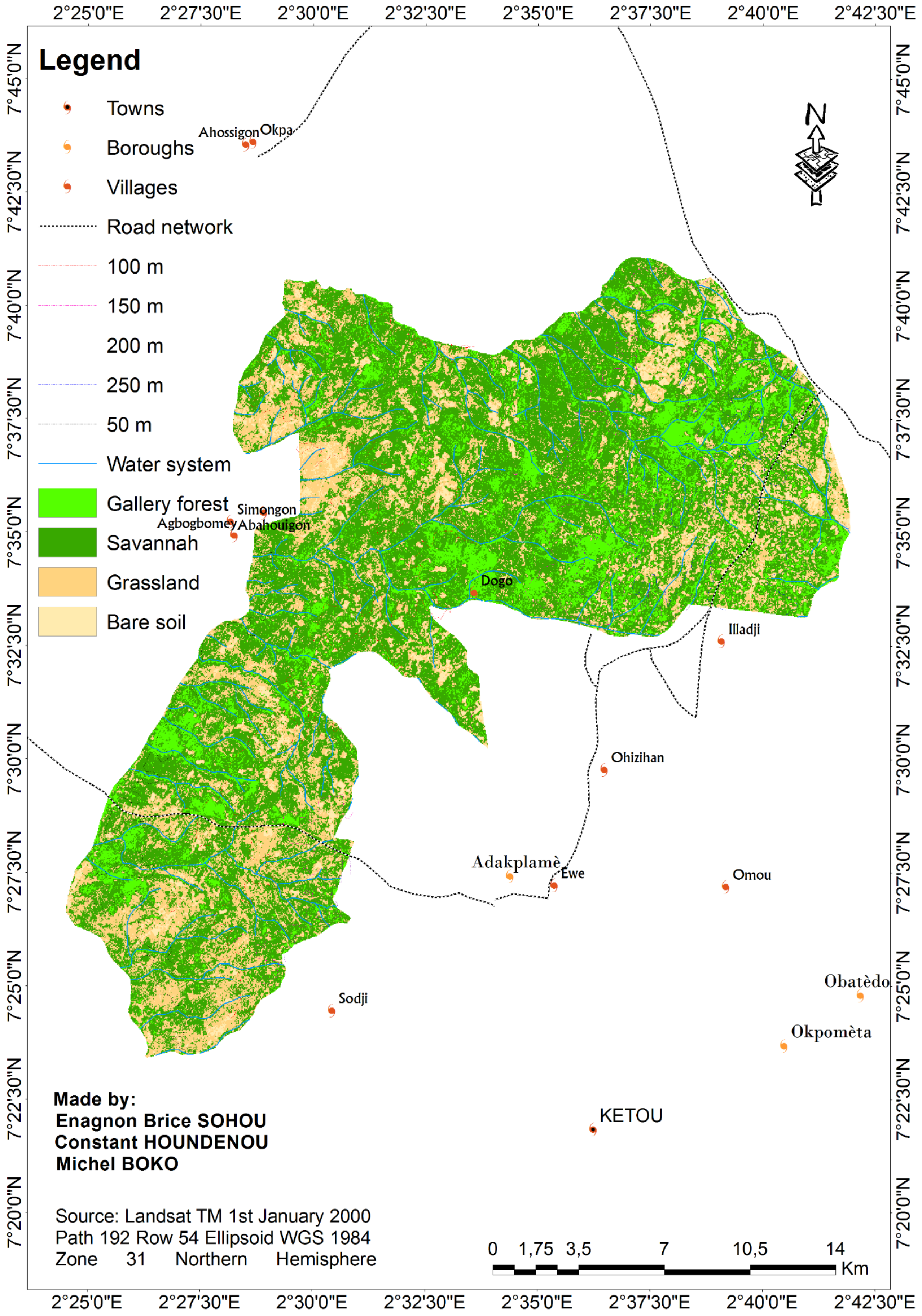


**Figure 2** : State of Dogo-Kétou forest in 2000

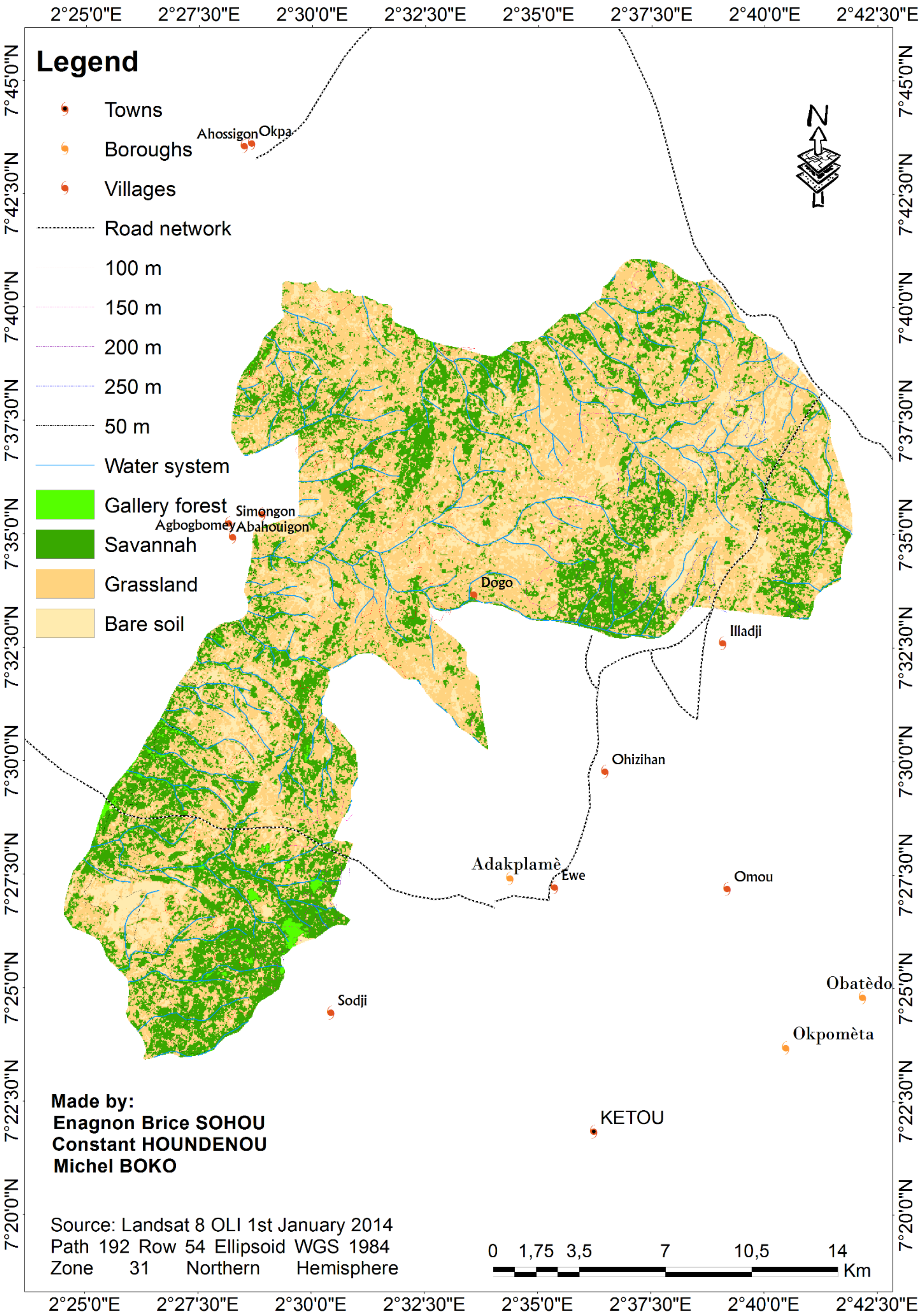


**Figure 3** : State of Dogo-Kétou forest in 2014

which represent various land use classes of interest. The thinning, changing, and elimination of forests deforestation, no less is not a recent phenomenon; it is as old as the human occupation of the earth, and one of the key processes in the history of our transformation of its surface (Williams, 2002). Over a period of 5 000 years, the cumulative loss of forest land worldwide is estimated at 1.8 billion hectares an average net loss of 360 000 hectares per year (Williams, 2002).

A recent statistical analysis of deforestation in 59 developing countries from 1972 to 1994 confirmed that the failure of political institutions plays a significant role in deforestation, but found no conclusive evidence in the sample to suggest that progress in development is associated with a slowing of the rate of deforestation (Van and Azomahou, 2007). The exploitation of the forest resource for private gain is apt to lead to its deterioration or eventual destruction" because "the private individual can hardly be expected to appreciate distant interests of his own motion in the management of his forest property, hence the state must guard them" (Fernow, 1902). Planting a tree is one of the very few human actions which can really be called altruistic. A person plants a tree for his children, his grandchildren, or even for their children, but not for himself (Seymour, 1983). In the past decade alone, about 130 million hectares of forest were lost, of which 40 million hectares were primary forests (FAO, 2010b). This forest loss and degradation are estimated to cost the global economy between USD 2 trillion and 4.5 trillion a year (Sukhdev, 2010). The need to feed a growing population and the effects of global climate change are expected to put further pressure on natural resources (FAO, 2011b). At the global level, the sector contributes about 1.0 percent of GDP and employs about 0.4 percent of the total labour force (FAO, 2008).

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