



## Tropical forest recovery and socio-economic change in El Salvador: An opportunity for the introduction of new approaches to biodiversity protection

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### A B S T R A C T

#### Keywords:

Tropical forest recovery  
Secondary forest  
Sustainable natural resource management  
Cinquera Natural Area  
El Salvador armed conflict

During the last few decades El Salvador has been considered as one of the most deforested countries in Latin America. Nevertheless, recent studies have pointed out the important forest recovery process currently occurring, which is favoured by socio-political changes recently experienced in this country. The latest research on forest recovery has been done at the level of the entire country; however, socio-environmental processes at the local level have not yet been examined. This article discusses the forest regrowth process at the local level in the natural area of Cinquera during the period from 1942 to 2004. It also illustrates how the effort made by local communities becomes an opportunity for the introduction of a new approach to biodiversity protection in El Salvador.

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### Introduction

The armed conflict in El Salvador in the period from 1980 to 1991, characterized by an escalating abuse of human rights and the death of thousands of people, led to the abandonment of several rural areas as the population migrated to refugee centers seeking to safeguard their lives (United Nations, 1993). Many cultivation areas were abandoned due to the exodus of this period, giving rise to forest regrowth processes which ended up in increasing the forest areas in the region. Apart from the Civil War, changes in the socio-economic context have contributed to this natural recovery due to the decreased pressure on the forestlands brought about by the fading agricultural activity.

By the end of the 20th century, El Salvador reported extremely low forest coverage of around 3–5% over the national territory

(FAO, 2001; PRISMA, 1996).<sup>4</sup> However, recent research has revealed the existence of areas with secondary forest grown as a result of natural recovery. According to this research the percentage value has been increased to 19% of the territory (Hecht & Saatchi, 2007).

These areas of secondary forest in El Salvador went unnoticed by policymakers for several years, partly due to the lack of information on their existence and ecological significance, and also due to the conservation approach in El Salvador which considers forests as “pristine areas”, underestimating the ecological and social significance of recovery areas with human intervention in the landscape. The secondary forests of El Salvador are characterized by high biodiversity values, which in turn are positively correlated with the presence of human activity on the landscape. There are many examples of this positive correlation (Chazdon, Harvey, et al., 2009; Herrmann & Torri, 2009; Toledo, 2005). Boege (2005) conducted a study that highlights the positive correlation between the areas of greatest biodiversity on the planet and the regions densely inhabited by indigenous people, matching the areas of high biological diversity and linguistic diversity.

Recent work reporting the existence of new secondary forest areas in El Salvador has been carried out on a nationwide scale. Owing to the limited cartographic information available, the

*Abbreviations:* ARDM, Association for the Reconstruction and Municipal Development of Cinquera (Asociación para la Reconstrucción y el Desarrollo del Municipio de Cinquera); IUCN, International Union for Conservation of Nature; MARN, Ministry of Environment and Natural Resources (Ministerio del Medio Ambiente y Recursos Naturales); SANP, System of Protected Natural Areas (Sistema de Áreas Naturales Protegidas).

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<sup>4</sup> El Salvador has a total area of 21,000 km<sup>2</sup>. The first documented estimates of forest cover are from 1978 and were conducted by the General Directorate of Renewable Natural Resources; the paper reported 190,300 ha of forest (9% of the territory). In subsequent years, there were other estimates that reported reductions in forest cover (FAO, 2001; PRISMA, 1996).

transformation has not yet been individually analyzed in every zone in which it occurred. Verburg et al. 2006; Redo, Joby Bass, and Millington (2009) mention the importance of analyzing the dynamics of forest cover change at specific sites and at the local level. After analyzing the change of forest cover in four areas of western Honduras, Redo, Joby Bass, and Millington (2009) found deforestation dynamics in some areas and forest recovery in others and drew attention to the importance of analyzing the immediate causes of the changes.

The present study addresses the Cinquera Natural Area at the local scale based on a nationwide analysis, focusing on socio-economic and political factors as the main causes of the forest recovery process. It also examines the environmental policies applied in recent years in El Salvador.

For this study, an analysis of land use, land use change and forestry (LULUCF) in the Cinquera Natural Area was made for three different years: 1942, 1978, and 2004. The analysis used aerial photographs after a process of orthorectification, photointerpretation and digitalization. This process facilitated the creation of LULUCF maps for the three mentioned years. In addition, landscape indexes were estimated which allow better visualization of the impact of forest cover and land use changes on the conservation of forest during each period (Messina, Walsh, Mena, & Delamater, 2006; Turner, 1990). In the particular case of the Cinquera Natural Area, besides the socio-economic and political factors contributing to the forest recovery process, the protective actions taken by the organized local community are one of the most important factors.

Currently, there is a major scientific debate over the impact of human population presence on natural areas and on the effects of its exclusion of land management of these areas (Brandon, 1995; Ellis & Porter-Bolland, 2008; Fletcher, 1990; Southworth, Nagendra, Carlson, & Tucker, 2004; Southworth, Nagendra, & Munroe, 2006). It is interesting to note that in the late 1990s, the International Union for Conservation of Nature (IUCN), added to its management categories for natural areas a sixth one, "Protected Area for Resource Management", which considers the participation of human activities in natural areas (Dudley 2008). The analysis presented here contributes to this scientific debate by providing elements in favour of socially-inclusive approaches for the management of natural areas.

### **Background: forest recovery, political-economic changes and migration in El Salvador**

Owing to its geographical situation, El Salvador is considered as one of the countries with a highest biodiversity in the area. Browning (1988) mentions that during the Spanish occupation in the 16th century, this small territory of 21,000 km<sup>2</sup> was covered by forest and had a highly fertile soil.

Later, during the decades of 1960 and 1970, the agricultural sector experienced an extraordinary boom, placing agro-exports at 80% of the foreign currency revenues. Many forest areas were turned into plantation fields for sugar cane, cotton, and coffee, giving rise to deforestation dynamics that transformed countless hectares of forest.

It is difficult to measure these deforestation dynamics because of the limited information available, which originates from diverse sources using different methodologies and approaches. Cuéllar et al. (unpublished results) mention five different studies which show that forest cover between 1978 and 2002 was, on average, at

7.55% of the national territory. When the area of shade-grown coffee is included, the coverage increases to 16%.<sup>5</sup>

Nonetheless, these figures do not reveal the phenomenon of forest recovery started during the 1980s (Hecht, Kandel, Gomez, Cuéllar, & Rosa, 2006; Hecht & Saatchi, 2007) that is evident in the most recent land use map of the country produced using the Corin Land Cover methodology. This map reveals that forest coverage reaches 19% (393,009 ha) of the territory. Adding the shade-grown coffee areas, this percentage increases to 29% of the territory (599,856 ha). Hecht and Saatchi (2007) analyzed Landsat satellite images with resolution of 30 m for the years 1992 and 2001 and documented the fact that deforestation dynamics were accompanied by a process of natural secondary forest regrowth in several areas of the country, a phenomenon that started during the armed conflict of the 1980s.

Based on this work (Hecht & Saatchi, 2007), deforestation took place over 670,000 ha, while some type of recovery occurred over 1,100,000 ha. This results in a positive balance with a 22% relative increment of forest area in zones with 30% tree cover, and 6.5% relative increment in zones with greater than 60% tree cover.

### *Economic change and the agricultural sector crisis*

On abandoned farmland across El Salvador, forest regrowth has been observed in some areas in recent decades. This process is explained by the economic and political changes over the last few decades. Until the end of the 1970s the Salvadorean economy depended largely on the agro-export sector (the main products being coffee, cotton, sugar cane and shrimp), to the extent that this rubric accounted for 80% of foreign revenue. By 2000, this sector had fallen drastically to 11% (see Chart 1). While the non-traditional exports sector of Central America also recorded a modest decline, other sectors grew, as in the case of the textile assembly industry (maquila) and the remittances from Salvadoreans abroad, the latter increasing from 8% of foreign revenue in 1978 to 67% in 2000 (Cuéllar, Larios, & Rosa, 2002; Hecht et al., 2006).

During the 1990s the service and financial sectors were stimulated.

The rise of these urban activities completely relegated the agricultural sector, which experienced a reduction in almost all cropland areas. Chart 2 shows the decrease in the coffee production, one of the major export-oriented crops. This decrease in agricultural activity also reduced strain on forest areas, indirectly slowing down the deforestation which characterized the 1970s.

### *Emigration and remittances: socio-environmental impact*

The emigration phenomenon has characterized the national socio-economic context. Emigration began in the middle of the 20th century and rose during the 1980s due to the armed conflict (1980–1991). It is estimated that 20% of the population emigrated abroad, 90% of which went to the United States. It is also estimated that some 50,000 people emigrate annually at present, even after the armed conflict has ended. Consequently, by 2000 an average of 20% of Salvadorean households received remittances<sup>6</sup> (Kandel, 2002; Lungo & Kandel, 1999).

Chart 3 shows the remittances growth and how they exceeded the foreign revenues generated by agro-exports and maquila exports since 1998.

These socio-economic changes, as well as the armed conflict, have helped to reduce pressure on forest areas. This has resulted in

<sup>5</sup> In El Salvador, coffee cultivation is done in the shade of trees, which means that part of the original forest is kept. For this reason coffee is considered of great ecological importance due to the biodiversity and ecosystem services it provides.

<sup>6</sup> According to the 2007 Census, El Salvador's population that year was 5,744,113 and the density, 274/km<sup>2</sup>.

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