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Synthesis

Forest Landscape Restoration in the Drylands of Latin America

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ABSTRACT. Forest Landscape Restoration (FLR) involves the ecological restoration of degraded forest landscapes, with the aim of benefiting both biodiversity and human well-being. We first identify four fundamental principles of FLR, based on previous definitions. We then critically evaluate the application of these principles in practice, based on the experience gained during an international, collaborative research project conducted in six dry forest landscapes of Latin America. Research highlighted the potential for FLR; tree species of high socioeconomic value were identified in all study areas, and strong dependence of local communities on forest resources was widely encountered, particularly for fuelwood. We demonstrated that FLR can be achieved through both passive and active restoration approaches, and can be cost-effective if the increased provision of ecosystem services is taken into account. These results therefore highlight the potential for FLR, and the positive contribution that it could make to sustainable development. However, we also encountered a number of challenges to FLR implementation, including the difficulty of achieving strong engagement in FLR activities among local stakeholders, lack of capacity for community-led initiatives, and the lack of an appropriate institutional and regulatory environment to support restoration activities. Successful implementation of FLR will require new collaborative alliances among stakeholders, empowerment and capacity building of local communities to enable them to fully engage with restoration activities, and an enabling public policy context to enable local people to be active participants in the decision making process.

Key Words: *biodiversity; conservation; dryland; ecological restoration; forest landscape; Latin America; reforestation; rehabilitation*

INTRODUCTION

In recent years, restoration ecology has advanced significantly both as a scientific discipline and as a practical approach to environmental management (Young et al. 2005, Brudvig 2011, Bullock et al. 2011). It is now widely recognized that ecological restoration can make a positive contribution to sustainable development, by strengthening the provision of natural resources on which human livelihoods depend (Nellemann and Corcoran 2010). This is illustrated by the incorporation of ecological restoration among the objectives of global environmental policy. For example, the Convention on Biological Diversity (CBD) recently developed 2020 Headline Targets (http://www.cbd.int/decision/cop/?id=12268), which aim for the restoration of at least 15% of degraded ecosystems. Similarly the European Union aims to restore biodiversity and ecosystem services by 2020 (http://www.eu-un.europa.eu/articles/en/article_9571_en.htm).

Chazdon (2008) provides a recent overview of the ecological restoration of forests, highlighting the progress being made in many countries toward reversing recent forest loss and degradation. However, as noted by Chazdon (2008), the implications of large-scale forest restoration for the structure and composition of future landscapes and their associated species remain poorly understood. Information is also lacking on the effects of different restoration approaches on the recovery of ecosystem services, and their links with biodiversity (Chazdon et al. 2009, Palmer and Filoso 2009). As evidence suggests that restoration initiatives may often be unsuccessful, there is a need to understand the reasons for such failures, and the conditions required for successful restoration to be achieved (Palmer and Filoso 2009).

In this study we examine one particular restoration approach, namely Forest Landscape Restoration (FLR). The concept of FLR was first developed by World Wildlife Fund (WWF) and the International Union for the Conservation of Nature (IUCN) at a workshop in 2000, in response to the widespread failure of more traditional approaches to forest restoration (Dudley et al. 2005). Traditional approaches have often been site-based, and have typically focused on one or a few forest products, relied heavily on tree planting of a limited number of non-native species, and failed to address the root causes of forest loss and degradation (Dudley et al. 2005). FLR represents a significant departure from such approaches (Appendix 1). The development and application of FLR has become a major

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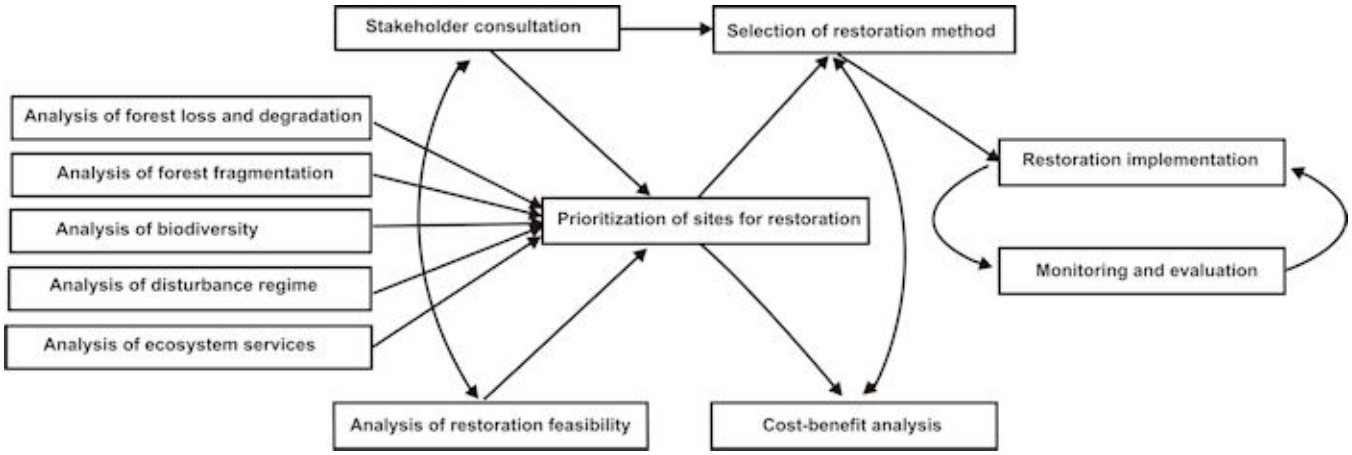
Fig. 1. The process of FLR, and its key elements.



As noted in the text, FLR is a flexible process that will need to be adapted to each individual ecological, socioeconomic, cultural, and political context. The elements illustrated here were those examined in the ReForLan project, and reflect the proposed core principles of FLR (see main text). Stakeholder consultation should occur throughout the FLR process, particularly when identifying where and how restoration actions should be implemented. Such site-level decisions should be made within a landscape context. Cost-benefit analysis can be performed by assessing both the costs and benefits of FLR to people, for example through the spatial analysis and valuation of ecosystem services. Such cost-benefit analysis should inform the selection of the restoration actions undertaken on particular sites. The need for adaptive management is illustrated by the iterative relationship between restoration implementation and monitoring and evaluation.

activity of the WWF and IUCN Forest Programmes, and was further supported by development of the Global Partnership on Forest Landscape Restoration (http://www.ideastransformlandscapes.org/), which now involves more than 25 organizations. Further details of the FLR approach are provided by Lamb and Gilmour (2003), Mansourian et al. (2005) and Rietbergen-McCracken et al. (2007).

If FLR is to be adopted widely, then its effectiveness first needs to be demonstrated. The principal aim of the research described here was to identify the principles underpinning FLR and to examine how these may be applied in practice. Specifically, the research explored application of FLR to dryland forests in Latin America, a forest type that is recognized as a global priority for biodiversity conservation and as being of high importance for supporting human livelihoods (Miles et al. 2006). Dryland areas have also been subjected to widespread degradation (Zika and Erb 2009), arising from human activities such as grazing, burning, and cutting of vegetation. Relatively little research has been undertaken on the impacts of human activities and the potential for ecological restoration of dryland forests. Here we provide a synthesis of the research results obtained by a major international research project (ReForLan, "Restoration of Forest Landscapes for Biodiversity Conservation and Rural Development in the Drylands of Latin America"; Newton 2008), to identify some of the key lessons learned. Further details of the research conducted in six different study areas are presented in a recent book (Newton and Tejedor 2011), to which the reader is referred for additional information. We here identify the general implications of the results obtained by this research, in relation to four fundamental principles of FLR (Appendix 1). The process of FLR implemented in this project is illustrated in Figure 1, and further details of the project are given in Appendices 2-4.

APPLYING THE PRINCIPLES OF FOREST LANDSCAPE RESTORATION (FLR)

Principle 1: FLR is a flexible, participatory process that is based on adaptive management and requires an adequate monitoring program.

As noted by Maginnis and Jackson (2007), active involvement of local stakeholders in planning and management decisions is considered to be an essential component of FLR. This is to ensure that local needs are adequately addressed, and that the distribution of benefits is equitable. Although stakeholder involvement is now widely recognized as essential for effective conservation management (Hockings et al. 1998), its application in FLR has received relatively little attention to