

INTRODUCTION

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Throughout history, vast forests have regenerated naturally after large-scale natural and man-made disturbances. There is evidence of extensive forest regeneration after widespread fire and agriculture in the tropics (see review in LAMB *et al.*, 1997). Pollen records show that forests spread across North America and Europe at rates of up to 1 kilometre per year, following glacial retreat at the end of the Pleistocene (CLARK, 1998).

Humans have long used this natural phenomenon to their advantage. For thousands of years, shifting agriculture has been practised in small clearings and, on a larger scale, foresters have manipulated forest regeneration after logging to maximise the re-growth of desirable timber species (e.g. the Malayan Uniform System). However, the concept of actively promoting natural regeneration to reforest extensive degraded lands is relatively recent, first emerging in the Philippines in the 1970s (JENSEN & PFEIFER, 1989). The Filipinos coined the term “assisted natural regeneration” or “ANR” to describe this approach, although the term “accelerated natural regeneration” is preferred in some circles (DRILLING, 1989). ANR has been implemented and developed in the Philippines for over 20 years but until now, there has been very little published information to enable other nationalities to learn from their experience.

ANR is a flexible reforestation approach, which depends on identifying factors limiting regeneration of woody plants, then implementing management techniques to overcome those factors. In the Philippines, the key limiting factors were fire and growth of weeds, so the methods used included protection from fire and weed control around naturally established woody seedlings or coppice sprouts (DALMACIO, 1987). One innovative technique was to control grass by flattening it using wooden planks suspended by rope handles, rather than cutting it, which tends to stimulate tillering (SAJISE, 1972). Where other factors are found to be limiting, different techniques may be more appropriate.

Even recently abandoned sites dominated by grass and forbs may harbour a surprisingly high number of species of tree seedlings, growth of which can be encouraged by ANR techniques. VAN SON explores this idea in Vietnam in the second paper in this part of the proceedings. However, in sites where there is a low density of woody regeneration, or where desired species are missing, tree species may need to be artificially introduced through enrichment planting of seeds or seedlings. This will usually take place after the initial ANR treatment has been implemented for at least one year to promote natural establishment of woody plants and decrease weed competition. Whether the ultimate objective is wildlife conservation or economic plantations, ANR is an effective first step. As the vegetation develops, serves as a nurse crop for late secondary and primary species, which are planted or establish naturally later on. In some cases, it may be possible to increase natural dispersal of seeds into sites undergoing restoration by providing perches or roosting sites for birds and bats or by planting groups of fruit-bearing trees and shrubs to attract them.

ANR offers an efficient, technologically simple and cost-effective approach to forest restoration. Comparisons carried out in Indonesia showed it to be 26 - 72% cheaper than traditional methods of intensive tree planting (DRILLING, 1989). It is particularly appropriate for remote and inaccessible areas where tree planting would present practical difficulties. Furthermore, by allowing tree communities to re-establish naturally, it ensures that they are ecologically appropriate to the site. Despite these advantages, there has been some resistance to ANR among foresters. One practical drawback of ANR is that both the final species composition of the restored forest and the amounts of time needed to achieve forest cover are uncertain. Also, it is possible that ANR may not be effective in areas far from tree seed sources, although it is not known exactly how close source areas should be.

The first paper in this part shows how ANR fits into the broad range of forest restoration approaches now under development and provides an ecological background to natural regeneration in the seasonal tropics. HARDWICK *ET AL.* review information relevant to developing protocols for site assessment and new methods of ANR and identify areas in need of further research. This general review is followed by two case studies from Southeast Asia. VAN SON concentrates on the botanical side of forest regeneration; his study of agricultural fallows in Vietnam clearly demonstrates the natural process of succession that ANR seeks to accelerate. In the final paper, DUGAN provides a social context for ANR. After presenting an example of its application, he discusses the general uptake of ANR in the Philippines, highlights the importance of community participation and suggests ways of making ANR more socially attractive.

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