

Silviculture in humid lowland forests of tropical America: assessment of current practices and recommendations for future improvement

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The paper reviews and synthesizes past and current silvicultural research and practice for the management of humid primary and secondary forests as well as degraded forest lands in tropical America. This is used to derive some practical lessons to be learned and to identify successful cases and contributing factors. The analysis then focuses on the current application of common silvicultural practices in the region to assess their merits and constraints. A set of guiding principles and "best silvicultural practices" is proposed for two broad management scenarios for silvicultural work (i.e. primary logged-over forests and secondary forests). The last part addresses some ways to improve the adoption of best silvicultural practices in the region. The discussion considers, among other aspects, the potential of on-farm (participatory) silvicultural research, the market prospects for promising timber species, the incentives for forest management, and the need for revision in policy and legislation.

Tropical silviculture: where should we invest?

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Looking at the international literature, the overall perception is that tropical silviculture means plantation forestry. But plantation forestry is not the only alternative for management of forests for wood production in tropical regions. In terms of economic return in short time, no doubt that plantations are the best choice. If other values like biodiversity, environmental conservation or sound utilization of natural resources are aimed, focus should be put on management of natural forests. Very important for tropical silviculture are secondary forests, which may have two origins: overlogged primary forests or a secondary forest succession on former forest lands which were used for agriculture or pastures. Silvicultural treatments are quite distinct for this two types of forests. In the first case, normally biodiversity was not too heavily affected, but wood

quality of the trees is poor. In the second case, the forests have a very simple structure, but with the absence of the valuable, slow growing tree species. Silviculture means the manipulation of the forest to achieve objectives, which may be a special product (e.g. wood), service (e.g. carbon fixation) or other commodity. For correct actions we need knowledge of a lot of relationships, between tree species (like *allelopathy*), between trees and soil organisms (like *mycorrhiza*), and between trees and animals (insects, birds and rodents). Also the growth reactions to interferences in forest structures must be known, and manipulation of the forest needs labor. Mechanization is highly developed for plantation forests, but nearly zero in terms of silvicultural treatments in tropical forests. Therefore, governments, industries and researchers should invest much more efforts in the development of tropical forest knowledge, in terms of research as well as practical applications in forest areas.

If forest certification is aimed, still more knowledge is needed. In the guidelines for certification, expressions like "minimization of changes in structure and species composition", "minimization of damages due logging operations" or "ecological functions are kept intact" are quite common and should be combined with improvement of income, for the forest workers as well as for the forest owner. But how to achieve this was never explained by practical demonstrations on the long run. Again, much expertise is required, for the millions hectares of secondary forests in tropical regions.

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markets for carbon sequestration from
tropical forests**

International Markets for Carbon Sequestration from Tropical Forests: Principles and guidelines to Ensure Beneficial Local Development and Environmental Impacts.

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Decisions taken at Kyoto in 1997 and Buenos Aires in 1998 pave the way for international financial and technological transfers to support forest-based activities that enhance carbon storage and sequestration and thus mitigate the build-up of carbon concentrations in the atmosphere. Carbon-related services of tropical forests may be more