Making secondary forests visible

Secondary forests have long been ignored by policy-makers, but that must change

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Not second class: secondary forest in Putamayo, Colombia. *Photo: H. Bravo*

ALTHOUGH reliable figures are not available, secondary tropical forests are almost certainly becoming more common: estimates range from 340 million (FAO 1996) to 530 million hectares (Emrich et al. 2000) across the tropics.

Despite their increasing abundance, secondary forests have been largely overlooked by policy-makers and foresters in many tropical countries. This 'invisibility' stems partly from the lack of a clear definition of the term, which has been used to describe a variety of forest conditions. Moreover, secondary forests, especially in younger stages dominated by shrubs and pioneer tree species, are frequently regarded as undesirable and without economic value and are consequently removed to make room for more 'productive' land-uses. On the other hand, some 250–500 million farmers on one-fifth of the world's tropical forest area value tropical secondary forests for their role as fallow vegetation in shifting cultivation systems.

Apart from problems of definition and perception, there is a lack of information on the extent and current and potential value of secondary forest resources and on appropriate management options. The lack of recognition leads to low political priority and a scarcity of financial resources and constrains the development of research, training and dissemination programs.

This article attempts to shed some light on the 'invisible' secondary forests, what they are, how they develop and how they might be managed sustainably for the production of a wide range of goods and services.

What are secondary forests?

ITTO (2002) defines secondary forests as:

> *woody vegetation regrowing on land that was largely cleared of its original forest cover (ie carried less than 10% of the original forest cover). Secondary forests commonly develop naturally on land abandoned after shifting cultivation, settled agriculture, pasture, or failed tree plantations.*

Secondary forests may also be the result of natural forest regeneration after catastrophic natural disturbances such as wildfires, storms, landslides and floods.

In an attempt to develop a typology of secondary forests, Chokkalingam and de Jong (2001) differentiated between post-catastrophic secondary forests, post-extraction secondary forests (degraded primary forest), swidden fallow forests, forest gardens, post-abandonment secondary forests and rehabilitated forests. Such a typology focusing on the processes underlying the formation and subsequent evolution of secondary forests could be used to guide secondary forest development along desirable pathways and to optimise the good and services they provide.

Secondary forests are an integral part of tropical landscapes. This means that their formation and dynamics are not only influenced by site-level factors but also by an array of interrelated biological and social forces acting at a larger scale—what will be referred to here as the

landscape scale. Conversely, the extent and configuration of secondary forests across a landscape will play an important part in determining the functionality of that particular landscape, which is a measure of the quality and quantity of goods, services, ecological processes and future options the landscape provides. Secondary forests tend to be located in accessible areas, close to human settlements, and are thus served with relatively good infrastructure. They are an increasingly important component of the forest resource in the tropics and, if maintained and properly managed, may provide a wide range of goods and services at local, national and international levels *(see box)*.

How do secondary forests develop?

Tropical secondary forests develop through the process of natural succession, passing through different stages that may be distinguished by the dominance of a given group of plants. In a basic model of succession, herbs, shrubs and climbers dominate the first stage. These establish quickly after human or natural disturbance and become scarcer under the shade of the emerging pioneer tree species, which are able to develop a canopy very quickly and will dominate the second phase for 10–20 years. As they die off, other already-established light-demanding species at the site take advantage of improved growth conditions and gradually become dominant. This is the third stage of succession, which may last for 75–100 years. The gradual occupation of the site by more shade-tolerant species is very likely to be continuous during this and subsequent stages. Differences in survival and growth rates among species at different stages play an important role in succession, determining the set of species that will be present in a given stage. Decreasing light availability at the forest floor during the course of succession is a major reason for these differences.

A range of factors determines the pace at which succession proceeds. Such factors include the intensity and duration of the original disturbance, the distance to primary forest, the availability of seed dispersers, and other site conditions such as local topography, climate, soil characteristics and light availability.

The existence of different regeneration mechanisms plays a crucial role in the speed and course of secondary succession. Resprouts from tree stumps and rootstocks form an important component of the regenerating vegetation, in both dry and moist forests. Regeneration from seed is, however, the main regeneration mechanism for widely dispersed pioneer species, especially after repeated crop-fallow cycles over long periods. In such circumstances, the future tree flora will be formed mainly by that subset of species capable of resprouting repeatedly from vegetative parts. In highly fragmented landscapes in particular, resprouting is often crucial for the regeneration of remaining primary forest species.

The productivity of secondary forests may vary in relation to factors such as site condition, time since settlement and, more specifically, the number of crop-fallow cycles at a particular site. The type and intensity of land-use during the cropping stage and the prevalence of disturbances such as accidental burning during the fallow period will all influence productivity. As succession progresses, total stem density tends to decrease and the stand increases in height, basal area and volume. The first 15 years or so of succession are characterised by rapid biomass accumulation—in exceptional cases by up to 100 tonnes per hectare per year. The relative amount of woody biomass increases rapidly during the first 15–20 years, followed by a steady but slower rate until maturity.

One of the most typical characteristics of secondary forests is the high floristic heterogeneity between stands only short distances apart, at the level of both the canopy and the understorey. This is due mainly to phenological variations in colonising species at the moment of land abandonment, the type of regeneration, and the presence of different species of remnant trees, which can influence species composition. At the regional scale, however, abiotic effects such as differences in rainfall and elevation mostly determine the rate of succession.

Management of secondary forests

Depending on the management objectives, several options for the management of secondary forests may be considered. These include:

- leave to regrow (eg as a land reserve);
- manage as fallow vegetation in the crop-fallow cycle;
- manage as part of an agroforestry system for producing mixed/multi-purpose trees;
- manage as a high-forest production system for wood or multiple-use; and
- convert to tree plantation or to a non-forest land-use.

The age and composition of the forest need to be taken into account in planning, as do the history of the site and local conditions. Given that secondary forests may be located on the land of smallholders, the role of this resource in farm production systems and the factors that underlie decision-making by farmers must be understood in order to identify the management options.

Goods and services from secondary forests

- Secondary forests are used as **fallow** within shifting cultivation systems and are often an integral component of small farmers' agricultural systems for the regeneration of soil fertility and the containment of pests and diseases.
- **Fuelwood and charcoal**, which are the primary energy sources for many rural people in tropical regions, are important secondary forest products.
- **Non-wood forest products** such as bamboo, rattan, edible fruits, medicinal plants, game, etc, are harvested in secondary forests because these forests are generally accessible.
- Secondary forests are a source of **wood** for local needs (house-building, posts) and for sale (sawn wood, veneer wood, industrial wood).
- If properly managed, secondary forests are important providers of **environmental services**. For example, they: protect soils from erosion; regulate the water regime and reduce water loss through run-off on hillsides; fix and store significant amounts of carbon, thus contributing to the mitigation of global warming; serve as refuges for biodiversity and biological corridors in fragmented/agricultural landscapes; contribute to reducing fire risk; and help conserve genetic resources.
- The use of secondary forests may **reduce pressure on primary forests**, thus reducing deforestation rates. However, this only applies if the products from the secondary forests are suitable for the same uses as those derived from primary forests, if the financial rewards are comparable, and if economic conditions do not encourage the simultaneous use of both types of forest.

The management strategy will vary depending on the objectives of management, the availability of land, labour and capital, biophysical characteristics, markets, opportunity costs, and so on. Fallow vegetation managed as part of shifting cultivation systems will require techniques permitting short fallow periods that don't compromise agricultural productivity. For instance, the incorporation of 'regenerative' species such as leguminous woody species will contribute to a more rapid recovery of soil nutrients during the fallow period.

When managed as part of the farming system to generate forest products for subsistence or sale, silvicultural practices that favour the establishment and optimise the growth of locally desired tree species should be promoted through the seeding or planting of target species during the crop phase of the agricultural cycle. Some characteristics of species that assist management under these conditions include: resprouting capacity after cutting and fire; compatibility with the agricultural cycle; short production cycles; and tolerance of shade in plants other than trees.

The multiple-use of many species growing in secondary forests is perhaps the most important feature to take into account for management purposes.

In a management regime aimed at the sustainable production of wood and/or non-wood forest products, landowners and/or forest users will probably have to take land out of the crop-fallow cycle. In any case, the change in land-use must generate a greater benefit than that provided by alternative uses of the land. The multiple-use of many species growing in secondary forests is perhaps the most important feature to take into account for management purposes.

The silvicultural treatments used to stimulate the production of commercial timber species in tropical primary forests, such as liberation thinning and refining, may also be applicable in secondary forests. Experience has shown that young secondary forests are more receptive to silvicultural manipulations than are primary forests because of their manageable tree size and rapid growth response. This also applies to enrichment plantings because enrichment requires canopy manipulation in order to optimise the growth and survival of the planted trees. Enrichment plantings have generally yielded promising results when applied in young secondary forests. However, they tend to be costly and labour-intensive.

When high timber productivity is a major objective, a monocyclic system that relies on creating a future, even-aged stand by opening the middle and upper canopies shortly before tree harvesting is perhaps the most appropriate. This strategy is required for pioneer/light-demanding species that need almost complete canopy removal to stimulate seed germination and sustain seedling growth and survival. In any case, the ability to compete financially with timber plantations has to be taken into account when this silvicultural management option is considered.

What needs to be done

The recently published *ITTO Guidelines for the restoration, management and rehabilitation of degraded and secondary tropical forests* (see page 3) aim to assist planners, policy-makers and practitioners in identifying the key policy, socioeconomic, legal, institutional, ecological and silvicultural issues that need to be taken into account in the planning and implementation of appropriate strategies and viable options for the restoration, management and rehabilitation of degraded and secondary forests. They also aim to stimulate the adoption of appropriate and adaptive management practices for conserving and enhancing the production capacity of these forests.

By creating a policy focus on secondary forests at the local, national and international levels, ITTO intends to increase their visibility, promote their sustainable and equitable management and use, prevent degradation and inappropriate conversion, and guide their development according to clearly defined management strategies.

ITTO encourages member countries to submit projects related to secondary forest management. Currently, several ITTO projects in different countries promote the sustainable management of secondary tropical forests for a variety of products and services. In Ecuador, for example, a pilot plan to facilitate the management and valuation of 10 000 hectares of secondary forests and to reverse the process of forest degradation through sustainable resource management and community training is being established and implemented. It aims to provide the Ministry for the Environment with technological packages to ensure the sustainable management of secondary forests at the regional and national levels.

The project portfolio regarding secondary forests is likely to increase in the future through a series of regional workshops being organised by ITTO with the assistance of IUCN to disseminate the guidelines and promote their use in member countries. However, much more needs to be done if secondary forests are to become truly 'visible' to planners and decision-makers and to be recognised as a valuable forest resource with considerable economic potential. Forestry legislation must distinguish between the legal requirements of primary forests and those of secondary forests. Adequate legal frameworks need to be developed that take into account the different management strategies for these forests according to the needs and objectives of landowners and local communities. Incentives must be provided to encourage the development and sustainable management of these types of forests. More applied research is required to develop management strategies that are adapted to the needs of landowners/communities while ensuring the functionality of these ecosystems. And, last but not least, successful examples of secondary forest management in the tropics need to be widely disseminated and publicised.

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