



# CENTRO AGRONOMICO TROPICAL DE INVESTIGACION Y ENSEÑANZA

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### PROYECTOS FORESTALES PARA EL DESARROLLO RURAL EN AMERICA TROPICAL

*sobre*  
Seminario para el personal forestal de los proyectos apoyados por el Programa de Cooperación Suiza en América Tropical

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#### Complementary functions of natural forests and plantations

1. In general the output from natural forests supplies different markets from those fed by plantation products.
2. A useful distinction can be drawn between management of land under government control and land over which customary and personal rights may be acquired. Statute law, case law, and custom in tropical America have combined to give governments little power to influence usage of land which they do not control directly. Private land owners or occupiers of land have very rarely realised the value of forest cover in maintaining levels of productivity and quality of life.
3. The range of possible commercial products from plantations is small in comparison with that from natural forests. As regards timber, which is the most easily quantified product, some types can be produced only from natural forest. No silvicultural methods are known for growing straight-barked trees of some of the slow-growing, fine-figured and highly coloured luxury timbers in plantations. Equally, no silvicultural methods have been demonstrated to accelerate the growth of the likely final crop trees in the regeneration leading to a second harvest. If a government considers that it is in the national interest to continue to produce such timbers, in commercial quantities, a large area of land must be reserved. These species tend to have wide crowns at maturity, so final stocking is low. If silvicultural intervention cannot accelerate individual tree growth, and as in any case many such species seem to require strong lateral shade to ensure straight boles, a second crop of luxury timbers will be associated with a matrix of mainly faster growing utility and more or less 'non-commercial' species. Some of this matrix may be harvested long before the technical rotation of the luxury timbers.
4. Many primary forest species have monopodial growth in the juvenile stages, with crowns expanding towards maturity. Harvesting trees with wide spreading crowns involves inevitably a degree of damage to the surrounding trees which need not occur in the harvesting of most (narrow crowned) plantation species. However, although felling damage may be less, skidding may be so damaging in plantations that the theoretical possibilities for early thinning yields and sustained growth rates of final crop trees are much reduced. In natural forest it is possible to direct skidders to avoid patches of regeneration of desirable species.

5. The prospects for intermediate yields from regenerating natural forest depend partly on the ability of millers to accept smaller logs than they are accustomed to from the primary forest. At present in most of tropical America the mills are antiquated, crude, badly adjusted and wasteful. They are largely unable to handle profitably the small logs, especially when there is a marked difference between sapwood and heartwood and only the heartwood is currently marketable. Yet other countries which never had supplies of large logs have developed efficient mills capable of handling small sizes. Smaller logs allow lighter logging equipment which is not only cheaper but also less damaging to the forest.

6. Principal problems from a technical point of view in the management of natural forests are not silvicultural but in yield prediction. The mathematics are relatively complicated, a large data base and computer assistance are essential, and the confidence limits are usually low on a per-species basis (though rather better when species with the same growth habits are combined). Growth data from regenerating natural forest are rather scanty in tropical America in comparison with the data available from Africa and South East Asia. Security of tenure and the establishment of growth monitoring plots (= permanent sample plots, or yield plots) are essential if management regimes are to be based on the actual performance of the forest. The same problems arise in principle in the management of plantations, but because only one or a few species are involved the arithmetic is slightly simpler. Secure tenure is also essential for the perpetuation of other natural forest products - hydrological protection, erosion control, gene pool conservation, recreational potential, non-timber physical forest products.

7. Species suitable for plantations are mostly naturally gregarious pioneer or early secondary seral trees, and/or characteristic of subclimaxes. In general they have technically more favourable growth habits than trees characteristic of primary forests - growth rates do not stagnate so easily at high stockings; crowns are usually more conical; wood quality is more uniform; there is a more or less marked response to silvicultural treatments; abundant fertile seeding occurs from an early age; there is often a choice of regeneration methods, including coppice. Wood productivity per tree is not necessarily higher than for primary forest species but the higher stocking which is possible allows higher yields per unit area. While plantation species tolerate a wider range of sites than do primary forest species, some of those with high productivity on optimum sites show poor growth on poorer sites though they may retain good survival.

8. Early financial returns may be possible from plantations because industries using plantation wood (often in disintegrated form) will accept smaller logs than the traditional mills fed from natural forests. The value per unit volume of plantation species is usually lower than for primary forest species. The wood-using industries are less concerned with the name of the species for marketing purposes than with the technological properties of the product. Much can be done to improve the market potential of medium weight and heavy primary hardwoods by grouping them into strength classes, as in West Africa.

9. The initial cash investment in a plantation is substantially higher than that for the early management of natural forest (primary or

secondary). If no wood-using industry exists when the plantation is started, careful timing is necessary to ensure that it is established by the time that the plantation is ready for first harvesting. The fastest growing plantation species have short lives and cannot be left to mature like brandy. With the likelihood of severe increases in fuel costs over the coming decades, plantations will have to be concentrated in the vicinity of the industries, since high-bulk, low-unit-value material like wood cannot stand high costs of transport. It follows that plantation schemes should be established after the location of the industry or industries has been fixed. Fast growth in plantations requires snappy management decisions. These require in turn good training, field experience, and good information flows; these factors are in very short supply in tropical America. Natural forests can tolerate a much greater inefficiency in management, since their biological flexibility is in certain respects greater and the invested capital is less.

10. From a technical point of view it is usually preferable to establish plantations on land long cleared of forest. However there are often considerations of land prices and land tenure which make it financially preferable to clear existing forest for plantations. Should governments allow this? If the land is technically adequate for plantations, and if the existing forests cannot supply the products required by the consumers, then there are only limited grounds for objection to clearing and planting. Obviously this can be and has been abused, by companies with large forest areas whose products (actual and potential) could have been commercialised but which did not fall within the marketing interests of those companies. The more extreme case is the conversion of existing forest to pasture or arable farms. A legal system for zoning land use in accordance with the results of land capability surveys may be the only way to prevent loss of forest. The common situation, in which some Forest Services in tropical America must authorise all forest clearing but have no legally supported guidelines for taking decisions, serves only to bring both the Forest Services and the laws into contempt. On the same theme, countries which have laws protecting squatters and rewarding the unplanned destruction of forests must repeal such legislation if they expect to retain any natural forest either in public or <sup>in</sup> private ownership, for production or for protection.

11. Government management of plantations has not, so far, proved easy in tropical regions. The complexity of government financial systems, the difficulty of getting public servants to deliver money at the appropriate times in the biological year, and the difficulty of firing unsuitable staff, have discouraged most attempts at direct management. Meanwhile private investors have shied away from the uncertainties of plantation schemes since large scale experience is limited, growth prediction data have to be accumulated as each scheme develops, and technical rotation lengths are extended in comparison with most agricultural crops. However when some degree of government assistance has been made available, either through direct planting and management grants or through allowances against personal and corporate taxation, large investors have shown themselves willing to acquire new land and to plant up parts of existing holdings. The more advanced incentive schemes used in South America have shown

clearly the inadequacy of much of the legislation in use. The patchwork of amendments which characterises the Brazilian legislation causes uncertainty to the investors. Before incentive schemes are started the basic legislation needs to be prepared very thoroughly. It is important that details (which are liable to alteration because of advances in technical knowledge, and because of changing financial circumstances) should be included in technical directives or rules made by the Forest Services without the need to amend the basic legislation by parliamentary process. There is ample material available from existing incentive schemes to guide those embarking on new programmes. Proper attention to this matter is much more important than concentration on extension of silvicultural research.

12. The historical attitude of settlers of European descent is traditionally that the forest represents an obstacle to be disposed of as rapidly and as permanently as possible. Some governments in the tropical American region now recognise that this view is short-sighted. They must take urgent steps to protect the remaining forest, and to ensure the creation of high-yielding forest plantations to supply the bulk of their industrial timber needs. The natural forests are now too reduced in area and quality to do so on their own. Changes in social attitudes tend to be very slow, and this matter is urgent. Therefore strong, simple and relevant legislation is essential, with expanded Forest Services capable of implementing it. Further, government policy and the essence of the law must be so stated that they are readily comprehended by the whole population. It is not essential that everyone agrees with the conservationist policies or with the law, but they must be shown that the future of forest products, in the widest sense, is bound closely to the future prosperity of each individual.

