

## Chapter 10 Implementation

The question "Can we manage tropical forests to sustain them?" is frequently asked. Some respondents, either unfamiliar with (or unimpressed by) a century of tropical forestry experience throughout the world, consider our technical knowledge to be grossly inadequate. What is needed, they say, is more research to ascertain objectives, policies, strategies, and the effect of prospective forest management practices on the environment, the people, and the economy of the Tropics before anything is done. While experts may procrastinate, it is fortunate that protection alone can sustain the forests and that it poses no technical challenge. Nevertheless, procrastination may not ensure even protection and certainly will not provide the forest products increasingly needed in the region.

There are also those who believe that an adequate technical basis exists for making the region's forest lands sustainably productive, at least where conditions are favorable. In their view, the task appears to be one of merely getting on with the job, starting with the information already available from experience. The main obstacle they see is a lack of the means or will to proceed.

Whatever the merits of these extreme viewpoints, some aspects of the situation are clear. In 1980 some 21,881,000 ha of the forests of tropical America were already being managed at what may be a sustainable level (Anon. 1985e). These included 14,066,000 ha of forests apparently legally protected from use, 522,000 ha of natural forests so managed that yields can be expected to be sustained, and 7,293,000 ha of forest plantations, also managed as to be sustainable. This total, however, is only 3.2 percent of the total forested land of tropical America, indicating that forests being sustained are few. Furthermore, the forests are diminishing and deteriorating, primarily as a result not of mismanagement, but of no management.

Steps to restore or enrich forests on vast areas where their former protective or productive functions have deteriorated or ceased would seem warranted without fear of irreversible environmental damage. On the contrary, such a course should go a long way toward restoring at least some of the attributes and biota of the tropical environment, even if the structure and composition of the resulting forests differ from the originals.

Closing the wide gap between present practice and full application of forest production technology is one of the most beneficial steps that could be taken in this region.

Tree cover on much of tropical America is essential to the water resources upon which the agriculture and the very habitability of the land depend. Improving forest productivity will help fulfill the most pressing need of the region, the supplying of food.

Most of the literature concerning forestry in the Tropics deals with the consequences of technological practices. Little reference is made to the challenge of promoting social acceptance and support for implementing those practices. Lack of widespread support is understandable; in the past, forest products have been available simply for the taking. Sustainability, on the other hand, calls for refraining from depleting the forests that remain and investing in what is seen as a distant future. Difficulties in mobilizing support from communities either distant from or perceived to be only indirectly dependent on forests indicate that implementing technical knowledge can be harder than acquiring it. Yet, depletion of forest resources has continued along past the time when distance and scarcity began to increase the costs of forest products.

Implementing what is known would in itself generate a need to acquire more knowledge, to perfect practices, and to develop new or improved practices. Therefore, emphasis on implementation must not be in lieu of continued research directed toward better management.

Pierre Gourou concluded that the problems of the Tropics are due more to a lag in organizational techniques than to economics (Frisk 1979). By that reasoning, the key to progress is administrative improvement.

Inexperienced administrators tend to mistake planning and decision making for action and achievement (Phillips 1961). Commonly encountered throughout the Tropics is great enthusiasm for industrial development for its own sake. Too few government leaders in the region seem to realize that development in agriculture, forestry, and the related industries is a gradual and intricate undertaking, liable to fail unless based on experience, vision, sound technology, consistent financial support, and of course, full integrity.

The success of forest production depends partly on preventing human activities that threaten forest lands. These threats cannot be met opportunistically; they must be anticipated. Experience suggests a number of circumstances that foster such perils, including: (1) impotent national land-use planning, (2) misguided agrarian

reform, (3) unenforced legislation and regulations, (4) underevaluation of indirect forest environmental values, (5) inadequate concern for soil limitations, (6) agronomically neglected small farming, (7) the taking for granted of water supplies, and (8) the perception that forests, once cut over, are worthless.

Eliminating such threats requires the combined efforts of planners, agronomists, foresters, soil experts, hydrologists, government leaders, and the general public. There can be breakthroughs. The Lands Advisory Committee of Trinidad and Tobago, which was composed of cabinet members, at the urging of the head of the Forestry Department, ordered acquisition of the Northern Range as a forest reserve and protection of all reserves from the threat of takeover by powerful petroleum interests (Brooks 1941a). As a consequence, the department has been compensated for petroleum extraction, and productive forestry was intensified on most of the land so reserved.

The sequence of forest policies and practice in the Tropics is similar for most countries and consists of some or all of the following steps (Sartorius and Henle 1968, Wyatt-Smith 1959):

- Exploitation of the best timber from accessible forest areas
- Uncontrolled hunting of game animals in the forests
- Permitting of widespread deforestation for shifting agriculture
- Creation of a forest department governing parks, water, and wildlife
- Initiation of legislation defining national conservation policies and protecting forests and fauna
- Inventorying of forests on a national scale
- Reservation of public forests as a national commitment
- Protection of reserved forests, including control of wood cutters, consumers, and forest cultivators
- Development of incentives for wood production on privately owned land and for wood-processing industries

- Preparation of management (working) plans for regulation of production and orderly disposal of public timber
- Surveying of soils on a national scale and the mapping of land capability
- Biological studies of the forests
- Reservation of forest lands to be left unmodified (some may be national parks)
- Research in ecology, silviculture, and wood utilization
- Intensification of wood production to sustain yields from public forests
- Improvement of wood utilization technology and markets
- Establishment of public outreach programs, administering public recreation and education on public forest lands
- Strengthening of national planning for land use and rural development, fully recognizing uses and benefits derived from forests and related industries.

These steps are only in approximate order and many overlap. Placing public outreach programs near the end does not indicate low priority but rather recognizes that normally the earlier steps so completely occupy the available staff that this important function is delayed until the program matures. Actually, this delay may also postpone some of the earlier steps. Specialists must not presume public privilege based on the importance of their managerial role over extensive public land areas (Ovington 1974). Public acceptance and support of their programs must be actively sought and earned.

These developmental steps emphasize public lands because private forest owners are generally interested only in immediate returns. Moreover, many of the indirect forest benefits are vital to national welfare. Throughout the region, there is little protection of privately owned forests except those clearly bearing a potentially valuable crop.

The first and, historically, probably the most effective forest department in the Tropics was in India (Parker

1923, Qureshi 1968a). As early as 1800, a study of the availability of teak (*Tectona grandis*) was completed. The first conservator of forests was appointed in 1847. A simple but effective national forest policy was enunciated in 1855. By 1871, working plans for the publicly owned forests were in preparation. In 1875, the oldest extant forestry journal of the Tropics, the *Indian Forester*, began publication. Throughout the last half of the century, informal studies in forest botany and wood anatomy were underway. The Forest Research Institute began in 1906, working largely on volume tables, growth, and yield. The first of some 10 All-India Silvicultural Conferences was held in 1918. A survey of the forest types of India and what is now Myanmar was published in 1936, and a section of Forest Ecology was added to the Research Institute in 1948. For decades, the Indian Forest Department generated more revenue than it spent.

In tropical America, early evidence of concern for forests was to be found in the laws of the Spanish Crown, applied to Puerto Rico and the rest of the Spanish West Indies. In the "Ley Primera" of 1513, Ferdinand V offered land with the proviso that part of it be planted to trees (Peyton and Peters 1912). In 1824, the government of Puerto Rico required the leaving of trees growing along streams (Ramos 1866). A forest law was issued by the Crown in 1843 (Rodriguez San Pedro 1865). In 1860, a Forest Department was created, and in 1876, public forests were reserved (Anon. 1907). Between then and the end of the century, the disposal of timber from public lands was by permit, and royalties were collected according to tree species and volume.

The appreciation of forests by the city of Veracruz, Mexico, led, as early as 1890, to the plantations of *Casuarina* that have stabilized the sand dunes north of the city (Quevedo 1945). Forest, water, wildlife, or park departments concerned with the forest goods and services now exist in nearly every independent political unit within the region. Some of the first departments established are still in existence, including those begun in Trinidad in 1901 (Swabey 1932), Puerto Rico in 1917 (Wadsworth 1949), British Honduras (now Belize) in 1922 (Oliphant 1925), and Jamaica in 1937 (Swabey 1945). Advancements in the region have been made in all 18 of the developmental stages described earlier.

### **The Forces Behind Implementation**

Implementation of forest technology requires the support of both people living near the forests and people living in distant population centers. Unfortunately, decision mak-

ing tends to be concentrated at a great distance from the forests, where people are least likely to see a critical link between technology, forests, and their lives.

Those most obviously involved are the "forest people" who live within or adjacent to the forests and who directly depend on them for shelter, fuel, food, implements, and transportation. An attempt to convince these people that they need forests is a redundancy that could occur only to a rank outsider. Not only are forest people intensely aware of the role of the forests in their lives, but they also may be better aware than anyone else of the degree to which the resource is deteriorating and why. These are outdoor people who know the forests and their uses well.

Forest people are capable of undertaking the work needed to make the forests produce in perpetuity (and could use the employment), and their proximity makes them ideal candidates for such work. Where outside leadership and support have been available, these people have implemented nearly all the forest-management practices of the region.

Another distinct group, also rural, lives in farming centers concerned with processing and distributing other products of the land. These people may farm coastal or irrigated lands distant from forests. However, the presence of upland forests may protect their lands from floods or sedimentation even though they are less dependent on the forests for fuel or food than the forest people. Some of these farming communities have cooperated in common resource needs, such as the allocation and distribution of irrigation water, the construction of reservoirs, and the provision of community services.

City dwellers are generally oblivious to the importance of forests to their welfare, except in areas where a large volume of forest products is processed or exported, where tourism in forest areas is important, or where domestic water must be brought a long distance. Nevertheless, these people should be concerned about the fate of the forests and may have the financial resources to do something about it. City residents have the income, leisure, and work-related stress that makes them look to forests for respite and enjoyment. They also have the purchasing power to pay the highest domestic prices for the more prized forest products. These people are also conditioned to paying taxes for such long-term social benefits as libraries, municipal reservoirs, and parks. Forests could also benefit from such enlightened support.

**The Government's Role.** Democratic national governments theoretically represent all of these diverse populations and are concerned with aspects of national welfare that are not better provided at local levels. These include the widespread distribution and benefits of forests within each country, the need to forego maximum short-term benefits for greater long-term benefits, and the difficulty of amassing adequate financial and personal resources at local or regional levels for highly specialized activities. For these reasons, forestry leadership for most tropical countries must rest at the national level.

At the national level, goals, policies, plans, and programs are formulated, funds or assistance is allotted to regions where the need is beyond local capability, incentives to forest landowners and processors of forest products are offered, specialized training may be available, and forestry contributions from international donors are received and administered. All forestry practices need not emanate from the national government, but other agencies of implementation are clearly impaired without an effective forestry program at the national level. The strengthening of national institutions is thus a key to the continuity of effort that attracts outside assistance.

Government has an interest in implementing forestry, because its indirect and noncommodity values are of major importance to the public. One of these values is sustained timber yields. Another is water quality for the population's domestic needs. In some countries, such as Mexico, legally formalized rural communities (*ejidos*) have proved receptive to management practices that both perpetuate timber supplies and preserve other forest benefits. Governments more remote from the forest areas also have much to gain from stabilized or increased employment, water resources, and tourism.

National governments are now all somewhat sensitive to forest problems and needs. Some are responsible for major water storage and transportation projects, and they discern potential international benefits from forests, such as tourism, export products, and the substitution of local forest products for more costly imports.

**The Public's Role.** The average citizen is largely concerned with maintaining or bettering his or her standard of living. Any ideas about forests (if indeed they exist) are concerned only with how the forests directly affect one's own way of life. Such a narrow perception suggests the most effective approach to implementation: convince the citizens that their way of life depends in part on forests

that must be conserved. This tie is equally valid for every group: farmers, landowners, community leaders, industrialists, and educators.

Primary responsibility for focusing public attention on the needs of forest production lies with professionals who understand and can explain human dependence upon forest resources and the actions needed to conserve them. Such talent is better developed in some forestry curricula than in others. Nevertheless, weaknesses in both technical knowledge and persuasiveness on the part of foresters have been major obstacles to progress.

It is increasingly apparent that other disciplines must be involved in implementing good stewardship of tropical forest resources. A multidisciplinary approach is needed largely because forest benefits are manifested in diverse ways. An example is water conservation as a component of agriculture. In the past, agronomists have been largely responsible for developing forestry in many countries of the region. Others who must participate include ecologists, hydrologists, and social scientists, who could develop more effective ways to demonstrate interdependencies and improve persuasiveness.

Private individuals and organizations, especially forest landowners and forest products processors, have played a dominant role in the deterioration of forest resources in the region and so must be vital participants in implementing good management. Therefore, they are prime targets for persuasion. They are most responsive to economic incentives, a key therefore to the success or failure of forest conservation in much of the region.

**Outside Assistance.** Local resources to be used in implementing forest conservation and management tend to be least available where the consequences of the mistreatment of the forests are most tragic. This fact has led to more than a century of efforts by extratropical governments and multinational organizations to assist in implementing forestry in the Tropics. Such outside donors have frequently increased initial investments for forestry manyfold, and they are in a nonpartisan position to influence priorities. Their financial resources solve a great local problem: the shortage of investment capital. However, many forestry projects undertaken with outside assistance have fallen short of expectations. The reasons, more social than technical, are complex.

A summary of investments by multinational and unilateral donors in projects involving forestry between the

late 1960s and 1985 totaled \$US 400 million (Spears 1985). Although only about 1 percent of this amount was assigned directly to forestry, the contributions of outside donors, including nongovernmental organizations, are a major supplement to the investments of developing countries for this purpose. The “nonforest” portion of this investment has gone largely into land-use planning, watershed rehabilitation, rural development, and integrated agriculture.

International assistance is fraught with pitfalls. Despite good intentions by both donors and recipients, there are several obstacles to achieving what both parties may intend. Uncompromising policies by the donor may ultimately lead to the accusation of outside interference in the affairs of a sovereign nation. External concepts that usually do not fully reflect the situation on the ground may prove inapplicable even where accepted.

Outside assistance is frequently implemented through one or more counterpart agencies of the recipient government. This can produce horizontal imbalance and interagency rivalries that obstruct coordinated utilization of what is offered. Then there is the prospect of vertical imbalance, the ratio of expenditures for administration versus those that reach the forest.

Local governments often differ from donors in their degree of emphasis on assisting the rural poor. Lack of synergy between outside “experts” of the donor and local professionals is another potential problem. Finally, and perhaps most important, is the lack almost everywhere of coordination among donors.

Donors have been aware of these problems, and a mechanism was developed to foster voluntary coordination (Harcharik 1986). At a meeting of 20 donating governments and agencies in 1985, agreement was reached to cooperate in implementing the Tropical Forestry Action Plan under the aegis of the Food and Agriculture Organization (FAO) in cooperation with each government. Subsequent meetings have been productive, and moves have been taken to include nongovernment organizations, where a lack of coordination has also been evident. Recent critical assessments suggest that much improvement is still possible, particularly in increased local participation in the generation of plans and in more comprehensive consideration of environmental problems as a whole.

Roche described some of the problems of international assistance as experienced in Africa (Roche 1986). As he saw it, developing nations draw up a list of projects and sell what they can to donors. Outside support tends to flow into an elitist structure rather than to the mass of the people. Roche concludes that until agricultural production by the masses is seen to be as important as mass agricultural production, and until western nations are prepared to forego some of their selfish interests, there can be no major improvement in the present system despite the incidence of famine and the generosity of donors.

Similar conclusions regarding tropical America were reached by Mery (1987). He concluded that most of the constraints affecting the forest sector have their roots in the socioeconomic structural problems of Latin American societies. A significant change in the contribution made by forestry to the general welfare cannot take place without a more general change in these societies. Structural changes that secure long-term interests must prevail over those that favor short-term interests. Such changes must aim at reducing present inequalities, allow the spread of benefits obtained from economic growth, overcome dependence on transnational corporations with goals that are often distinct from those of the nations, and permit the implementation of policies aimed at stopping uncontrolled deforestation and promoting sustained use of forest resources.

The mounting criticism of international assistance programs as causes of forest destruction led the United States Congress to legally sharpen the focus of assistance to developing countries by resolving to do the following (Anon. 1986f):

- Support and cooperate with others in identifying, establishing, and maintaining a network of protected tropical forest ecosystems.
- Conserve remaining forests by supporting forest production on lands already cleared.
- Support training, education, and institutions that increase the local capacity to formulate policies, plan land use, and develop and apply environmentally sound forest management.
- Support stable farming in areas that are already cleared or that will inevitably be settled, using locally suited technologies, including agroforestry.

As an example of the adaptation of donor interests to international assistance, the Canadian International Development Research Centre, in channeling funds to institutions in developing countries for the development of research, has applied the following criteria, among others, in assessing projects (Anon. 1986h):

- Are the research findings likely to apply in most developing countries or only in the one in which the research takes place?
- Will the research help close gaps in living standards or lessen the imbalance in development between rural and urban areas?
- Will the project make full use of local resources and research workers from the region?
- Will the project result in better trained and more experienced local scientists and more effective research institutions?

The Brundland Report of 1987, addressing world environmental problems, called for more effective international efforts to support national conservation strategies, biosphere reserves, and the Tropical Forestry Action Plan (Anon. 1987b). The report singled out the need for national forestry planning, enhanced cooperation among development agencies in forestry, and an increased flow of technical and financial resources into forestry and such related fields as small-holder agriculture.

#### **Some Long-Term Goals**

Global efforts to prioritize problems of tropical forestry and goals and strategies for their solution have been reported in documents from multinational agencies. In 1980, the United Nations Environmental Program and the International Union for Conservation of Nature and Natural Resources, with assistance from the World Wildlife Fund (Anon. 1980h), released "World Conservation Strategy," a document that went a long way toward closing a previous rift between environmental concerns and forest-management agencies. It defined conservation as the management of human use of the biosphere to yield the greatest sustainable benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations. The level of sustained yield is considered an index of its achievement. Integration of multiple forest uses is supported, and the potential for making some uses compatible under good

management is recognized. The International Union for Conservation of Nature (IUCN) recommendations that are essential to forestry in the Tropics include the following:

- Nations should form conservation strategies, meet their requirements, and raise public consciousness concerning them.
- Such strategies should be formulated for the protection of watersheds and mangroves, and for the restoration of degraded environments, including reforestation.
- Government agencies should be given clear conservation mandates and the power and funds for implementation.
- Nations should ensure that laws are both economically and socially feasible to provide for protection and sustainable utilization of resources.
- Conservation education should be intensified at all levels.
- Conservation efforts should be prioritized to make the best use of available funds.
- Conservation measures that require deferral of consumption should be complemented by measures to maintain or improve living standards.
- More subtropical rain forests should be placed in biosphere reserves.
- Resource uses should be compatible with ecosystem capacities and in harmony with each other.
- Lands most suitable for food crops should be reserved for agricultural use.
- Existing information about resource management should be put to use and more information gathered.
- Rural communities should adapt new production systems that are known to work.
- More research should be dedicated to sustainable production systems.

- The economic (and other) benefits of the well-planned, multipurpose use of rain forests should be demonstrated.
- Tropical forests should be managed to yield increased goods and services if production can be sustained without damage to the resource.
- The productive capacities of forests should be determined as a prerequisite to determining sustainable yields.
- The utilization of forest goods and services should be efficient and ecologically sound.
- Governments should control logging operations and assist settlers to develop land that is suitable for planting trees and other crops.
- Diverse gene pools should be preserved to sustain improved forest production.
- Plantations should be established to produce fuelwood and industrial timber.

More specifically directed at forests of the Tropics is the Tropical Forestry Action Plan of the FAO's Committee on Forest Development in the Tropics (Anon. 1985e). The committee, representing 45 countries, convened a meeting of specialists who recommended action in five priority areas: ecosystem conservation, land use, energy development, industrial development, and institutions. The proposed goals are summarized here.

- *Ecosystem conservation*
  - Select and establish a series of protected areas covering the whole range of tropical ecosystems and the genetic resources of species of actual or potential socioeconomic value.
  - Guarantee the permanence of existing and future protected areas by improving legislation and administrative policy to that end.
  - Expand the concepts of conservation policy and management to include maintenance of the intraspecific variation of species of actual or potential socioeconomic importance; conserve, where possible, the variation of other species whose qualities are not known.
  - Develop closer links between policies for the conservation of ecosystems and genetic resources and policies for the recovery of natural vegetation to provide protection for soil and catchment areas.
- Treat protected areas as part of the land-use pattern that surrounds them; design and operate these areas in such a way that they are acceptable to local people and benefit them.
- Adapt silvicultural methods for unmanaged forests to enable them to produce wood, food, and other nonwood products in a sustainable manner.
- *Land Use*
  - Create political and public awareness of the contribution of forestry to the sustained use of the resource and to minimizing damage and degradation to food security and rural development caused by desertification, floods, droughts, torrents, cyclones, and high tides.
  - Ensure that forestry is made a vital part of national plans involving food security, conservation, and prevention of desertification.
  - Enhance the role of forests and woody vegetation within sound land husbandry to ensure that the whole system will contribute effectively to the production of goods and services and to the wider aim of food security.
  - Enhance public benefits from appropriate use of the forest resources by involving the community in their expansion, diversification, management, conservation, and rehabilitation.
- *Energy Development*
  - Raise political awareness, encourage sustained commitment and support of wood energy programs, and adapt and strengthen the responsible institutions.
  - Promote coordinated policies and programs defining priorities for wood energy in national forestry planning, and encourage the collection of information required for sound planning for resources and for the production and use of wood for energy.
  - Develop and disseminate approaches that integrate environmental, social, economic, and technical aspects of energy development, and promote more efficient technologies and cost-effective solutions to energy problems.
  - Mobilize national and international technical and financial assistance to build up capabilities and meet the requirements of large-scale wood energy programs.

- Encourage the active participation of rural communities and local organizations in the design, implementation, and distribution of benefits of fuelwood/wood-energy programs and strengthen the communities' capabilities to undertake and sustain self-help initiatives.
- Promote international and regional cooperation in research, development, demonstration, and training in new developments and successful approaches to energy problems.
- *Industrial Development*
  - Create awareness of the need for holistic forest industries, integrated from the resource development and management stage through harvesting, transport, and processing to marketing.
  - Create awareness of the social, legal, and institutional aspects of planning and implementing forest-industry projects.
  - Improve managerial capability for resource management, for planning, construction, and operation of forest industries, and for raw-material harvesting operations.
  - Provide vocational training in raw-material procurement and forest industries.
  - Establish forest industries that are appropriate for tropical conditions and developmental objectives.
- *Institutions*
  - Integrate forestry development into national development.
  - Increase human capabilities in forestry and promote support for forestry development.
  - Improve the administration of tropical forest lands through appropriate utilization of institutional support.
  - Ensure active participation of all institutions and social sectors with a view to making forestry development technically efficient, productive, and socially effective.

Most of these goals are social in nature and call for effective communication as much as they do the development and application of management practices to make forest resources contribute more goods and services.

The task of augmenting forest productivity in tropical America so exceeds the funding to be expected that misdirected efforts are tragic. A starting point for minimizing such losses is to focus efforts on long-term goals subject

to general agreement. Examples of goals that might apply at national levels are:

- *Keep tree-covered rural lands that are incapable of sustained production of food or forage crops but capable of producing forests.*

This goal calls for classifying lands according to slope, soil erodibility, and potential productivity. It does not dictate land ownership, although the land-use constraints implicitly call for controls that must be attained through government action.

The use of the term "rural" recognizes the traditionally dominant importance attached to urban, industrial, and commercial development, and the need for forested areas to be accommodated thereto. However, in rural areas, this goal calls for more forests than result from merely abandoning submarginal farmlands. Provision must be made, however, for shifting cultivation if it can be sustained by forest fallows and if adequate fallows are ensured.

- *Utilize forests concurrently for a broad range of purposes, both social and economic.*

This objective recognizes the diverse benefits and products of tropical forests, including water, recreation, and wildlife, as well as timber. The requirement of a "broad range" implies that conflicting uses must be governed by constraints on one or all as to location or intensity of use. Fragile resource values, such as primary ecosystems or habitats for unique fauna, must be sheltered from uses that could damage them.

- *Reserve a public forest estate, composed of representative forests, to preserve national diversity, demonstrate progressive forest management, and, through research, develop better techniques to protect, restore, and manage forests and their resources.*

Implicit in this goal may be a program of public land acquisition and protection, followed by investments in management, investigation of better techniques, and an extension program for other forest landowners and forest products processors. Despite the importance of this goal, governments generally retain but a small proportion of the forest lands dedicated to commercial production.

- *Promote rational, private, forest enterprises to meet the needs for forest products—local, national, and international.*

Fundamental to this goal is the assumption that forest enterprises should be largely private rather than public. The government role here is to offer incentives and, where necessary, establish controls. Specific goals include sustainable raw material supplies, improved utilization and processing, better marketing, trade promotion, and effective labor-management relations.

- *Develop public appreciation of forests and forestry.*

This is a prerequisite to good management by private enterprises but, more importantly, to public support for the conservation of tropical forest land resources. The task is largely one for the government, working with appropriate informational and educational institutions. Local school and university curricula to these ends are being expanded.

- *Base forestry policies and practices on scientific research.*

This goal implies development and maintenance of one or more scientific institutions focused on solving a nation's forestry problems. Research institutions need not all be within the national territory, because regional research programs may adequately address some of the priority problems. Training of professional forestry scientists and providing for adequate and stable support for their work are prerequisites to effective research but are absent in many tropical countries. Government support is generally vital.

These goals are general and applicable to most countries of the region. For local adoption, however, more specific language is needed, and a timetable should accompany each goal. These goals could well be adopted in preambles to legislation or in a government proclamation, against which future forestry proposals, support, and progress could be assessed.

### **Strategies**

Identifying long-term goals is an important first step toward implementing forest practices, but it is only that. Many studies to foster implementation of these goals have been made throughout the region, but results have

been so general that little that appears concrete, feasible, or attractive to decision makers has resulted. So the next step is to develop strategies to prepare the way for realistic progress toward the goals.

Before strategy for better forest management is actually planned, opinions should be sought from the different sectors of the public that will be affected or must support what may be proposed. Forestry often calls for limitations on present forest use that may conflict with the interests of either those accustomed to using the forests at will or those who profit from forest exploitation. Moreover, the social rewards of forestry are not immediate and appear only gradually, so public attitudes may range from lack of interest to hostility. In India, for example, where strong forest policies and a well-organized forest department have existed for a century and the more remote forests have been maintained in fairly good condition despite severe population pressure, foresters have been blamed for the deterioration of 24.5 million ha of village forests over which they have had no authority (Tiwari 1983).

Public attitudes such as these may be partly a matter of ignorance, but usually the causes go much deeper and require a thorough analysis in planning future public support for forestry. A favorable corollary to such situations is that soil and water resource deterioration is recognized as serious and its relationship to forests has become common knowledge. If the forest department is blamed, the reasons must be understood clearly. Part of the blame may be properly placed, but more often many other factors are involved, such as overall governmental weakness, bickering among government agencies, or grievances of individuals. Unless the underlying causes are identified and fully understood, efforts to sustain forests may be frustrated. The analysis and interpretation of such situations call for the application of sociological disciplines that in the past have incorrectly been considered remote from forestry.

A fundamental argument underlying the strategy for the preservation of tropical forests is presented by Westoby (1983a). He believes that local pressures on the forests by landless people can be reduced only with greater equity in access to land and other resources. He concludes that technologies adapted to the sustained use of tropical forests are unlikely either to be developed or to find widespread application until the rural poor have won both a stake in the land and a share of political

power. So the key to saving the tropical forests is political. Catinot (1984) reached the same conclusion regarding tropical Africa, recommending using the very rural dwellers who have been the principal agents of destruction to reforest and giving them a majority ownership in the new stands.

Several such strategies are appropriate generally within the region.

- *For Further Planning*
  - Determine the most pressing needs of specific groups, particularly in rural areas and near forest lands.
  - Integrate forest resource conservation into national land-use planning and agrarian reform.
  - Identify and quantify local nonmarket and offsite benefits, present and potential, of forest land resources.
- *For Rural Development*
  - Quantify forestry benefits to rural development, including watershed protection, food security, and employment.
  - Stabilize rural land tenure.
  - Stimulate rural investment in tree growing.
  - Promote tree production with multiple benefits.
  - Develop alternative sources of off-farm income.
- *For Forest Land Resources*
  - Assess the relative potential of different forest areas to produce products and benefits as guidance for location priorities.
  - Prevent deterioration of remaining forests.
  - Intensify the management and development of existing forest land resources.
- *For Wood Supply*
  - Reduce wastes in the forests and during processing, including the development of new uses for forests and processing residues.
  - Concentrate wood production in plantations to ease current wood demand on remaining native forests.
  - Increase processing near the forests to raise living standards in and near the forests.

### **Principles for Achieving Success**

There are different approaches to all these strategies. Many have failed miserably, usually at least partly be-

cause of faulty approaches or execution. A few have been successful. Listed here are some approaches that have proven merit:

- Strengthen and link the national institutions responsible for leadership, whether their function is stewardship, information dissemination, or research.
- Identify and consider local circumstances that may not be obvious before a course of action is prescribed.
- Involve affected local groups, be they small communities or isolated rural people, in forestry matters from the outset.
- Strengthen local expertise at the professional, managerial, and technical levels before attempting to implement plans.
- Do not propose departures from tradition beyond that proven acceptable in other activities.
- Do not begin programs on a scale that will overtax the local system, calling for more trained personnel or other scarce resources than can be promptly provided without more than compensatory costs to other important community needs.
- Develop a link between research, demonstration, extension, training, and education. Without such links, programs generally fall far short of their potential.
- Maintain open communication and continuing publicity directed toward key audiences, such as decision makers or youth, focusing on themes designed to mold opinion and persuade rather than merely inform.
- Make sure that rewards to forestry personnel are attractive and closely linked with responsibilities and accomplishments on the job.
- Establish working conditions that are sufficiently favorable and stable to develop deep career involvement in employees.
- Establish an ongoing training program, conducted by experts, and timed to precede promotion opportunities.

The crucial role of national institutions is illustrated by the experience of the World Bank (Spears 1985). Such external agencies can, at best, contribute only minimally to the solutions of long-term deforestation problems. Outside aid may create an infrastructure and institutions to begin forestry programs, but such investment decreases as soon as a combination of government effort, political commitment, and private investment has elicited favorable responses from farmers, communities, and private enterprises for self-sustaining programs. Moreover, the notion that forestry yields low rates of return (because of the long time needed for trees to mature) is contrary to experience (Spears 1985). In fact, some agroforestry and environmental protection projects have yielded higher rates of return than those of industrial forestry projects (15 to 30 percent versus 10 to 15 percent).

The record in Latin America strongly supports such governmental incentives as shared payments, tax relief, or credit for forest planting (Romero Pastor 1983). In Peru, without such incentives forest planting from 1964 to 1981 averaged only 62 km<sup>2</sup> annually, whereas in Brazil, with such incentives, the corresponding average was 305 km<sup>2</sup>.

### Overcoming Resistance

Resistance to intensified forest production is motivated by diverse circumstances. Some objections may be purely emotional and cannot be allayed simply by presentation of the facts. In such cases, it is crucial to understand the underlying reasons and search for an acceptable middleground until the benefits of the proposed practice (which may have to be curtailed or postponed for purposes of agreement) become so evident (if they do!) that emotional opposition becomes patently untenable.

One pervasive opposing viewpoint on timber production (and especially harvesting) nowadays is founded on what is perceived as "environmental damage." Presumably, however, timber production can be environmentally sound. But if proposed forest practices can be shown to be ecologically unsound, they should be modified forthrightly by their proponents, not as a defensive action under duress of heated controversy.

Usually, such controversies are not rapidly and peacefully settled, because opponents (and proponents!) may

have a distorted perception of the proposal's consequences, greatly exaggerating its environmental effects, all in the absence of conclusive evidence. Here, the soundest course may involve one or more of the following actions:

- Incorporate in advance as many suggestions as possible (such as these) into any proposal that appears potentially controversial.
- Use a diverse team to review proposals to seek a balanced consensus rather than an individual judgment.
- Bring in genuine experts to advise on the validity of opposing viewpoints and accept their counsel.
- Sharpen evidence of intangible values or financial returns to answer critics who begrudge the use of funds for the proposal.
- Readily omit controversial aspects of a proposal that do not jeopardize its overall result. An example here might be to accept less land for timber production or lower yields to accommodate integration of other values into management.
- Reduce the proposal's scope so that any controversial consequences can be assessed on a small scale.
- Reduce the proposal's time period, so fewer steps are contemplated before early consequences can be assessed.
- Incorporate monitoring features in the proposal to allay fears of undetected, irreversible, environmental damage.
- Incorporate concurrent or prior research precisely to clarify controversial issues in advance of large-scale application.
- Appoint a diverse team to oversee the proposal as the work is undertaken, to sense unforeseen problems, and to counsel on the issues of concern; plan to publish both good and bad reports, and take guidance therefrom.

### Effective Organization

Institutions concerned with implementing forestry technology, be they governmental or private, must have the following characteristics to endure and be effective:

- A clearly defined mission with a widely supported purpose
- The legal authority to make decisions and the resources to take action
- Continuing counsel from those served and responsiveness to needed changes
- Program orientation defined by long-range planning goals and short-range strategies
- Differentiation of line authority (directing programs and personnel) and staff authority (evaluating and recommending policies, programs, and procedures)
- Staff performance that presents solutions, rather than problems, to those with line authority
- Clear and prompt internal transmittal of policies, information, instructions, and feedback between management and those who execute the plan
- Systematic coordination of the functions required to achieve objectives and organization for efficient work performance
- Sharing of authority and responsibility for decisions and accomplishment through delegation to the lowest level consistent with effective managerial control
- Capability to ensure timely accomplishment of objectives
- No more than eight subordinates per supervisor
- Employees with but a single supervisor and supervision directed solely at immediate subordinates.

### Personal Commitment

Conservation of the tropical forests is of overriding importance. The fate of society itself may depend on it. It is a difficult task calling for long-term dedication. The values at stake, when fully understood, should inspire great personal commitment on the part of those who may be-

come responsible. This strong incentive for involvement, diligence, and extra effort can best be instilled in public employees at the time of (and shortly after) their recruitment.

Forestry work in tropical areas will continue to be directed largely by employees of institutions such as governments and large nongovernment agencies. Such employment, to be effective, carries certain responsibilities involving ethics, laws, loyalty, and knowledge of the governing regulations and an intent to execute them.

### Some Successes

**Industrial Production in Brazil.** *Eucalyptus* plantations were established in Brazil on a large scale in 1910, and in 1966, a successful forestry incentive program was instituted that allowed a generous portion of Federal income taxes to be used for certain forestry activities. This program is chiefly responsible for 2.2 million ha of industrial and fuelwood plantations in the southern part of the country. More than a quarter of the national industrial wood requirement has now been met from plantations, nearly all in private ownership (Anon. 1981f).

One of the most spectacular planting enterprises in Brazil is at Aracruz near Victoria in the states of Espiritu Santo and Bahia (Spears 1985). Planting of 60,000 ha of *Eucalyptus* was undertaken and supported by a strong companion research program (12 percent of the recent budget), emphasizing tree improvement, pathology, entomology, soils, and nutrition. Success in vegetative propagation led to commercial clonal plantations in 1979. Average yields have been increased from 33 to 70 cubic meters per hectare per year with an increase of 25 percent in wood density and 23 percent in cellulose content.

**Fuelwood in Haiti.** A reforestation project in Haiti, sponsored primarily by the United States Agency for International Development and conducted by numerous independent agencies, has focused on alleviating soil erosion and fuelwood shortages caused by excessive tree cutting, while enabling farmers to earn an income growing trees (Anon. 1986e). The trees used are fast growing, producing fuelwood or poles in 2 to 3 years. Regeneration is by coppice, so replanting is not necessary. In the first 5 years, some 20 million seedlings were planted by 110,000 farmers. The key to the project's success was the motivation of farmers to accept and care for seedlings on

their own property. Some 73 Haitian voluntary organizations and missions participated in the operation of 22 local nurseries.

**Multipurpose Trees in Costa Rica.** The Centro Agromómico Tropical de Investigaciones y Enseñanza (CATIE) in Costa Rica has been testing innovative ways to introduce trees into small-holder production systems (Spears 1985). At Pedades Norte, the organization persuaded 900 farmers to plant some 50,000 trees as "live fences," as windbreaks, and for shade. Farmers proved quick to introduce trees into their farming systems, mainly for their own use but also for the market.

**Pilot Project in Mexico.** Sixteen rural communities (18,000 people) in southeastern Mexico were conceded 360,000 ha, of which they selected 150,000 ha of fairly good natural forest to remain permanently forested (Bruenig and Poker 1989, Santos 1991). The area was inventoried and a management system implemented with a specific rotation and an annual cutting area of 5,000 to 6,000 ha. Enrichment planting was tested. Participants used technical assistance and government credit to acquire logging equipment. Both the most valuable species, such as mahogany (*S. macrophylla*) and cedar (*Cedrela odorata*), and secondary species are being harvested. The communities have constructed two carpentry shops and train carpenters to increase wood utilization. Several of the communities formed a joint council as an authority for collective decision making.

Technical support for research and training has been provided by the government and the German Agency for Technical Development. Nearly 600 people are employed.

Within the American Tropics there are other examples of successful rural betterment as well as forest conservation and production. Some are so local that they are not widely known. The importance of applying more generally what has succeeded under different conditions presents one of the world's most important messages for the coming revolution in human communications.

There is every reason to approach forest conservation and production within the region with optimism. We now live in a world where forest mismanagement is rapidly becoming a general concern. Growing social enlightenment is calling for protection and production of forests. Technically, so much is known that the costs of inaction far surpass those to be expected from moving ahead cautiously using fully existing knowledge. Past experience has taught many lessons. Causes of former deficiencies, being generally known, can, with judgment, conviction, and patience, be overcome. A coming public demand for a shift from forest exploitation to productive management provides for those for whom this book is directed, the forestry students of tropical America, challenges but also unprecedented opportunities to perform a service fundamental to the future of the entire world.