

Message from the Dean

In the rotunda of Marsh Hall there is a magnificent table made of tropical woods bearing a silver plate inscribed "From the Yale Foresters of the Orient" that was presented to the School in 1920. I have on my desk the Master of Forestry thesis of Edward C. Childs, entitled "The Forests and Forest Products of the Philippine Islands," submitted to the School in 1932. "Timbers of the New World," by S.J. Record and R.W. Hess (1943), is still in print and in use. The flow of tropical interest and scholarship has been a characteristic of the School from its earliest beginnings. The Tropical Resources Institute is the modern incarnation of this flow and a continuing attempt to channel it to the benefit of students and society.

This modern incarnation can be traced from student and faculty activity in the 1970's to its formal initiation in early 1984. In addition to providing opportunities to students from the tropics and elsewhere to pursue graduate professional study focused on tropical problems and places, the Institute had several other initial purposes. Perhaps the most important of these was to formalize the idea that all professional natural resource management takes place on a world stage and in a global context. By offering courses with tropical and international content, by increasing the presence here of students from overseas, and by helping students pursue their own overseas experiences through research and internships, we hoped to make real the global implications of resource stewardship and scholarship. This has worked well and will be enhanced as these activities are strengthened through the natural, reasoned development of the Institute.

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Another important dimension of the Institute's purpose is the theoretically coequal role of social science and policy analysis with biological and physical science in equipping professionals to work effectively in the tropics (or anywhere else). Although it may be scarcely credible with today's elevation of 'social forestry', 'community involvement' and 'technology transfer' to the status of received wisdom, there was at the outset fairly strong pressure to equate 'tropical resources' with 'tropical botany' or, radically, with 'tropical botany, zoology and geography'. We resisted, and even named a social scientist as our first Faculty Director. It was our further notion that whatever the disciplinary content, the Institute was to be an integral part of the School and not a free-standing entity. TRI currently has the largest standing faculty committee, the largest program budget and the greatest number of visiting scholars of any identified area of activity within the School. Since the formal initiation of TRI, faculty and student involvement has grown steadily and over half the faculty now have continuing tropical teaching and research interests.

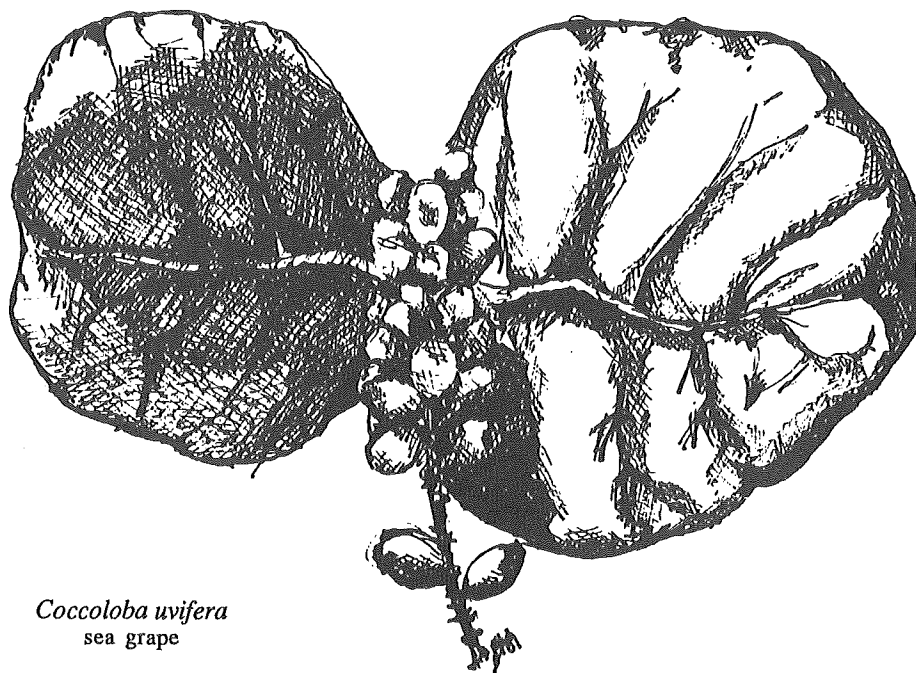
Thus TRI has become the umbrella mechanism coordinating most of the tropical and international activities of the School, which now reach all continents and more than thirty overseas cooperators.

While our activities have broadened institutionally and geographically, we have retained the initial view that our major role is first in providing education and research opportunities for faculty and students, with particular emphasis on students from tropical countries, and second in cooperating with tropical institutions in mutually

beneficial 'institution building' education and research activities. TRI is not a crash program which can achieve short-term objectives and then vanish in favor of the next fashionable 'cause'. Rather, it is a long-term effort to incorporate global thinking and information into the fabric of the School and Yale.

The future is exciting. As TRI matures, I expect not only a continued, if measured, expansion of our geographic involvement, but also more common activities with other parts of Yale. The new joint degree with International Relations is an example of a trend that will continue. We will also continue to seek additional resources for support of tropical activities, particularly for foreign students, internships and cooperative research. Federal legislation is pending that may help the development of tropical forestry and environmental studies at U.S. institutions. We are carefully examining the possibilities of 'debt swaps' to fund tropical cooperators, and are exploring a wide variety of sources for expanded support. The most essential ingredient for the future of TRI is length of view. Academic programs that last, like endowment funds, are built carefully and usually rather slowly. As we grow and change, we must be extremely careful not to sacrifice our long-term goal for short-term expediency. One of the dividends we will realize is the friendship and knowledge gained from overseas cooperators. One of our most important tasks in this country is to learn from others. TRI presents us with ever-richer opportunities to do this effectively.

*John C. Gordon, Dean
Yale School of Forestry and Environmental Studies*



Coccoloba uvifera
sea grape

RESEARCH PROFILES

THE SEARCH FOR SUSTAINABLE TROPICAL SILVICULTURE:

Regeneration and growth of mahogany after disturbance in Mexico's Yucatan forests

Laura C. Snook, Doctor of Forestry Candidate

INTRODUCTION TO MAHOGANY AND SILVICULTURE

To be sustainable, timber harvesting in natural forests must not exceed the replacement rate of the desired trees through growth and regeneration. By integrating knowledge of ecological processes into the design of harvesting practices and other treatments, silviculture not only ensures the sustainability of yields but can also maximize them by stimulating faster growth and encouraging more abundant regeneration. A major obstacle to the practice of silviculture in the tropics is the lack of basic ecological information on most tropical hardwood species, including Honduras mahogany (*Swietenia macrophylla*), the most important neotropical timber.

Honduras mahogany is native to the dry and moist tropical forests of eastern Mexico and Central America, the Atlantic slope of northern South America, and the Amazon Basin. A large buttressed tree which may reach 3.5 meters in diameter and 70 meters in height, mahogany grows as a canopy emergent at densities of one to two trees per hectare in both primary and secondary forests. In Mexico, mahogany is abundant in the semideciduous forests of Quintana Roo, a state in the southeastern quadrant of the Yucatan peninsula (see map). Up to 50% of the tree species in these forests, including mahogany, drop their leaves during a portion of the three- to six-month dry season.

Durable and easily worked, mahogany timber has been harvested for hundreds of years from the natural forests of Mexico and Central America. By the beginning of this century, European and American shipbuilders and furniture makers were concerned about the future supply of mahogany. In what was then British Honduras (now Belize), the Office of the Conservator of Forests was established in 1922 to encourage natural regeneration of mahogany in the forest. Elsewhere foresters took an agronomic approach to assuring future yields, planting mahogany in monospecific plantations throughout the tropics. Most of these plantations have failed due to disappointing growth and poor tree form resulting primarily from infestations of a nightflying moth, *Hypsipyla grandella*, whose larvae bore into the terminal shoot of young trees. Because the moth apparently flies at



The Yucatan Peninsula

random searching for its host plant, it has trouble locating mahogany trees growing within a matrix of other tree species. Consequently, silvicultural management of natural forests may be the most efficient way to produce sustainable yields of mahogany.

Mahogany is a pillar of the economy in central and southern Quintana Roo, where the government recognizes forestry as a more sustainable land use and stimulus for rural development than clearing the shallow soils for agriculture or cattle ranching. In 1983, ten communities with 125,000 hectares of forest land were integrated into a model community forestry project called the 'Plan Piloto Forestal'. The communities involved care about sustainable management of their forests because they have permanent rights to their land. They realize that the future of their forest industries depends on balancing the extraction of mahogany with natural replacement through growth and regeneration.

THE STUDY OF STAND DEVELOPMENT

In order to establish silvicultural guidelines which ensure and maximize mahogany harvests, two basic questions must be answered. First, how fast does mahogany grow in mixed natural stands? Second, under what circumstances and at what densities does mahogany regenerate in the forest? The interactions between mahogany and associated species are integral to both questions. It seemed that the answers could be found through the study of stand development, using a conceptual framework and methodology developed at the Yale School of Forestry and Environmental Studies by Professor David M. Smith and several of his students, notably Dr. Chadwick Oliver.

Studies of stand development focus on the role of disturbances in initiating or releasing regeneration, and subsequent changes in relative abundance, height and dominance among different individuals and species of trees growing in aggregations. Because forest stands take decades or centuries to develop from the seedling stage to maturity, only brief intervals in this process can be observed chronologically. Instead, most stand development studies reconstruct and analyze patterns of past growth or compare stands of different ages to elucidate how a stand has developed over time. Stand development studies have so far been carried out only in temperate forests, where the ages and past growth rates of trees can be determined by counting and measuring annual rings. The difficulty of aging tropical trees has proven an obstacle to this kind of research in the tropics.

While it seemed likely that a marked dry season would lead to the formation of annual rings in at least some species, two additional features of the Quintana Roo forest made it possible to determine tree ages. Periodic drastic disturbances have destroyed patches of forest, defining starting points for the development of new forest stands. In addition, because local people have hunted and harvested subsistence and commercial products in the forest for generations, they know when and where different kinds of disturbances have occurred.

DISTURBANCES IN THE FORESTS OF QUINTANA ROO

The forests of Quintana Roo grew up on former agricultural lands and urban centers abandoned by the Mayans when their culture collapsed beginning about 1000 years ago. These forests have been affected by an array of disturbances, both natural and anthropogenic. An average of two hurricanes a year slam into Quintana Roo. Since 1955, three of these storms have caused massive destruction, affecting hundreds of square kilometers of forest. Hurricanes are 'top down' disturbances which

blow down individuals and groups of trees. Defoliation and crown damage kill others gradually, but the understory is left relatively intact.

Agriculture in Quintana Roo, based on a shifting system of clearing, burning, cultivation, and subsequent abandonment of small fields in the forest, dates back thousands of years. In addition to creating clearings, agricultural practices have also caused fires which periodically burn thousands of hectares of forest. Both agricultural clearing and fires affect forests 'from the bottom up', killing trees from the base and destroying seedlings and other understory plants.

Another cause of disturbance in the forests of Quintana Roo is timber harvesting. Selective felling of individual trees opens holes in the canopy, while extraction of logs creates skid trails through the forest and clearings scraped clean by bulldozer blades to serve as loading areas.

FIELD METHODS

The forests of Quintana Roo represent a mosaic of 'natural experiments', patches which grew up after different kinds of 'treatments' at particular times in the past. With the assistance of the community of Noh Bec (Mayan for 'great tree') in whose forests this research is being conducted, sample plots were established on sites with known histories: burns dating to 1945 and 1974, a 1955 hurricane blowdown, and log-yards opened up over the past 40 years during selective harvesting operations. Evidence used to confirm site histories included burn scars on residual trees, sprouting, crown breakage, uprooted trees, stumps, and rotting logs.

On each plot, trees were identified and mapped, and their diameters, heights, and crown radii were measured. These data on numbers and sizes of different species of trees and their horizontal and vertical distribution on each type of site will be analyzed and compared for insights into the regeneration potential and growth rates of mahogany and its associated species. Sites will be compared according to types of disturbance to reveal how the density and species of survivors and initial environmental conditions favor or impede regeneration. Harvesting systems or silvicultural treatments could then be designed to imitate the post-disturbance conditions which are found to give rise to the highest densities of mahogany.

Where the date of an initiating disturbance is known, tree ages can be determined. Average growth rates are derived from age and diameter measurements. This provides a point of reference for defining cutting cycles and rotation lengths. Comparing the sizes and numbers of different tree species among stands of different ages provides



Swietenia macrophylla
Honduras mahogany

additional information about growth and reveals changes in density and dominance among species over time. This provides an estimate of the number of young trees which are likely to survive to commercial size, and indicates how they are affected by interspecific competition.

To determine whether trees produce annual growth rings, an increment borer was used to extract cores from mahoganies and several other species which were 1) soft enough to core, and 2) revealed visible rings. Checking the number of tree rings against the hypothesized stand age serves to confirm the stand history and indicates whether or not tree rings in a given species are annual.

INITIAL OBSERVATIONS

While the data have yet to be analyzed, certain useful observations have been made already:

- 1) Mahogany became established naturally in clumps at densities equivalent to 60/ha on sites affected by drastic disturbance, as compared to the average density of 1-2/ha. This implies that silvicultural practices which imitate natural disturbances can probably increase the density of mahogany trees in the forest.
- 2) Some mahoganies have reached commercial size at 40 years of age.

3) Several species of trees have been found to produce annual rings in Quintana Roo. This permits determination of ages and growth rates, which in turn can be inferred for associate trees if stands are even-aged.

4) The complex, multi-strata tropical forests of Quintana Roo include many even-aged or two-aged stands (which include even-aged regeneration of residual trees surviving the initiating disturbance) like those commonly found in the forests of the United States. Although tropical forests are inherently complex due to their high species diversity, their patterns of development appear to correspond to familiar models.

ACKNOWLEDGEMENTS

Academic advisors for this study are Dr. David M. Smith, major professor, Dr. George Furnival, and Dr. Bruce Larson. Financial support for the project has come from the Tropical Resources Institute of Yale F&ES, the Charles A. Lindbergh Fund, and a Fulbright Doctoral Dissertation Grant. Institutional support has been provided by Mexico's National Institute for Research on Biotic Resources (INIREB) in Xalapa, Veracruz, and Mexico's National Institute for Research on Forestry, Agriculture and Animal Husbandry (INIFAP) through their station at San Felipe Bacalar, Quintana Roo. Additional support has been provided by the German-Mexican Forestry Agreement (Acuerdo México-Alemania) of the GTZ, and the State Forestry Program of Quintana Roo.

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For complete citations see:

- Snook, L. C. 1988. Regeneration and growth of mahogany (*Swietenia macrophylla*) in mixed natural stands in Quintana Roo, Mexico. Yale F&ES Library. 39 pp.

INTERRELATIONS AND ETHNOECOLOGY OF SAMBURU PASTORALISTS, DOROBO FORAGERS, AND LOCAL FAUNA IN NORTHERN KENYA

Jock Conyngham, PhD Candidate

The world knows Kenya for a number of disparate phenomena: fabled wildlife parks, relative prosperity at the national level, premium coffee, and a human population growth rate, 4.1% annually, which demographers once thought impossible for our species. With these characteristics in mind, many readers may be surprised by the assertion that arid northern Kenya is underpopulated by both people and livestock. Photographs and written accounts of overgrazing and desertification fill the technical and popular literature. National statistics, however, blur problems of distribution. Various social, economic, and political processes have led to urban migration, sedentarization of formerly mobile herders, and a general marginalization of pastoral livestock production in the semi-arid and arid areas that comprise the majority of land in Kenya and sub-Saharan Africa.

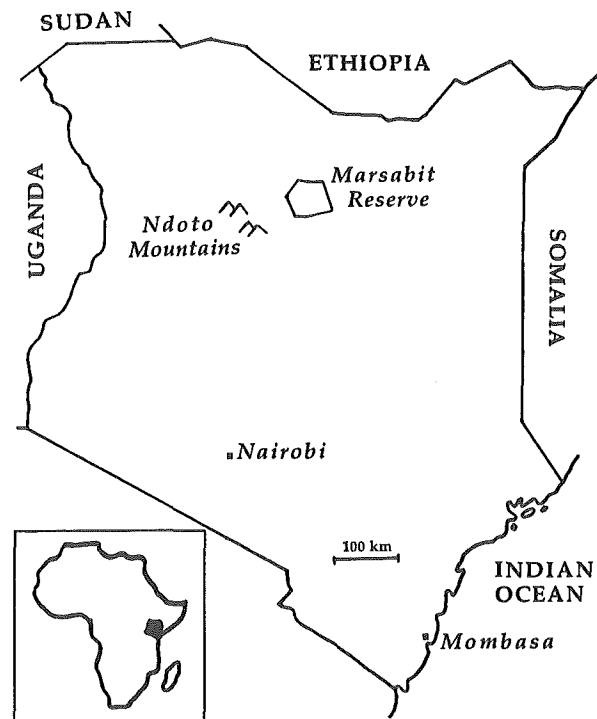
Low rainfall in these regions virtually precludes crop agriculture. The alternative, livestock production, requires balancing constraints and surpluses in animal, forage, water, and labor resources. Nomadic pastoralism in its varied forms, considered an exotic mode of subsistence in the recent past, has increasingly been shown capable of sustainably supporting more people per unit area in arid regions on a subsistence basis than other forms of production. Pastoralism in countries such as Somalia and Mali may support 50 times more people than would be possible if reorganized into models and practices of modern ranching (Cossins 1983).

Subsistence production is clearly not the whole answer for countries with hungry urban populations and balance of payment problems. Africa's current focus on production potential and conservation of rangelands has been coupled with awareness that pastoralism and its derivatives (particularly mixed domestic and wild communities; see Taylor & Walker 1978) may represent the most productive and sustainable land use for such areas. These interests have created an immediate need for further research on interactions between livestock production, arid and semi-arid ecosystems, and wildlife in sub-Saharan Africa. Current rates of cultural change necessitate research on the ethnic and ecological contexts of interactions between herders, related groups, fauna, and other components of local ecosystems.

My research focuses on culturally and ecologically significant interrelations between Ariaal Samburu

pastoralists, local fauna, and their ecosystem in the Ndoto Mountains and Marsabit region of northern Kenya (see map). The primary research objective is to explore subsistence strategies in a marginal and unpredictably varying environment by analyzing three sets of interactions: 1) those of herding Samburu with a foraging sub-group, the Dorobo; 2) those of indigenous perceptions of livestock, wildlife, and the environment with decision-making and behavior; and 3) those of the respective subsistence systems with the local ecosystem and its fauna.

The Samburu are Maa-speaking pastoralists whose traditional herd composition includes cattle, goats, and sheep. Recent additions of camels to herd complexes have accompanied and facilitated expansion into drier areas. The Dorobo are forager-herders living at higher elevations than the Samburu. During periods of normal seasonal conditions the two groups share formalized relations in which the foragers trade honey and ritual services for pastoralist livestock, milk, hides, meat, and protection from raiders. After episodes of stock loss to



The Ndoto Mountains and Marsabit Reserve in Kenya

drought, epidemics, or raiding, however, Samburu disperse and turn to Dorobo for meat, gathered foods, and training in subsistence skills. They then call themselves Dorobo until able to rebuild their domestic herds again. The Maa word *ldorobo* refers to a poor person, one without cattle. The Samburu regard such a condition with explicit distaste regardless of whether it occurs with a dispossessed Samburu or a longstanding Dorobo. Thus the ethnic boundary between the two groups appears permeable, and passage across it offers a critical ecological and economic refuge for the Samburu. The motivation for the Dorobo to participate in the relationship is less clear.

The project takes a systems view of cultural, economic, and ecological interactions. It focuses on the following hypothesized patterns and processes:

- 1) The ethnic boundary between Samburu and Dorobo is permeable. The boundary and passage of people, goods, services, and information across it have social, economic, and ecosystemic contexts and consequences, with size of herd holdings serving as the primary criterion for group membership.
- 2) Anticipation of risk by herd managers represents the principal voluntary constraint on production of marketable surpluses. An example is the maintenance of large non-milking herds.
- 3) Chronic shortages of labor represent the principal involuntary constraint on production and often result in localized overgrazing.
- 4) Samburu and Dorobo ethnoecology, relative to one another and to Western counterparts, is influenced primarily by perceptual salience (defined as the attribute[s] of the perceived entity most evident to the five senses) and secondarily by mode of subsistence.
- 5) Geographic ranges are being restricted by external political and economic influences (e.g. mission activities or inter-tribal raiding), altering the environment and creating localized areas of competition with wildlife.

The main period of data collection will take place from April 1990 to March 1992 in an area of approximately 2500 sq. km. along the eastern slope of the Ndoto Mountains. A secondary site of approximately 500 sq. km. lies just south of Marsabit. Field trips in 1986, 1988, and 1989 facilitated selection of these areas and formulation of hypotheses.

The project will begin with documentation and analysis of abundance, distribution, movement, and economic activities of herders and foragers. Micro-level efforts will focus on twenty Samburu and five Dorobo families. These families will be selected from different clans in order to observe flows to and from larger units as well as resource allocation at several levels. The sample families

will be closely studied through interviews and participant observation. Since herders and foragers maintain sophisticated information networks, continuous interviews will aid in tracking movements of individual family units and checking efficacy of resource monitoring. Complemented by aerial photographs and SPOT satellite imagery, these data will be analyzed for patterns of and reasons for movement, with identification of system thresholds and anomalies as the primary goal. Similarly, time and series analysis of economic data will reveal production system bottlenecks and surpluses.

Interviews and ethnolinguistic analysis will be used to derive classificatory models on landforms, forage, livestock, wildlife, and water sources. The units of folk classification and the systematics linking them will be correlated with perceived goals, constraints, decision-making, and behavior.

Investigation of the ethnic boundary between Samburu and Dorobo communities is the most methodologically difficult component of the project. Since this research takes issue with traditional assumptions of discontinuity in cultural variation, it applies the same methods to both groups and focuses on the flow of goods, people, and information across the ethnic boundary. The processes by which that boundary is maintained are of primary interest.

Extensive cooperation is anticipated with Kenyan personnel from various ministries and departments. The project's affiliate institution is the University of Nairobi's Institute of African Studies. On-site fieldwork will be conducted in close cooperation with staff from the Kenya Agricultural Research Institute's National Arid Land Research Centre in Marsabit. Governmental records, as well as aerial photography from the Survey of Kenya performed between 1949 and 1979, will lend temporal depth to the proposed research. Aerial imagery will also be analyzed in cooperation with the Department of Resource Surveys and Remote Sensing.

This project will yield a systematic analysis of largely undocumented interactions between two culturally distinct groups of people, their perceptual systems, and their modes of subsistence in an unpredictably varying and risk-filled environment. Building on past work in cultural anthropology, ungulate ecology, range management, and dry savanna ecology, it is specifically targeted at those gaps in knowledge resulting from the predilection of researchers to concentrate on a local system's interior patterns and processes rather than those occurring at its boundaries. Various methods and sources have been selected to address problems of temporal and spatial scale experienced by past research and to allow cross-checking of various data types.

The project should also produce insights applicable to problems of livestock development in arid and semi-arid lands. Management innovations which build upon existing subsistence strategies will be essential to increased production in light of pastoralist aversion to risk and the relatively small amounts of development funding available for capital inputs. My Kenyan collaborators and I hope to identify strategies for harnessing the strengths of traditional subsistence practices to the production needs of a rapidly growing country.

RECOMMENDED LITERATURE

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Beloperone guttata
shrimp plant

**John D. and Catherine T. MacArthur Foundation Fellowships
and
The Underhill Foundation Fellowship
for
Graduate Study in Tropical Environmental Management**

The Yale School of Forestry & Environmental Studies is pleased to announce the establishment of fellowship opportunities for Master's work in tropical environmental management. MacArthur Foundation fellowships are available to residents of Puerto Rico and the U.S. Virgin Islands to pursue a Master's Degree in Forestry or Environmental Studies. The Underhill Foundation Fellowship is available annually to one Latin American student seeking a Master's degree at Yale F&ES. The purpose of these fellowships is to provide educational opportunities for future leaders who will make significant contributions to the management and conservation of natural resources in their native lands. The MacArthur Foundation fellowship is offered for two years of graduate study. The Underhill Foundation fellowship covers tuition, fees, travel, books, room and board for study beginning in September, 1990. Qualified students with a Baccalaureate degree and a strong scholastic record are encouraged to apply. For more information contact: Nancy Rabbott, Director of Student Affairs/Registrar, 205 Prospect Street, New Haven, Connecticut 06511 USA. Telephone: (203) 432-5106. Telex: 5101012363. Fax: (203) 432-5943.

MASTER'S PROFILES

COMMUNITY PARTICIPATION IN THE MANAGEMENT OF NATURAL RESOURCES IN COLOMBIA

Marco Lowenstein, MFS Candidate

The world's natural resources are increasingly threatened by exploitation, degradation and contamination. Their overuse and consequent scarcity lead to global problems of climate change, habitat destruction, hunger, and unemployment. Paradoxically, as human societies become more dependent on technology, social limitations to productivity and conservation become more important. Although some people in the industrial Northern Hemisphere focus on problems of tropical resource degradation, the deterioration of environmental quality and natural resources in both industrialized and developing countries shares the same sociological and ecological roots. As a result of years of experience under conditions of economic scarcity, natural resource professionals in Colombia have begun to address environmental problems with viable, low cost management and planning methodologies which are based on local participation and a broader vision of environmental quality.

COLOMBIA: LAND OF CONTRASTS

Colombia's human and natural resources demonstrate a wide range of contrasts. Although plagued by political instability and violence, Colombia hosts one of Latin America's oldest and strongest democracies. Despite declining coffee prices and a thriving black market, Colombia's economy has been able to hold its own and even achieve a reduction in foreign debt. In terms of biological diversity, Colombia ranks among the top ten countries in the world, and yet its rate of deforestation and habitat degradation is alarming (Myers 1980).

The Sierra Nevada Santa Marta National Park is a microcosm of this biological and cultural diversity. Stretching from splendid Caribbean beaches at sea level to the 18,000-foot, glacier-capped peaks of Mount Bolivar, the park is home to condors and tapirs, colonists and Indians, smugglers and drug lords, monkeys and guerillas. Although many of the biologically richest areas of Colombia have been declared national parks, the government has been powerless to protect the majority of these reserves. For example, management in the Sierra Nevada National Park is spread across three provinces, four regional natural resource authorities, several dozen counties and an endless array of government agencies. This lack of coordination and control is representative of the Colombian political and social reality.

In and around these physical, sociological and political spaces, a dynamic group of Colombian individuals and institutions is working to redefine the relationship between people and their environment. Local governments, environmental foundations and federal agencies are collaborating with grassroots organizations to address the socio-economic roots of environmental degradation.

INTEGRATED RESOURCE MANAGEMENT

To understand the Colombian process, it is helpful to look at several specific examples. In the Sierra Nevada National Park there exists a small non-governmental organization (NGO), Fundación Pro-Sierra Nevada de Santa Marta (FPSNSM), which focuses on the micro-watershed as a socio-ecological unit for integrated environmental management. Two years ago, the FPSNSM developed an interdisciplinary research team to survey a remote colonist community—*el Congo*—on the edge of the Sierra Nevada National Park. The team—a medical doctor, a nurse and a sociologist—spent a night at each household in the watershed community. During the course of two months they collected demographic, cultural, technical and ecological information on each household in the watershed. At the same time the team provided primary health care to several hundred people, particularly children, acquired a basic understanding of the people's viewpoints on important social and environmental issues, and established the basis for an ongoing relationship with the community as cooperators in the struggle for survival.

In another approach to integrated conservation, the Fundación para la Educación Superior (FES) is incorporating socio-economic development objectives into the operation of the 3000 hectare Reserva Natural La Planada, located in a critical conservation area in the southern Andean department of Nariño. By providing visiting scientists with accommodations and laboratory space, they are helping support biological and ecological investigation of this remote area. Already many new species of plants, birds and invertebrates have been discovered. In addition, a doctor has been employed to work with neighboring communities, teachers from thirty elementary schools have been trained in 'new school' methodologies, and a livestock-based diversification project has been established.

In Colombia's central coffee-growing region, local volunteer environmental groups such as Grupos Ecologicos de Risaralda (GER) and the Fundación Ecologica del Cauca (FEC) are focusing on education as a primary tool for environmental protection and natural resource conservation. Through cooperation with the poorer sectors of the urban and rural populations, they have redefined environmental education to incorporate issues of land tenure, health care, housing and drinking water. Environmental clubs, formed in universities, high schools and elementary schools, give students opportunities to participate in workshops and field trips with community leaders concerned with watershed management and garbage disposal.

There are many more examples of groups who have adopted participatory strategies for implementing resource conservation, including major government agencies like the National Institute for Natural Resources and Environment (INDERENA), the National Planning Department, the Bogota Regional Resource Authority (La CAR), the Fundación Natura, and the Green College (see page 17). It is useful to examine why these approaches are so widely adopted in Colombia.

ROOTS OF PARTICIPATORY ENVIRONMENTALISM

Two main elements have contributed historically to the development of participatory environmental and natural resource management in Colombia. These are: 1) the Government's emphasis on administrative decentralization and local democracy; and 2) sociological research methods of Participatory Action Research.

Local Democracy

Since large centralized institutions have failed to respond to development and conservation needs, local governments have recently assumed more control over these issues as a result of legislative and administrative decentralization. Popular election of mayors and the local distribution of tax revenues give communities legal and financial autonomy to plan and execute local development. In 10% of Colombia's 1100 municipalities, grassroots organizations, civic groups and alternative politicians share the electoral stage with the two major political parties—the Liberals and the Conservatives—which have dominated the Colombian political scene since the founding of the Republic. In several cities (e.g. Armenia, Cali, Tenjo, Tabio), the Mayor's office and local environmental groups have collaborated to promote recycling, environmental education and resource planning to conserve natural resources while simultaneously addressing socio-economic development issues such as employment and housing.

Participatory Action Research

Colombian sociologists have been working for over twenty years with governmental and non-governmental organizations to develop methodologies for organizing communities in order to make more efficient and effective use of scarce financial and natural resources (Fals Borda 1987). One such methodology is known as Participatory Action Research (PAR).

In response to failed top-down ideologies of the left and right, PAR proposes that "people develop their own endogenous process of consciousness-raising and knowledge generation" (Rahman 1985). The main distinction between PAR and traditional sociological research is that in PAR the investigator takes an active involvement in the community development process. The justification for this intervention is a belief that all social sciences are inherently biased (by the observer's attitudes, by the reigning structural paradigms, by the research technology, etc.). However, direct action by the researcher allows hypotheses generated in the field to be applied quickly, bringing timely solutions to pressing problems. In this way, a community with scarce resources can participate in the research process and benefit directly—through organization, experimentation, and education—enabling it to be better prepared to continue the development process on its own.

The community participation methodologies that have evolved in the last thirty years are best exemplified by the National Training Service (SENA) in its Training for Campesino Participation (CAPACA) and other community action programs. The methodologies were systematized for educators and promoters working in urban and rural communities who found that training efforts were wasted without viable community organizations prepared to follow them through (SENA 1988). According to this approach, investigation, planning and action are based on community opinions, ideas and efforts. Institutional objectives must be flexible and solutions must be based on an interdisciplinary approach. Although environmental, housing or agricultural objectives may be at the heart of an institution's organizational agenda, the emphasis should be on addressing the broader range of needs and goals of the local people.

CONCLUSIONS

It is important to stand back from these impressive achievements and look at some of the limitations of the Colombian situation. While integrated environmental practices and attitudes are widespread, national and international interests are still heavily invested in traditional growth-oriented, top-down development models. Although Colombian awareness of

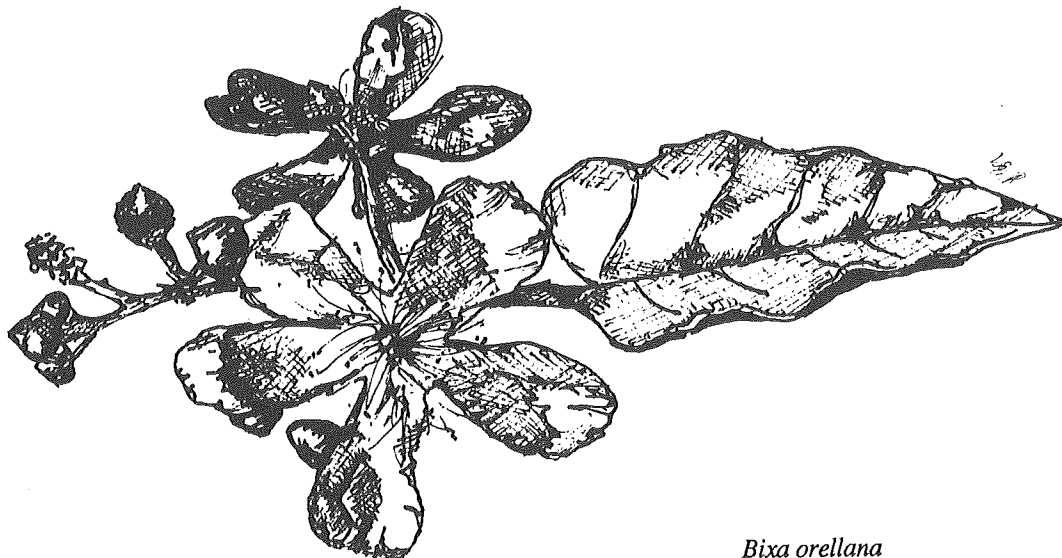
environmentalism is growing, local efforts will not stem the rapid rate of environmental degradation without major shifts in government policies and expenditures. Finally, political and drug-related violence can erase years of community-building overnight. Yet in spite of these limitations, the seeds of community participation in environmental management, planted and adapted to local conditions by local people, can certainly be seen as a positive example for others working to protect and improve the quality of the environment in which they live.

Although in the United States the environmental movement has matured politically, scientifically, and legally over the last twenty years, it is evident that solutions to ecological problems, from acid rain to park preservation, are increasingly constrained by social factors. The problems we face are not unlike those of our neighbors in Latin America. As the United States and other industrialized countries move toward an economy of scarcity, jobs, health care and housing are for many the main 'environmental' problems. The credibility of the environmental movement would be enhanced, and an environmental ethic would become more widespread, if it were to address these problems and adopt a broader 'Colombian' definition. This approach could lead conservation organizations such as The Nature Conservancy to help the urban poor buy or finance a housing project and promote employment opportunities with recycling and urban reforestation projects. Or the Sierra Club could diffuse the extreme polarization of the spotted owl issue in the Pacific Northwest by helping laid-off millworkers buy and re-tool their mills for second-growth timber processing.

Thus, while international development activities have concentrated traditionally on the transfer of modern technology from North to South, it may be time for the transfer of social methodologies from South to North. The Colombian vision of environmental quality, which encompasses the houses we live in and the water we drink, the jobs we have and the voice we can express to influence and participate in our communities, can provide a model for those of us struggling with tenacious social and environmental problems here in the United States. While at this very moment the press is full of news about how the 'developed countries' must 'help' Colombia in this time of crisis, it is perhaps a greater truth that we have much to learn from the integrated, sociological approach to grassroots ecological development, Colombian style.

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Bixa orellana
annatto

LADAKH: CONFLICTS IN CULTURAL ECOLOGY

Seema Bhatt, MES Candidate

Tucked away in the remote northeastern corner of Jammu and Kashmir, India's northernmost state, is a unique cultural and ecological region called Ladakh. A mountain desert, this Himalayan enclave of Tibetan Buddhism is currently being subjected to increasing pressures from development and tourism. Both its wildlife and cultural traditions are seriously threatened.

Conflicts arising between development and conservation are common all over the world. Ladakh, however, is at a critical stage where development could either enhance or destroy the area. The indigenous residents of Ladakh have historically lived in extremely harsh physical conditions while at the same time practicing conservation of the natural resource base. Today's rapid changes are transforming Ladakh as revenue-generating industries such as tourism become increasingly important. In fact, at this stage a parallel can be drawn between the course of development in Ladakh with that in Nepal, another Himalayan country where tourism has become established. On the slopes of Mt. Everest in Nepal, severe deforestation has resulted from increasing demand for wood by tourist trekkers. The economy and culture of the local people, the Sherpas, has been transformed due to the establishment of the tourist industry. If Ladakh were to follow the same course of tourism development as Nepal, both the culture and fragile environment of Ladakh could be irrevocably damaged.

This past summer the School for Field Studies (SFS) in Beverly, Massachusetts conducted a two-month field course in Ladakh for undergraduate students from the U.S. to examine the cultural and ecological factors affecting wildlife in the Ladakh region, including the snow leopard (*Panthera uncia*). Accompanying the students as Associate Faculty for the course, my role was to teach various aspects of ecology and culture related to the area.

Ladakh, or the "Land of Passes" (La = pass; Dakh = land) as it has been known for centuries, lies in the remote Trans-Himalayan ranges between 2900 and 5900 meters altitude. In 399 A.D. the area was described by the Chinese traveller Fa-hien as "the land where snow never melts and only corn ripens" (Moti Dar 1984).

Though politically part of the Indian subcontinent, Ladakh is ethnically and geographically different from the rest of the country. It has always been more closely associated with its neighbor Tibet, as reflected in its language, architecture, costume and mythology. In both,

the predominant religion is Tibetan Mahayana Buddhism. 52% of Ladakh's population is Buddhist, 36% Muslim, and 2% Hindu and other religions (Goldstein 1981). Within an area of 95,876 square kilometers, Ladakh supports a population of more than 132,299 (Chatterji 1981). This distinguishes Ladakh as one of the most densely populated regions in the world at such high altitudes.

With very low annual precipitation (92 mm), the landscape is classified as a "mountainous arctic desert." Ladakhis have adapted to arid conditions by utilizing water flow generated by snow melt for irrigation. Streams have been channelled to support irrigated crop cultivation—chiefly barley and mustard—up to an elevation of 4000 meters. The natural vegetation, on the other hand, is characteristic of high-altitude desert. Scattered trees, mainly conifers (*Juniperus* spp.), grow on high, inaccessible slopes or in remote valleys. Shrub thickets of *Salix* spp., *Populus candicans*, *Myricaria germanica* and *Hippophae rhamnoides* can be found along valley floors.

In such an inhospitable environment, adaptation and survival are best exemplified by the snow leopard. This rare and elusive cat ranges the entire Himalayas between 1850 meters in the winter to 5550 meters in the summer (Van Gruisen 1987). During the course of the summer, I was fortunate to sight three handsome wild dogs (*Cuon alpinus*), an animal which has not been seen by outsiders since 1968 (Osborne, Mallon & Fraser 1983). Other predators such as the wolf (*Canis lupis*) and the fox (*Vulpes vulpes*) are relatively common in Ladakh. A number of wild sheep, like the argali (*Ovis ammon hodgsoni*) and the Ladakh urial (*Ovis orientalis vignei*), and goat species such as the Ibex (*Capra ibex*), are the principle grazing species in this region.

Ladakh's social structure has traditionally been well-adapted to this 'encapsulated environment', characterized by severe climate, a finite resource base and minimal water. Fraternal polyandry, in which one wife is shared by two or more brothers, once helped maintain a low population. The conservation of land was supported by the principle of primogeniture, whereby only the eldest son inherited land (Goldstein 1981). These practices, which long served as effective resource management strategies, are no longer observed.

As in the past, Buddhism plays a significant role in the lives of Ladakhis and heavily influences their relationship

to the environment. Ecological sensitivity has been absolutely essential for the continued survival of Ladakh's inhabitants. Since Buddhism condemns the killing of any living being, wildlife in this area has flourished. Predation and harsh climatic conditions have maintained livestock populations well below the carrying capacity, thus preventing overgrazing. Resources have been conserved and recycled. Dung from cattle is carefully collected to meet fuel requirements, while human waste is collected for use as fertilizer in the fields.

The winds of change blowing over Ladakh can be traced to several extraneous political factors. Typical of a frontier region, Ladakh has long been the focus of political and military intrigue. The withdrawal of British power from India in 1947 resulted in instability at the northern Himalayan frontier. India's relations with China and Pakistan, both of which border the region, soon deteriorated and Ladakh was subsequently closed to foreigners. Since then, the Indian army has been permanently stationed in the area. Army personnel numbering over 40,000 must seem overwhelming in a district where the indigenous population itself is about 130,000! Indeed, one of the most visible impacts of the Army has been on wildlife, where the introduction of arms, ammunition and indiscriminate killing has led to tremendous decimation of animal populations.

In 1974 Ladakh was opened to tourists. New roads were constructed, greatly improving accessibility to the region. Today, Ladakh supports a tourist industry largely focused on trekking. The number of tourists has increased rapidly from 551 in 1974 to 14,200 in 1984 (Chatterji 1987). Unfortunately, as more trekking routes are established, the potential danger of fragmented wildlife habitat and soil erosion grows. If not carefully planned, these new routes will prove disastrous to the ecologically fragile mountainous area.

The 'modernization' which has begun to alter Ladakh is most apparent in the main town of Leh. Attempts to copy the Western development model have led to increased use of chemical fertilizers and pesticides. New breeds of livestock introduced by the government such as the Jersey cow and Merino sheep are not adapted to climbing steep slopes, increasing the potential for overgrazing in low-lying areas.

Nature continues to be the dominant factor governing the lives of most Ladakhis living in rural areas outside Leh. Here, factors such as overgrazing are not viewed by the villagers as potential problems. As Buddhists they are ready to compromise—even if the situation arises where wild ungulates compete with their livestock for fodder. High in the alpine pastures (4300 meters and above),

people in their summer dwellings are happy to welcome visitors and expect nothing in return for their hospitality.

As in many areas of the world subjected to the pressures of a growing tourist industry on fragile ecosystems, change is inevitable. The opening of Ladakh to the outside has altered the perceptions and values of people who live there. The younger generation of Ladakhis, for example, does not wish to be deprived of material goods generated by the tourist industry which they feel will enhance their lives. As outsiders, we may view such change as a negative and destructive transformation of a pristine natural area and traditional culture. And yet we have no right to deny the Ladakhis opportunities for development.

What natural and cultural aspects of Ladakh can be successfully conserved? Will cultural attitudes and practices impact plans for management? What type of development is best-suited for this area? How can management practices incorporate local knowledge of the environment? What role should we as outsiders assume in the complex process of change in Ladakh? One possible solution integrating people's needs and conservation goals is eco-tourism through a well-managed protected area system. If properly developed, eco-tourism could be an extremely successful method for generating income for local people through employment while at the same time protecting the fragile ecosystem. To ensure sustainability, however, management and stewardship of the park system should be controlled by local people. Much can be learned about conservation measures from the Ladakhis. Such an experiment in synthesizing human and ecological needs may prove to be the solution to Ladakh's emerging problems during these times of change.

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TRI COOPERATION

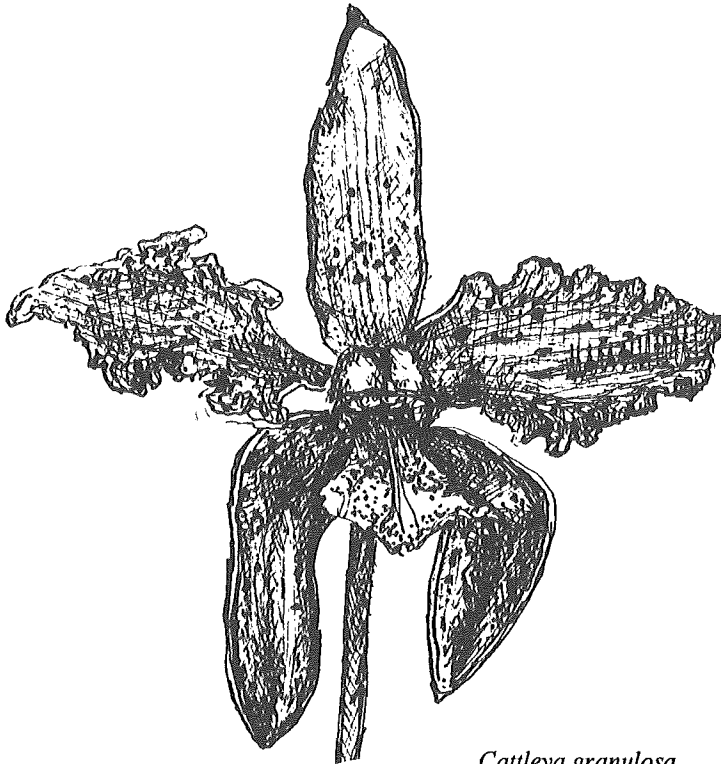
The Madagascar Project

The Tropical Resources Institute has established direct ties with the Beza Mahafaly Reserve project in southwestern Madagascar. This project, directed by the University of Antananarivo's School of Agronomy, integrates the conservation of a forest reserve with economic development. Yale's involvement with the project began with its inception eleven years ago when Dr. Alison Richard, now chairwoman of Yale's Anthropology Department, helped establish the forest reserve.

The reserve is the habitat of four species of lemurs and many other unique forms of flora and fauna. Endemism is estimated at 90%. Covering six hundred hectares, the reserve will be expanded in the next few months to approximately twice its current size. Two different types of forest and a transitional zone are represented in this area: a gallery forest dominated by *Tamarindus indica* that grows along a seasonal river, and a dry forest that is composed of spiny species such as *Aullaudia procera*.

Unlike many protected areas in Africa, the special reserve at Beza Mahafaly is not a remnant of the colonial era when parks and natural reserves were imposed on areas without the consent or involvement of local people. Villagers have been involved with the creation of the reserve since the beginning. Indeed, it was only with their approval that this community land was established as a reserve. This is particularly significant in light of the fact that much of the land in the reserve has good agricultural potential and is by no means marginal.

Its withdrawal from common use represented a considerable sacrifice on the part of local communities. In return for local support and cooperation, a program of economic development financed by the World Wildlife Fund (WWF) and USAID has been initiated. Goals for economic activities have been based on needs expressed by the local population and so far have included road improvements, construction of a local school and, most recently, the repair of an irrigation system.



Cattleya granulosa
orchid

In addition to conservation and development, the project has an important educational component. A camp has been established where students from the School of Agronomy's Forestry Department study ecology and conservation. Field courses are held there annually.

TRI is now involved in all three components of the project. Dr. Sheila O'Connor, a WWF Technical Advisor and TRI Visiting Fellow, advises the University of Antananarivo on overall policy for the reserve. This year she directed the Field

School. Courses were taught by Yale F&ES doctoral candidate Eleanor Sterling, who is conducting research on the endangered aye-aye lemur, and TRI Fellow Russell Barbour, who has since returned to Yale F&ES to teach a course on African agronomy. Tentative plans are underway for two Yale F&ES Master's students to spend a year as interns on the reserve, and we anticipate that TRI's involvement in this exciting project will continue to expand in the coming years.

The Nepal Institute of Forestry Project

Nepal faces serious environmental problems that threaten the continued productivity of its natural resource base. An increasingly severe cycle of poverty has been set in motion whereby social and economic pressures are resulting in more intensive use of the land. As a consequence, deforestation, soil erosion, and other environmental problems have further fueled the marginalization of the country's rural poor majority.

To counter these trends in Nepal, a corps of well-trained natural resource managers is needed to support local people in sustainable land use practices. With United States Agency for International Development (USAID) funding, Yale F&ES is implementing a five-year project with the Institute of Forestry in Nepal to improve the caliber of trained personnel that can address and solve these pressing resource management issues.

Nepal's Institute of Forestry (IOF) is the country's only educational institution with the capability of producing professional resource managers. Established as part of the Government of Nepal Department of Forests in 1947, the IOF became part of the national university system with its incorporation into Tribhuvan University in 1972. The IOF offers a two-year technical certificate in forestry and a three-year Bachelor of Science degree with specializations in general forestry, soil and water conservation, and wildlife management. Both training programs are offered at the IOF's main campus in Pokhara, while only the certificate course is taught at the Institute's branch campus in Hetauda.

The IOF Project, initiated in April 1989, will provide technical assistance, training, and other institutional support needed to help IOF carry out more effective teaching, research, and extension. The Project will provide advanced training for IOF faculty and staff; strengthen the Institute's administrative systems; upgrade the library, laboratory, computer, and other academic support facilities; fund faculty research; facilitate networking with other institutions; and assist with the revision of the Institute's curriculum to meet the standards of the country's new Master Plan for the Forestry Sector which emphasizes social forestry.

A technical assistance team consisting of an Academic Administrative Management Specialist and a Forestry Research Specialist has been posted at the Pokhara campus by Yale F&ES to work alongside the IOF Dean and faculty to implement the project. The technical assistance team draws on support from a variety of locations: a small office staff in Pokhara; a facilitator in Kathmandu; the International Resources Group, Ltd., in

Washington D.C., a subcontractor hired by Yale F&ES to handle commodity procurement, shipping, and hiring of local staff; and Principal Investigator Dr. William R. Burch, Jr., Project Manager Bob Clausi, and others at Yale F&ES who will concentrate on technical support, contract management, and reporting.

Highlights of the first six months and major activities anticipated in the near future include:

*The Social Sciences in Asian Forestry Curricula Workshop, hosted by the IOF in July, brought experts on forestry education from the U.S. and Asia together with IOF faculty and administrators to explore ways of increasing the social science content of the region's forestry curricula.

*A future curriculum development workshop to focus exclusively on the IOF curriculum will be held to integrate the 'leading edge' knowledge of the Department of Forest's field officers with the educational expertise of the IOF administration, faculty, and the project technical assistance team.

*Yale F&ES Librarian Joseph Miller will assist in cataloguing the IOF Library's holdings and in identifying new books, journals and periodicals to establish a professional collection.

*Plans are being made for Nepal's National Administrative Staff College to assist with the administrative upgrade at the IOF.

As a tool for education and information exchange, several networking activities will begin in the near future. Visiting scholars will be appointed to the Institute to cover some of the teaching duties of IOF faculty who are away for advanced training, as well as to conduct research in collaboration with IOF faculty and students. In addition, up to 14 Peace Corps volunteers will be posted at the IOF over the next five years to assist with teaching, research, and support activities at the Institute.

Yale F&ES is excited by the opportunity to work closely with Nepal's IOF Project in a collaborative effort to improve the academic infrastructure supporting Nepal's resource managers.

The Free Student Union of the Institute of Forestry in Nepal has recently established a student library and is seeking donation of publications and books concerning forestry, soil science, wildlife, and other natural resource topics. Any assistance in this effort would be greatly appreciated. Please write: Krishna Prasad Woli, Secretary, Free Student Union, Institute of Forestry, Central Campus, P.O. Box 43, Pokhara, Nepal.

Incorporating the Social Sciences in Asian Forestry Curricula: the SSAFC Project

In September, the Tropical Resources Institute concluded the Social Sciences in Asian Forestry Curricula Project (SSAFC), funded through USAID's Forestry/Fuelwood Research and Development Project (F/FRED). SSAFC's goal was to integrate the social sciences in Asian university forestry programs and consequently shift the focus of their academic structure from purely biophysical science to include social science. The following objectives guided the project: 1) to determine the level of interest of department administrators and faculties in curriculum development; 2) to identify constraints and opportunities encountered in the integration of social sciences in university forestry programs; and 3) to work with a select group of Asian advisors to organize and implement a curriculum development workshop. Thus, SSAFC attempted to bridge the gap between curriculum content, research, and field reality.



Calotropis procera
giant milkweed

The first phase of SSAFC concentrated on the design and organization of a workshop held November 27-December 2, 1988 in Khon Kaen, Thailand. Dr. William R. Burch, Project Director, was assisted by Yale F&ES alumni Dr. J. Kathy Parker (PhD '85), Principal Consultant, and Bob Clausi (MES '85), Project Manager, in the implementation of the workshop. Research and curricula recommendations under three broad categories emerged from the workshop. Under *interdisciplinary research needs and strategies*, it was decided that efforts should be dedicated to identifying and applying indigenous tree and forest management techniques, refining and adapting inventory techniques for human and biophysical resources, and creating opportunities for students and faculty to be exposed to socio-economic and agro-ecological situations. Towards *development of educational materials and curricula*, recommendations were made to identify existing courses that would benefit from social science inputs, to organize teacher-training courses at selected institutions in the region, and to solicit publication contributions from agencies implementing projects to libraries of training institutions. *Organizational issues* included identifying funding sources, networking, and developing inter-institutional action programs.

The second phase of SSAFC emphasized designing tools and approaches for integrated curriculum development with the goal of improving the education of forestry researchers and practitioners. A second workshop organized by TRI was held July 9-13, 1989 in Pokhara, Nepal at the Institute of Forestry (IOF), bringing together a select group of experts from across Asia including many from the Khon Kaen Workshop. Participants discussed ways of strengthening linkages between field forestry practice, research and education, analyzing the factors that affect curriculum development and change, and refining operational guidelines to improve forestry and natural resource-related curricula. Publications entitled "Tools and Approaches for Curriculum Development: A Working Paper" and "Issues to Consider for Curriculum Development" resulted from the workshop.

Throughout the course of the project, SSAFC publications were produced with the assistance of Yale F&ES alumni. These include: "Bibliography of Social Sciences in Forestry Literature," "Directory of Resource Professionals," "Readings from the Literature of Social Sciences in Forestry," as well as the Proceedings and papers from the Khon Kaen Workshop. For more information on obtaining SSAFC publications contact: *Winrock International, 1611 North Kent Street, Suite 600, Arlington, Virginia 22209, USA.*

COOPERATOR NOTES

The Yale School of Forestry and Environmental Studies (Yale F&ES) is in the process of signing a Memorandum of Understanding with **The Green College (Colegio Verde)** in Colombia. The Green College is a non-governmental organization (NGO) dedicated to cultural, environmental and scientific activities. As an advocacy group and think-tank for scholars, researchers, community members and social organizations of various disciplines, the Green College addresses the socio-economic and biophysical causes of environmental degradation. Since 1986, the College has been conducting summer seminars and workshops on topics ranging from alternative architecture to citizens rights. First-year Master's student **Juan Pablo Ruiz**, Chief of Planning for the Green College, is seeking to select a summer intern from Yale F&ES to investigate issues related to pesticide risk, use and regulation. Last summer, second-year F&ES Master's student **Marco Lowenstein** joined the Green College to conduct agroforestry training workshops for Colombian environmental leaders from both the private and public sector. Both Mr. Ruiz and Mr. Lowenstein believe that cooperation between Yale F&ES and the Green College will cultivate an effective information exchange network between the North and South. For more information contact: *Margarita Marino de Botero, President, Colegio Verde, A.A. 58308, Bogota, Colombia, S.A.. Fax#: 2352750.*

The Coolidge Center for Environmental Leadership in Cambridge, Massachusetts recently held one of its three-day workshops entitled "Energy Efficiency for Sustainable Development" for foreign graduate students and professionals currently studying in the United States. The workshop was led by three resource persons: Dr. Peter Rogers, Professor of Environmental Engineering at Harvard University; Alan Poole, an independent consultant specializing in energy planning and regional environmental development in Brazil; and Dr. Vina Mazumdar, co-founder and Director of the Center for Women's Development Studies in New Delhi, India. Participating in the workshop were individuals from a broad geographical range including Ghana, Costa Rica, Turkey, India, Malaysia, Israel, the People's Republic of China, Kenya, Colombia, Malawi, Brazil, Botswana, and Bangladesh. Master's student James Hirsch from Costa Rica represented Yale F&ES.

The mission of the Coolidge Center is to influence future environmental leaders of developing countries, many of whom are now graduate students and mid-career professionals in the United States, by coordinating educational programs which promote sustainable resource

use. The Coolidge Center's Director, Dr. Robert Singer, estimates that there are approximately 20,000 foreign graduate students in the Northeast who can take advantage of the Coolidge Center's programs. In addition to the Workshop Retreats, the Coolidge Center organizes a film series and lectures which are open to the general public, and publishes a monthly calendar of local environmental events for members.

The Coolidge Center is currently developing a program in environmental advocacy training. The goal is to expose foreign NGO leaders to the success of U.S. NGOs in influencing public policy, in community organizing as well as in advocacy. Through such exposure, indigenous NGOs can apply new methodologies relevant to the situation in their own countries. This innovative training approach is expected to have a greater impact than the more traditional approaches to the promotion of sustainable development.

Future seminars hosted by the Coolidge Center will include "International Trade in Toxics" (February '90) and "Population and Environment" (March '90). For more information on these and other programs offered by the Coolidge Center, contact: *Robert Singer, Director, The Coolidge Center of Environmental Leadership, 1675 Massachusetts Avenue, Cambridge, MA 02138.*

Yale F&ES/TRI is collaborating with the Forestry School of the Federal University of Paraiba (UFPb) in Patos, Brazil to develop the school into a regional center for land use management. Partial support for the program to date has been provided by Partners of America and TRI. The objective of this integrated program is to enhance the UFPb Forestry School's ability to provide foresters and scientists with the multi-disciplinary skills necessary to address complex local natural resource problems. Ideas for the program grew out of the Yale F&ES Nepal Project. Next summer, three F&ES students hope to travel to Paraiba and participate in internships under the supervision of UFPb researchers, further advancing the development of a long-term exchange program.

Cultural Survival, Inc. of Cambridge, Massachusetts and Yale F&ES/TRI are jointly developing a program to maximize sustainable development and minimize social conflict in select biosphere reserves of Latin America. The program will explore methods to encourage participatory management by indigenous peoples who live within these protected areas and buffer zones. PhD candidate Gustavo Ruiz is coordinating the project for

TRI and will serve as a project investigator along with TRI Director Dr. Bill Burch and Cultural Survival's Dr. Ted MacDonald. This applied research program aims to strengthen the technical skills of indigenous groups in conservation and forest management to facilitate more direct control over their natural resources. Additionally, the research will provide detailed knowledge about social organization in biosphere reserves with the goal of strengthening the local organizational capacity necessary for sustaining cultural and biological diversity.

Cultural Survival is a non-profit organization which sponsors a variety of activities that empower indigenous people in the protection and defense of their human rights and native lands in the wake of rapid global 'modernization'. The organization provides financial and technical support for a wide range of projects designed and implemented by tribal people and ethnic minorities. One such project has been to identify and create markets for non-timber rainforest products from Brazil. Products such as Brazilnuts, cashews, assai, cupuacu, and herbs can all be sustainably harvested without destroying the forest in the process. Director of Research Dr. Jason Clay, who developed the Rainforest Marketing Project, has successfully approached two companies—Ben & Jerry's Homemade Icecream of the U.S. and The Body Shops of England—both of which have expressed great interest in using these extractive raw materials in their products. By combining marketing with a public relations strategy, the project hopes to raise awareness of threatened rainforests in the tropics while also providing direct profits to the indigenous groups who have a vested interest in their protection. For more information contact: *Ted MacDonald, Projects Director; Jason Clay, Research Director, Cultural Survival, 11 Divinity Avenue, Cambridge, MA 02138.*

Through its National Associates Program, the Nitrogen Fixing Tree Association (NFTA) based in Waimanalo, Hawaii is identifying professionals to serve as NFTA representatives in developing countries. This program seeks to link NFTA's state-of-the-art knowledge of species use and management with the actual needs of local communities for on-site development and research. Jim Chamberlin (MF '86) is currently assisting NFTA's newly-hired National Associate in India design a workplan for coordinating NFTA's projects there. The principal objectives are to develop local and regional leadership, enhance NGO capabilities, and increase communication between farmers, NGOs, government agencies, and researchers. NFTA's programs ultimately seek to enhance the quality of life for people in developing countries by encouraging sound land use practices. This is accomplished by providing seeds for nitrogen-fixing trees and information on their uses and

management, distributing guidelines for research and demonstration plantings, and conducting educational workshops. For more information contact: *James L. Brewbaker, President, NFTA, P.O. Box 680, Waimanalo, Hawaii, 97695.*

The Island Resources Foundation (IRF), based in St. Thomas, U.S. Virgin Islands, has recently published a directory of donor organizations and technical assistance agencies supporting programs for sustainable resource development and environmental management in the Eastern Caribbean. This directory is provided free of charge to Eastern Caribbean NGOs participating in the IRF's institutional development project. Copies may also be purchased from the IRF. For more information contact: *Dr. Edward Towle, President, The Island Resource Foundation, Red Hook Center, Box 33, St. Thomas, VI 00802.*



Ipomaea arborescens
morning glory tree

TRI NOTES

GUEST LECTURES

"The Global Commons: Science and Policy of Resources Common to All Humanity" was the theme of a lecture series hosted this fall by the Yale School of Forestry and Environmental Studies. Each speaker addressed matters concerning the ecology, economics and ethics of protecting resources of global importance. Professors Stephen R. Kellert and F. Herbert Bormann convened the presentations, which were sponsored by the Andrew W. Mellon and Geraldine R. Dodge Foundations and administrated by Robin Cash. **G. Carlton Ray**, Research Professor at the University of Virginia, discussed his work in marine ecology and conservation in "Sustainable Use of the Global Oceans: The Marine Revolution." **John Twiss**, Director of the Marine Mammal Commission, explored consequences of indiscriminate deep sea fishing in "High Seas Drift Nets: A Metaphor of International Irresponsibility." **Robert Dickinson**, Deputy Director of the Climate and Global Dynamics Division of the National Center for Atmospheric Research, presented "The Future of the Global Atmosphere." From McGill University, **Maxwell Dunbar** emphasized the fragile nature of arctic zones in "Conserving Polar Regions." **Donella Meadows**, Professor at Dartmouth College, stressed the importance of seeking out biases that inform media images in "Managing the Information Sphere." The closing speaker, **Lynn Margulis** from the University of Massachusetts, offered her view of earth's genesis as a living planet in "Gaia and the Biosphere."

Werner Fornos, President of the Washington, D.C.-based Population Institute, shared ideas with the Yale F&ES community in the semester's opening guest lecture, entitled "Gaining People, Losing Ground: Can the Balance Be Equalized?" While presenting a dim prognosis of the world's population problem, and particularly of the current political climate that discourages rational debate of the issue, Dr. Fornos offered some hope that current trends can be brought under control in the near future provided enough political pressure and financial support are committed to their reversal.

Kenneth N. Brooks, Professor of Forest Hydrology, and **Hans M. Gregersen**, Professor of Forest Economics, of the University of Minnesota, presented a Henry S. Graves lecture entitled "People, Watersheds, and Sustainable Development." Drs. Brooks and Gregersen provided an overview of the problems and challenges facing the international resource management field, emphasizing the need for an integrative approach to watershed

management practices that balances the multitude of human demands placed on natural systems. They concluded that, if recognized, the economic benefits of conservation strategies justify their implementation. The lecture was co-sponsored by the Yale F&ES International Society of Tropical Foresters/International Resources Group (ISTF/IRG) and the student chapter of the American Water Resources Association.

Australia's Ambassador for the Environment, **Sir Ninian Stephen**, discussed "National Interest, Diplomacy, and the World Environment" with a panel that included Professors Garry Brewer, Margaret Keck, William Nordhaus, John Wargo, and Robin Winks. A former justice of the Australian High Court and the nation's Governor-General from 1982 until February of this year, Sir Ninian spoke primarily of the international consequences and policy issues arising from the current debate on global warming. His visit was jointly sponsored by the Yale Center for International and Area Studies and Yale F&ES.

Ethnobotanist **Elaine Elizabetsky**, currently at the New York Botanical Garden, explored concepts of traditional medicine in a lecture entitled "Ethnopharmacology in the Brazilian Amazon." Dr. Elizabetsky discussed medicine and culture in indigenous communities of the Amazon Basin, where health and disease are believed to manifest interrelationships between nature, supernature, society, and the individual. Her lecture was sponsored by ISTF/IRG.

TRI hosted **Michael A. Rechlin**, Head of the Forestry Division at Paul Smith's College and newly-appointed Senior Advisor to the Yale F&ES-Nepal Institute of Forestry Project in Pokhara. In his lecture "Forest Technicians: Who Needs Them?" Dr. Rechlin stressed the importance of communication between field forestry personnel and natural resource policy-makers, and raised the possibility of collaborative research and training between Yale F&ES and Paul Smith's College. In Nepal Dr. Rechlin will be working closely with the Dean of the Institute of Forestry, Dr. Tej Bahadur K.-C., to ensure successful implementation of the USAID-funded project.

Robert W. Slater, Assistant Deputy Minister for Policy, Environment Canada, gave a presentation entitled "Beyond Rhetoric: Sustainable Development in Practice." In Dr. Slater's view, economics in its current form is exhausting the ecological capital of the earth; without

long-term policies, sustained management of global ecological resources will be impossible. He stressed the importance of the environmental debate in Canada and presented examples of how that concern is being translated into political and economic action.

Osmarino Amancio Rodrigues, co-founder and Secretary of Brazil's National Council of Rubber Tappers, and President of the Rural Workers Union of Brasilia, spoke on "The Brazilian Rubber Tappers Movement and Development Alternatives for the Amazon Basin." Mr. Amancio has been, with the late Chico Mendes, a key figure in the initiative to create extractive reserves to be managed by local rubber tappers in four Brazilian states. His visit was sponsored by TRI and ISTF/IRG.

VISITS

On September 13, **Luis Carlos Buriti Pereira**, Secretary of Planning for Paraiba State, Brazil visited TRI. Mr. Buriti also serves as the Vice-President for the Paraiba chapter of Partners of the Americas. Discussion topics included Sr. Buriti's rural development work with Paraiba's Planning Commission, TRI's recent involvement with the Patos Forestry School in Paraiba, and ways to strengthen collaboration among the three institutions.

Representatives of the **Baltimore Department of Recreation & Parks** visited the School on October 13 to discuss TRI's Urban Resources Initiative (URI) with Dean John Gordon, TRI Director William Burch, and a group of interested faculty and students. Questions were entertained from students during an informal brownbag lunch discussion. Their visit was organized and facilitated by URI Program Assistant Morgan Grove (MES '89). TRI is in the process of developing formal working relations with the city of Baltimore with the goal of establishing a joint program to develop expertise in the principles of urban ecology and resource conservation working with innercity populations.

Dr. K. Ogino, Professor of Forest Ecology and Silviculture at the College of Agriculture, Ehime University, Japan visited the School on November 2. Dr. Ogino engaged a group of students and faculty in a brownbag lunch discussion of his work in mangrove and social ecology in Southeast Asia. Dr. Ogino's experience in tropical forest ecology dates to research begun in 1961 at Kasetsart University in Thailand. He is currently involved in research aimed at restoration of degraded tropical environments sponsored by the Japanese Ministry of Education, Science, and Culture.

FACULTY NOTES

Several faculty members of Yale F&ES addressed international resource issues in the "Research Seminar on Ecological Systems" lecture series this fall. **Clark Binkley** discussed a recent trip to the Soviet Union to investigate potential expansion of log exports from the Soviet Far East to Pacific Rim markets. **William Reifsnnyder** presented his skeptic's view of the current atmospheric CO₂ controversy, concluding that available evidence on the subject is not sufficient to justify prophecies of doom. **Florencia Montagnini** reviewed her soil chemistry and nutrient cycling research in Costa Rica and new projects in Porto Seguro, Brazil and northern Argentina. **Steven Beissinger's** work in the Florida Everglades and Venezuela with Snail Kites and Green-rumped Parrotlets has yielded ideas for conservation strategies. Finally, Visiting Professor and TRI Fellow **Skip Barbour** discussed some of the environmental aspects of root and tuber crops on small African farms.

STUDENT NOTES

ISTF/IRG sponsored several presentations this fall by current and former students. Master's students **Juan Pablo Ruiz** and **Marco Lowenstein** screened a video entitled "La Ley del Monte (The Law of the Jungle)" which explored the issues surrounding colonization of the Colombian Amazon and focused on the production of coca. Master's students and professional photographers **Chip** and **Jill Isenhardt** offered the inside story of their work developing an educational and promotional slide show in a presentation entitled "Stories and Politics of Photographing Costa Rica's La Amistad Biosphere Reserve." Yale F&ES graduates **Susan Huke** (MFS '84) and **Kathryn Hunter** (MF '86) gave presentations entitled "Tropical Forest Management in Zaire" and "The Role of Environmental Assessments in Planning Forestry and Natural Resources Projects." Both are employed by USDA's Forestry Support Program in Washington, D.C.

TRI was one of several sponsors of a symposium in Washington, D.C. on "Extractive Economies in Tropical Forests: A Course of Action." The symposium was organized by Yale F&ES graduate Dan Nepstad (PhD '89) of the National Wildlife Federation and professionals at the World Wildlife Fund/Conservation Foundation. Master's students **Miguel Pinedo-Vasquez** and **Dan Zarin** presented a paper written with **Peter Jipp** on sustainable use of community forest and lake reserves in northeast Peru. **Chuck Peters** (PhD '89) delivered a paper entitled "The Ecology and Economics of Oligarchic Amazonian Forests."

1989 SUMMER OVERSEAS INTERNS

The Tropical Resources Institute helps support research and management initiatives of Master's students through overseas internships. The following is a list of students involved in programs this past summer, the institutions with which they collaborated, and their project focus:

STUDENT	INSTITUTION	PROJECT
Miyan Ahmed Shahed Antigul Azam	BRAC-Proshika- Forest Department Bangladesh	Social forestry project involving seedling production and distribution, silviculture, and credit mechanisms.
Salvador Alemany	Luquillo Experimental Forest Puerto Rico	Tropical ecology field research with Dr. Florencia Montagnini.
Seema Bhatt	School for Field Studies Ladakh, India	Taught SFS field course on cultural ecology (see pages 12-13).
Tim Donnay Jim Waltman	Smithsonian Institution Venezuela	Field research on Snail Kites and Green-rumped Parrotlets with Dr. Steven Beissinger.
Tara Evans	Department of Public Works St. Thomas, US Virgin Islands	Assessed impact on water quality of non-industrial waste discharges.
Melissa Grigione	World Conservation International Cameroon	Field research on endangered river manatees.
Regina Hirsch	U.S. Fish & Wildlife Service Puerto Rico	Assisted implementation of recovery plan for the endangered Yellow-backed Blackbird.
Peter Jipp Miguel Pinedo-Vasquez Dan Zarin	Federation of Natives and Campesinos of Loreto Iquitos, Peru	Field research on uses, ecology, and marketing of non-timber tropical forest products.
Marco Lowenstein	Green College Colombia	Taught agroforestry seminar and studied community participation (see pages 9-11).
Vicki Nichols	U.S. Fish & Wildlife Service Puerto Rico	Field research on endangered sea turtles.
Nick Simmons	Caribbean National Forest Puerto Rico	Field research on endo-mycorrhizae in disturbed moist tropical forests.
Patricia Shanley	New York Botanical Garden Iquitos, Peru	Collected medicinal plants and studied use of minor forest products.
Eirik Stijfhoorn	La Selva Research Forest Costa Rica	Field research on root ecology with Dr. Florencia Montagnini.
Jim Weigand	CATIE Costa Rica	Studied silvicultural management of native tree species.
Gary Wolinsky	Tropical Science Center Monteverde Cloud Forest Reserve Costa Rica	Studied water resource supply, conservation, and utilization by the Monteverde community.

LITERATURE

Noted below are selected additions to the TRI bibliographic database. Copies of these articles are available upon demand. We would welcome any papers or reports you could send for inclusion in this database for listing in the next TRI NEWS. If you do not have publications to send, please mail us citations of publications you judge to have special importance to tropical resource management.

LAND

The African experience with river basin development. Scudder, T. *Natural resources forum*, 13(2):139-148, 1989.

In search of a strategy for coastal zone management in the Third World--notes from Ecuador. Merschrod, K. *Coastal management*, 17(1):63+ 1989.

Optimization of traditional systems of soil resources inventory to achieve increased agricultural production. Osunade, M. A. A. *Third World planning review*, 11(1):97-108, 1989.

An activity-based systems concept of anthropogenic desertification. Zonn, I. S. *Journal of arid environments*, 17(1):103-108, 1989.

PLANTS, AGRICULTURE

Primary productivity of natural grass ecosystems of the tropics; a reappraisal. Long, S. P. et al. *Plant and soil*, 115(2):155-166, 1989.

Nitrification rates in two undisturbed tropical rain forests and three slash-and-burn sites of the Venezuelan Amazon. Montagnini, F.; Buschbacher, R. *Biotropica*, 21(1): 9-14, 1989.

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Rethinking crop genetic resource conservation. Brush, S. B. *Conservation biology*, 3(1):19-29, 1989.

Ecological implications of some cash crop ecosystems in Northeastern India. Kumar, A.; Ramakrishnan, P. S. *Proceedings of the Indian Academy of Sciences*, 99(3):211-222, 1989.

Agricultural sustainability and traditional agriculture; learning from the past and its relevance to Sri Lanka. Moles, J. A. *Human organization*, 48(1):70-78, 1989.

FORESTS

Population, development, and tropical deforestation: a cross-national study. Rudel, T.K. *Rural sociology*, 54(3):327-338, 1989.

A prescription for slowing deforestation in Amazonia. Fearnside, P. M. *Environment*, 31(4):16-41, 1989.

The potential use of the pejibaye palm in agroforestry systems. Clement, C. R. *Agroforestry systems*, 7(3): 201-212, 1989.

Eucalyptus in agroforestry: its effects on agricultural production and economics. Ahmed, P. *Agroforestry systems*, 8(1):31-38, 1989.

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Ecological impacts of selective logging in the Brazilian Amazon: a case study from the Paragominas region of the State of Para. Uhl, C.; Guimaraes Vieira, I. C. *Biotropica*, 21(2):98-106, 1989.

ANIMALS, WILDLIFE

Primate species richness in relation to habitat structure in Amazonian rainforest fragments. Schwarzkopf, L.; Rylands, A. B. *Biological conservation*, 48(1):1-12, 1989.

Ecology of the Asian elephant in southern India. I. Movement and habitat utilization patterns. Sukumar, R. *Journal of tropical ecology*, 5(1):1-18, 1989.

SOCIAL

Access, control and use of resources in African agriculture. *Africa*, 59(1):1-124+ 1989. Special issue.

Modeling Kalahari hunter-gatherer subsistence and settlement systems; implications for development policy and land use planning in Botswana. Hitchcock, R. K.; Ebert, J. I. *Anthropos*, 84(1-3):25-46, 1989.

Ecosystem function in a Khasi village of the desertified Cherrapunji area in Northeast India. Gangwar, A. K.;

Ramakrishnan, P. S. Proceedings of the Indian Academy of Sciences, 99(3):199-210, 1989.

Ethno-ecology: a tool for community-based pest management. Farmer knowledge of termites in Machakos District, Kenya. Malaret, L.; Ngoru, F. N. Sociobiology, 15(2):197-212, 1989.

How households cope in the hills of Nepal: can development initiatives help? Nabarro, D. et al. IDS Bulletin, Institute of Development Studies, 20(2): 68+ 1989.

Participation and indigenous knowledge in rural development. Awa, N. E. Knowledge, 10(4): 304-316, 1989.

Environmental perspectives on rural development strategies in rural Nigeria. Segynola, A. A. Journal of environmental management, 28(2):109-116, 1989.

Time for development: the case of womens' horticultural scheme in rural Gambia. Barrett, H. R.; Browne, A. W. Scottish geographical magazine, 105(1):4-11, 1989.

ECONOMY, ECONOMICS

An optimal path to extinction--poverty and resource degradation in the open agrarian economy. Perrings, C. Journal of development economics, 30(1):1-24, 1989.

Trees as savings and security for the rural poor. Chambers, R.; Leach, M. World development, 17(3): 329-342, 1989.

TRI Publications

TRI has recently published several Working Papers: No. 29, *Forester's Field Guide to the Trees and Shrubs of Puerto Rico*, updated version, by P. Mark S. Ashton, \$8.00. No. 30, *Mangroves of Utria National Park, Pacific Coast of Columbia*, by Betsy Carlson & Claudia Martinez; with accompanying educational field guide in Spanish, \$8.00. No. 31, *Tropical Forests and Biological Diversity in India and the Role of USAID/New Delhi*, by Jeffrey Y. Campbell, \$9.00. No. 32, *Changes in Forest Structure and Composition along a Gradient from Streams to Ridges in a Subtropical Moist Forest in Puerto Rico*, by Kate Heaton & Al Letourneau, \$4.00. No. 33, *An Examination of Forestation Practices in the Loess Plateau as Part of China's Three North Protection Forest System*, by Cyril John May, \$5.00. No. 34, a three-paper compendium for the Tropical Science Center, Costa Rica: *Social and Biological Limits of Tourism at Monteverde Cloud Forest Reserve, Costa Rica*, by Dave Tobias; *The Relationship Between the Monteverde Cloud Forest Reserve and the Neighboring Communities of Cerro Plano, La Cruz, Santa Elena, and Monteverde*, by Cristin Gallup; *An Inventory of Formerly Settled Lands in the Penas Blancas Cloud Forest Reserve, Costa Rica: Implications for Management*, by Tony Cummings; \$15.00. No. 35, *The Initiation of a Secondary Forest Management Project in the Central Peruvian Amazon*, by Jeff Bopp, \$8.00. For a complete list of TRI publications and ordering information, please write: Susan Brandi, Forestry Library, Yale F&ES, 205 Prospect Street, New Haven, CT 06511 USA. Telephone: (203) 432-5130.

IN MEMORIAM

Francois Mergen, '52, PhD '54, Pinchot Professor of Forestry, Professor of Forest Genetics and former Dean of the Yale School of Forestry & Environmental Studies, died June 26, 1989 in Florida. Professor Mergen was a native of Luxembourg who joined the Yale faculty in 1954 and led the School as Dean (1965-1975) through a period of transition and growth, culminating in today's program integrating environmental studies into the forestry curriculum. He was a renowned expert in the field of forest genetics and became involved in international forestry following his tenure as Dean. Professor Mergen played an important role in the conceptualization and establishment of the School's Tropical Resources Institute which has contributed to the growing importance of international resource issues as an educational focus of the Yale community. He was a dedicated teacher, scientist, and international forester whose knowledge and wisdom will be remembered and greatly missed.

The students of Yale F&ES join the faculty and administration in expressing our deepest grief over the untimely death of fellow student and friend **Filo Chinaka Steady** on December 6, 1989. Chinaka's kindness and enthusiasm were a source of inspiration to us all.

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