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SOCIAL SCIENCE APPLICATIONS IN ASIAN AGROFORESTRY

Editors

WILLIAM R. BURCH, JR.

Director, Institute of Forestry-Yale Project
Nepal

J. KATHY PARKER

President, Oriskany Institute
U.S.A.

WINROCK INTERNATIONAL, USA
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We dedicate this volume to Dean Wacharakitti Sathit of Kasetsart University, a leader in international forestry and a great contributor to the emergence of social forestry in Asia—a leader taken all too quickly from us.

Foreword

Winrock International Institute for Agricultural Development and the Oxford & IBH Publishing Co. Pvt. Ltd. began publishing a book series on agroforestry research and practice in 1990. The first volume. *A Handbook for Managing Agroforestry Research*, was written by Dr. John Gordon, Dean of the Yale School of Forestry and Environmental Studies, and myself.

This is the third volume in the series. The editors. Dr. William R. Burch and Dr. J. Kathy Parker, have organized a social science perspective of agroforestry around disciplinary themes, but only after setting the stage for understanding the problems from a client perspective. We think that the causes of the problems agroforestry technologies will help solve are primarily social. Consequently, it will not be possible to solve these problems unless the primary causal factors are understood and addressed in designing effective agroforestry interventions.

The second volume in the series was edited by Dr. Martha Avery, Dr. Melvin Cannell, and Dr. Chin Ong. They organized our current understanding of agroforestry systems in terms of biological concepts. The fourth volume, which is a collection of readings edited by me, Dr. P.K. Khosla and Ms. Karen Seckler, will apply the concepts and practices discussed in the first three volumes to agroforestry systems in South Asia.

Other volumes in this series will expand our conceptual and empirical understanding of agroforestry, and develop more locational-specific understanding of particular systems. At present, Winrock and Oxford & IBH plan on publishing ten or more volumes on agroforestry over the next three years.

We have three goals in this series. We want each volume to be relevant to the problems faced by researchers and practitioners, but we are especially concerned that the volumes lead toward results of benefit to rural poor people throughout Asia. Our authors and editors are working hard on the quality of their written expression as well as the quality of their ideas, so each volume can be easily understood and translated into practice.

Finally, we want the price of each volume to be within reach of students, researchers, and practitioners. We are most grateful to the U.S. Agency for International Development for supporting the first three volumes of this series through its F/FRED Multipurpose Tree Species Network Project being managed by Winrock International. The Ford Foundation and other donors are supporting future volumes, and we are searching for additional support.

General Series Editor
May 1991

WILLIAM R. BENTLEY

Preface

Human beings have always had a well-stocked cafeteria of social forestry strategies. Agroforestry is one of them. Like most, it has a long history of practice by farmers, though scientists and resource managers have only recently discovered its possibilities. Agroforestry represents some combination of people, domestic animals, crops, and trees designed to rehabilitate land and/or to sustain and increase the production of certain desired social benefits. In some practices, the preferred activities seem to be more in the domain of horticulture than of forestry. Yet the practices share much with the full array of social forestry strategies for improving the ecosystems and the lives of rural people.

The common elements of such strategies are: (1) small-scale applications; (2) technologies with low capital and energy investment requirements; (3) outputs primarily directed to immediate human needs rather than commercial advantage; (4) orientation to clients rather than to professionals and their large-scale public and private agencies: (5) diversity of products and benefits rather than a monocultural approach. Of course, we could identify other similarities in the wide array of strategies. However, the point is that we are as concerned with the structure and functioning of the human ecosystem as we are with the biophysical system.

It is important to see agroforestry within the broader context of people-tree related development strategies lest we become convinced that agroforestry is primarily a matter of discovering some new technologies—tissue culture, super trees, fertilizers, or pesticide systems. The "green revolution" is an appealing model because it is familiar, it seems modern, and it involves the same set of biophysical scientists doing the same kind of research. However, the need for approaches that balance biophysical and social knowledge are suggested by several factors: (1) the social scale in which we are operating is large; (2) deforestation is more often a symptom of underlying institutional and cultural problems than of failures of technology; and (3) afforestation, reforestation, and other land rehabilitation activities gain more through improved social organizational technologies than through biophysical technologies.

Indeed, agroforestry is a "very social science" as Tom Pawlick[1] has demonstrated. However, the acceptance of agroforestry as a social science often seems honored more in rhetoric than in practice. This book hopes to share with Asian agroforesters some conceptual tools to convert rhetoric into practice. Diligent readers may make systematic use of the theories,

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Pawlick, T. 1989. Agroforestry . . . a very social science. *Agroforestry Today* 1: 2-7.

methods, and substantive findings of the social sciences in their daily research, policy, planning, and management activities in agroforestry.

The book is divided into three sections. The first section introduces the underlying theme that we must connect the older, traditional Asian practices to some of the newer approaches. It also sketches some of the long-term contributions social science can make to guide natural resource policy and management.

The second section identifies some of the problem areas in Asian agroforestry where social science may be of most use. Rao gives an overview of the variety in Asian institutions and programs that rely on and influence participatory forestry practices. Shah examines how one particular problem, restoring wastelands, is less a biotechnical issue and more a matter of addressing sociocultural issues and changing political, institutional, and administrative imperatives. Bentley suggests an array of social science applications, the foremost being that social science research is needed to sustain the utility of biophysical research.

The third section considers the conceptual and methodological approaches of four social sciences—social ecology, political science, economics, and anthropology. Though these four disciplines have overlapping approaches and interests, they are as different at their cores as cell biology is from whole system ecology. The reader will need to keep these similarities in mind but should not let them obscure the utility of their distinctly different approaches.

The successful agroforester will need an awareness of cultural values and the forces that compel the emergence of new values. Here anthropology may be the best guide. On another site, the central interest may be how social norms, which structure behavior, can affect the equity of distribution. Here social ecology may be a useful guide. On another project, the central interest may be how material wealth is created and motivates behavior and how efficiently resources are allocated. Here economics may be the best guide. Yet again, the question may concern the structure of social power and how its effectiveness is made manifest. Here political science may be the best guide. Of course, most agroforestry projects require some combined attention to values, norms, wealth, and power and their emergence, equity, efficiency, and effectiveness.

The chapters in this third section concentrate on the particulars of their individual disciplines. They also show how these specialized sets of knowledge provide insight into particular facets of project development and overall project success. Parker and Burch emphasize how policy, planning, and management of agroforestry systems are both part of the normative social order and the very forces for altering and reconstituting that order. Blair discusses how political science is a diagnostic tool for identifying power relationships between national elites, local elites, and the masses. These organized systems of power can both inhibit and facilitate the agroforester's goals, while a lack of knowledge about such systems ensures failure. Mercer demonstrates how the economics paradigm can improve efficiency in resource decisions and the distribution effects of those decisions. Messerschmidt provides an overview of methods and perspectives, anthropologists use to incorporate cultural aspects in social and agroforestry projects to ensure that they serve the needs and fit

the capacities of the populace. He also furnishes a set of case studies that include and tie together all of the four social science approaches considered in this book. In short, the reader who is open to new perspectives, methods, and concepts for solving old issues will find much that links biophysical hopes to social utility.

Though all books are a shadow dance between individual aspirations and a large underlying stratum of collective help, this book is even more than usually so a product of many others whose names do not appear in print. The original planting of the idea for the book has now faded into the mists of myth where we believe that some important dialogue between Asian scientists, USAID planners, and Winrock contractors produced the vision for such a collection. We do know that many of our colleagues in the FAO-South and Southeast Asia Forestry Educators Network have been in the forefront of interest, as have our colleagues in the Science and Technology Bureau of USAID.

We can name many of our Winrock colleagues—Güner Gery, Carol Stoney, Chun Lai, Bill Bentley, Tom Niblock, Ken MacDicken, Charly Mehl and Celso Lantican—who at one time or another gave necessary guidance. We owe particular gratitude to Karen Seckler, who, more than anyone, has helped to turn the work into an ordered form. Additional thanks go to Melinda Murtha and Barbara Scott who brought this book to a physical reality and whose liaison and logistical efforts helped move the manuscript around numerous obstacles during its long and sometimes arduous path to publication. Our past and present Yale colleagues—Asmeen Khan, Sonia Varley, Jeff Bopp, Betsy McGean, Linda Lind, Bob Clausi, Marco Lowenstein, Christin Gallup, and Christine LaPorte—found threads of thought we did not know we had lost.

Of special importance have been our Faculty of Forestry colleagues at Kasetsart University, Thailand, and our colleagues at the Institute of Forestry, Pokhara, Nepal. It is their wisdom and openness, their generosity and kindness, their firmness in countering our errors that have helped us to persevere. They have taken us to the frontlines of social forestry and helped us to find the points of entry for a useful social science.

Though we are most grateful to all of those who have helped guide us in this effort, we fully accept all responsibility for the errors of omission and commission.

W. R. BURCH, JR.
J. K. PARKER

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Contributing Authors

WILLIAM R. BENTLEY is senior program officer, Winrock International Institute for Agricultural Development. He is currently at the Yale School of Forestry and Environmental Studies as Director of the Tropical Resource Institute as part of a Winrock collaborative effort on research and leadership development. He specializes in forest economics, management, and policy; his current research focuses on leadership, biomass energy, and tropical forestry issues.

Winrock International Institute for Agricultural Development,
Route 3, Petit Jean Mountain, Morrilton, AR 72110, USA

HARRY W. BLAIR is professor of political science at Bucknell University. He has also held academic appointments at Colgate, Columbia, Cornell, and Yale Universities. His major interest is in rural development policy in South Asia, where he has worked on forest and water resource management issues. In addition to his university teaching and research, he has worked as a consultant with FAO, the Ford Foundation, USAID, the Swedish International Development Authority, and the World Bank.

Department of Political Science, Bucknell University,
Lewisburg, PA 17837, USA

WILLIAM R. BURCH, JR. is Hixon Professor of Natural Resources Management in Forestry and Environmental Studies and the Institution of Social and Policy Studies at Yale University; research sociologist with the National Park Service; faculty associate at the College of the Atlantic, Bar Harbor, Maine; project director of the IOF-Yale Project (Nepal); and director of the Yale Urban Resources Initiative. His research has focused on forecasting future patterns of behavior for planning and on identifying social consequences of management decisions. Much of his applied work has concentrated on social/community forestry planning, management, and training.

Yale University, 205 Prospect Street, New Haven, CT 06511, USA

D. EVAN MERCER is a natural resource economist with the Duke University School of Forestry and Environmental Studies. He was formerly at the East-West Center's Environment and Policy Institute, where his work was in social and agroforestry, and watershed management research and policy analysis. His current research interests include the economics of sustainable land-use systems in

tropical ecosystems, natural resource accounting and its role in economic development policy, fuelwood market and policy analysis, and natural resource damage assessment.

Duke University, Center for Resource and Environmental Policy Research, Durham, NC 27706, USA

DONALD A. MESSERSCHMIDT is senior social scientist with International Resources Group, Ltd. (IRG), of Washington, DC, and adjunct professor of social forestry in the Yale University School of Forestry and Environmental Sciences. An anthropologist by training, he is currently a social forestry/research adviser on the USAID/Yale/IRG/IOF Project at the Institute of Forestry in Pokhara, Nepal. He specializes in the study of people and natural resources and in the training of social foresters.

Institute of Forestry Project, P.O. Box 2106, Kathmandu, Nepal

J. KATHY PARKER is president of the Oriskany Institute in Pennsylvania and is an international consultant on social ecology and natural resource management for USAID, the US Congress' Office of Technology Assessment, and the UN. She has lectured at the School of Forestry and Environmental Studies, Yale University. Her work focuses on agroforestry, forestry for rural development, and natural resource conservation and management in Asia, Latin America, and Africa.

P.O. Box 487, Broomall, PA 19008 USA

Y.S. RAO is the regional forestry officer for FAO's Regional Office for Asia and the Pacific. In this position, he develops FAO's forestry field program in the developing countries of the region, publishes the periodicals Tigerpaper and Rural Energy, organizes the technical meetings of the Asia-Pacific Forestry Commission, and manages a program of publication and dissemination on forestry. He has edited and co-authored several publications on various aspects of community, social, and agroforestry.

FAO Regional Office, Mailwan Mansion, Phra Atit Road, Bangkok 10200, Thailand

S.A. SHAH is retired from the Indian Forest Service. Prior to his retirement, he was appointed to the All India Committee by late Prime Minister Indira Gandhi to study the destruction of forests with special reference to the tribals. He was secretary of the International Tree Crops Institute, India, director of the Gujarat Forest Development Corporation, and additional chief conservator of forests in charge of development planning and social foresty. His work has focused on social forestry and rural development.

Jesal Apartment #1, Abhishek Colony, Race Course Circle, Baroda 390007, India, or
c/o Dr. S. Desai, 1190 Park Avenue, Waynesburg, PA 15370 USA

Acronyms

FAO	Food and Agriculture Organization of the UN, Rome, Italy
F/FRED	Forestry/Fuelwood Research and Development Project, Washington, DC
ICRAF	International Center for Research in Agroforestry, Nairobi, Kenya
IOF	Institute of Forestry, Pokhara, Nepal
RAPA	FAO's Regional Office for Asia and the Pacific, Bangkok, Thailand
USAID	US Agency for International Development, Washington, DC
USDA	US Department of Agriculture, Washington, DC

PART ONE

Setting the Stage

CHAPTER 1

Our Theme: Thinking Social Scientifically about Agroforestry

William R. Burch, Jr.

HIGHLIGHTS

- As forestry is being challenged to change from a custodial, reactive profession to one of participation and action, we are reminded that long before the colonial period Asian forestry was taught and practiced as a multiproduct, community-directed activity based on local people's experience, knowledge, and needs, not on the few and specific needs of commercial enterprises.
- Agroforesters intervene in ecological systems to increase the production of socially desired benefits (output of goods and services) on a sustainable basis and to decrease negative outputs (soil erosion, genetic loss).
- Drawing from theories in sociology, political science, anthropology, geography, history, and psychology, the social sciences can provide agroforestry with a unique angle of vision for analyzing people-forest interaction.
- The intellectual antecedents of agroforestry are neither new nor untried. Indeed, there is a substantial empirical literature—from social, community, and agroforestry studies, as well as from studies of assessment (such as benefit-cost analyses), tenure (such as property rights), institutions, communities, and adoption of innovation—that can be synthesized, reshaped, and applied to aid agroforestry.

INTRODUCTION

Long before European forestry had taken shape, let alone been imposed upon Asia, Asian forestry had addressed the needs of the village, incorporated social and religious values, and reflected the wisdom of the arts. Hinduism, Buddhism, and other Asian religions emphasized the wholeness of society and nature and the union of the forester and the forest, the scientist and the poet. Those who used and protected the forests (the foresters) were part of the local community, and they reminded us to approach nature with gratitude, with awareness of its immense unity, and with awe.

The theme of this book, which comes from deep in the Asian culture, expands on the theme of the July 1989 Curriculum Development Workshop held at the Institute of Forestry, Pokhara, Nepal: to find ways for Asian forestry educators to rediscover the early wisdom of pre-European forestry and combine it with the practices and technologies of modern forestry that are appropriate to the means, needs, and skills of Asian farmers. Like the field forester who uses the chain saw and the nursery as tools for managing and restoring the forest ecosystem, the forestry educator uses curriculum development and course syllabi as tools for transforming students into professionals and technicians who can deal with a changing world. But for both the field forester and the forestry educator, we can only succeed in the long run by learning to listen to the still, inner voice of the evolving forest ecosystem and its dependent human community, as well as to students, faculty, administrators, and employing agencies. Our theme is now, as it was in Pokhara, the exploration of these mutual connections of past and future, nature and society, practitioner and educator, student and professional.

The Pokhara workshop was itself a continuation and deeper specification of an earlier Asia-wide workshop held at Khon Kaen, Thailand, in November of 1988, that gathered together from a wide array of disciplines and countries professionals interested in exploring how research and educational programs can restore and sustain forest ecosystems so that they may more directly serve the welfare of human communities. Though the impetus for this first workshop was to find ways to incorporate the social sciences in the biophysical training of foresters, attention was devoted to solving specific problems. Our interest was in determining what kinds of knowledge and experience were necessary to resolve the observed problems rather than how to achieve political balance between competing disciplines. We continued that vision at the Pokhara workshop. We continue in this book.

Throughout the world, forestry has moved from the shadows of social indifference to the brightness of international media as our dependence upon a healthy forest ecosystem becomes clear. At the same time, people around the world—from the Chipko movement in India to Amerindians in the United States Pacific Northwest—are challenging traditional forestry practices and asserting their traditional religious and social uses of indigenous tree species and forest ecosystems. Scientists and economists are reporting on the great importance of nontimber goods and services that often have much higher values than traditional commercial timber.

We are thus being challenged to change from a custodial, reactive profession to one of participation and action. It is Asia that has pioneered these new approaches--community and social forestry have 20 to 25 years of field application in many Asian countries. But more importantly, as our colleagues

S. Chinnamani, S.A. Shah, and others remind us, before the colonial period Asian forestry was practiced and taught as an integrated social and biological science. It was a multiproduct, community-directed practice based on local people's experience, knowledge, and needs, not on a few commercial species.

Consequently, the objective of this book is to rediscover and restore to current patterns of thought the wisdom of precolonial Asian foresters about natural resources so that modern technologies can be refocused on enduring issues of village resource sustainability. To do this, we must better combine the wisdom and insight of biophysical and social scientists, villagers, and foresters with national policy makers. Asia seems the ideal venue to lead the world in defining the directions and domains of this new forestry for the 21st century.

ON THE FUNCTIONS AND VARIETIES OF FORESTRY PRACTICES

It is certain that no human culture fully exploits all of the benefits, goods, and services possible from a given agroforestry ecosystem. Choices of what to exploit and what to avoid vary from culture to culture and from one historical period to another. In the practice of agroforestry, as in all other human resource activities, we develop policies about what needs to be done and plan how to implement the policies; we assign the implementation of plans to organizations and persons; and we monitor, revise, and evaluate how well we are doing and have done in carrying out plans and fulfilling goals. We know that a wide stream of sustainable and nonsustainable benefits is potentially available from a forested ecosystem; some of these uses have markets and others do not. Consequently, decision makers and clients look to resource professionals who supposedly possess technical and organizational skills that allow them to suggest ways to regulate the socially desired flow of benefits. Research permits these professionals to improve those skills.

Agroforesters, then, intervene in ecological systems to increase the production on a sustainable basis of socially desired benefits (output of goods and services) and to decrease outputs that are perceived as negative (floods, soil erosion, genetic loss, fires). Like all professional forestry practices, agroforestry manipulates human uses and access to forest ecosystem benefits. Hence, all forestry is social in terms of its rationale for practice, its venue of practice, and the socially approved incentives for practice.

Benefits of forests should not be valued only by the traditional measures of willingness to pay (whereby toothpaste, for example, is treated as a benefit, and its price measures the value of the benefit). In full social reality, obtaining a specific item or service is not a benefit; a benefit is what a given consumer or collection of consumers perceive as a likely and desirable outcome—for example, good health, prestige, sexual attractiveness, or a good place in the hereafter.

A value of agroforestry is that it compels us to consider a wider array of benefits and motives. Foresters often make a good deal of noise about wood and wood products, yet people do not always think in terms of the source of a product, but in terms of how the product benefits them, what its function is. A table, whether of wood, steel, or plastic, is a place to set things. A house provides shelter, whether made of wood or concrete. Protecting crops from wind can be done as easily by a fence of thornbushes, wrecked cars, used tires, or

wood. Erosion can be controlled by grasses and shrubs as well as by *Eucalyptus* plantations. Foresters spend so much of their lives worrying about trees and forests that they think others share this view of the importance of trees and forests. The general population, however, tends to look at benefits rather than objects and often has a wider view of the benefits of forested ecosystems than do professional resource managers. Foresters who are attempting to serve human populations need to discover the range of these benefits.

While many forest benefits have a clear market price, other benefits may be highly valued by human communities but have no direct exchange value. Clean air or water come immediately to mind, but so too should sacred groves, which cannot be included in any balanced exchange system because they are priceless. They simply exist. In addition, many benefits of forested ecosystems may be highly valued but have no direct monetary value. Tobacco may be traded for fruits or nuts, a gift of firewood may obligate the recipient to provide certain favours at a later date, a tree or forest animal may be removed to celebrate a significant event. Though no money changes hands in these exchanges, there are clear and well-known metrics of reciprocal value.

Indeed, Asian foresters could draw inspiration from the forest service of an earlier developing country, the United States. In the early 1900s, the US Forest Service was an emerging resource agency of a rapidly developing society. The agency's administrator argued that "all land is to be devoted to the most productive use for the permanent good of the whole people and not the temporary benefit of individuals or companies. . . . where conflicting interests must be reconciled, the question will always be decided from the standpoint of the greatest good of the greatest number in the long run."

The search "for the permanent good of the whole people" has led to a wide array of forestry strategies. Though these strategies are seldom officially noted in curricula, they have existed formally and informally wherever people have managed forest ecosystems. Only in recent years has this diversity of forestry strategies been recognized. Although combining food and tree crops with animals to meet human needs and organizational requirements is an ancient practice, moderns assign a classification scheme, some systematic measures, and a name and assume they have invented agroforestry.

Some of the diversity of forestry practices and the framework within which agroforestry fits are presented in table 1.1. Of course, any such classification has its problems. Let the reader create one that is more pleasing. The point is that there is a wide array of strategies that can be classified by their functions, markets, exchange mechanisms, organizational level, scale, and nature of property rights. For our purposes, it is crucial to recognize that human beings are opportunistic animals and that no particular strategy has permanence if any other is perceived as more useful and fitting to human interest. Consequently, a particular agroforestry system may have evolved from the perceived failure of one strategy; it, in turn, may fail and evolve into yet another strategy.

As noted in the beginning, an aim of this book is to encourage Asians to learn from Asians and from their own past. Many varieties of agroforestry systems await discovery, classification, and systematization. The means to that discovery is an awareness that agroforestry is part of a changing set of forestry strategies.

A second aim of this book is to help Asian agroforesters make better use of available social science theories, methods, and technologies. However, because

Table 1.1. Social characteristics of forestry strategies: Operational definition

Forestry Practices (goods and services produced)	Market Locale	Exchange Media	Organizing Level	Scale of Investment	Formal Property Rights in Resource
COMMERCIAL/ INDUSTRIAL FORESTRY Saw timber	National/ international	Cash/foreign exchange	Corporation/ state	Large-scale investment to support large, contiguous tracts of land with intensive management of a new species	Corporate or state owned
PROTECTION FORESTRY National parks Biosphere reserves Forest reserves Wildlife reserves International tourism Watershed management Dune stabilization Shelterbelts	International/ national	Knowledge/foreign exchange/opportunity savings	State	Small-scale investment and high maintenance costs on relatively large, contiguous tracts of land with management in most cases of greatly diverse natural species	State agency managed/ regulated
COMMUNITY FORESTRY Silvipasturage Fuelwood	Local/national	Barter/cash	Village	Moderate-scale investment on small, isolated, contiguous tracts or margins along fields and roads of rapid-growing species	Commons locally held
FARM FORESTRY Integrated farm system Specialty products Multipurpose trees Agroforestry	Regional/local household	Barter/cash/ reciprocity	Individual/ household	Small-scale financial investment/high labor costs in planting and maintaining individual trees or scattered woodlots	Privately held/owned by clan, household, individual
SUBSISTENCE FORESTRY Food for hunter-gatherers Land for rural landless and scheduled castes	Household/tribe	Directly consumed	Household/tribe	Small-scale investment in marginal lands	Unowned/unclaimed wildland territory or traditional

Source: Burch 1984.

Table 1.2. Examples of technical dimensions of forestry strategies: Evaluative indicators

Operational Goals	Biophysical and Social Technology	Social Indicators	Biophysical Indicators
INDUSTRIAL/COMMERCIAL FORESTRY			
Profit Hard currency Production	Plantation monoculture Heavy duty harvesters Social impact assessment Marketing analysis, labor force analysis	Employment rate Accident rates Per capita income trends	Growth rates of commercial species Soil stabilization/loss rates Biomass production volumes
PROTECTION FORESTRY			
Preserve biota Protect endangered species Toursim revenue National pride	Fire, disease, and pest control Ecosystem monitoring Tourism/socioeconomic monitoring Social profiles of adjacent communities and of tourists	Visitation trends and sources Transfer of payment measures "Downstream" benefits Cost/benefit analyses	Water production volumes Species survival rates Soil stabilization measures Wildlife species census
COMMUNITY FORESTRY			
Reforestation Protection of land base Sustained production of tree products	Genetic Nursery development Soil analyses Social survey Demographic analyses	Trends in preferences Participation rates Flow in distribution of resources	Percent Vegetative cover rates Forest planting rates Growth rates of fuelwood species Charcoal production
FARM FORESTRY			
Energy Cropping Forage Shade Supplemental income Direct consumption	Kinship analyses Property right analyses Systematic interviews Trace measures Soil survey	Time budgets Nutrient budgets Energy budgets Money budgets	Deforestation rates Plantings, diameter breast height, basal area Survival rates of key species
SUBSISTENCE FORESTRY			
Survival—food, fuel, shelter Improved levels of living	Historical analyses Systematic observation Horticulture trials	Migration rates Health rates Intertribal marriage rates	Forest recovery rates Soil erosion rates Species extinctions, niche expansion

Source: Burch 1984.

our interest is in solving problems rather than in playing academic politics, the right kind of knowledge for the particular problem we are attempting to resolve is needed. At all stages of the agroforestry cycle, from taking inventory through planning, implementing, managing, monitoring, and evaluating, we need to combine social and biophysical technologies (table 1.2). Again, the reader should delete and add as necessary. The point is that many biophysical and social technologies and indicators exist that are likely to fail if applied independently, yet, if combined, are likely to help us realize the "permanent good of the whole people."

The intellectual antecedents of agroforestry are neither new nor untried. Indeed, there is a substantial literature on these very topics, though often it is not labeled social forestry, community forestry, or agroforestry. Rather, the labels may be community studies, innovation studies, time budget studies, survey studies, social indicator studies, or regional studies (Burch and DeLuca 1984). Synthesizing and reshaping these applied findings will aid agroforestry applications.

THEORETICAL PERSPECTIVES

Perhaps the most useful contribution the social sciences can make to agroforestry is to provide a theoretical perspective. Social scientists have had a long and extensive interest in natural resource and forestry issues, and various disciplines have struggled to develop integrative models that combine people and nature as part of the same system. With these models, the resource professional can begin to see how certain silvic or other treatments may affect distributional or socially sustainable factors in the dependent human community. These models currently are associated with particular individuals or schools within particular disciplines. However, they usually have more in common with one another than with other exploratory models within their own disciplines. The following gives an overview, or set of snapshots, of the social science potential.

One of the earliest writers with a holistic viewpoint was Radhakamal Mukerjee, who argued in *Regional Sociology* (1929) that "cooperation in the conservation of land; in the use of water, in forest management, in the training and management of rivers, and finally, in the reciprocal relations of village and city must be the keynote of the future." In 1963, his *The Dimension of Human Evolution* continued to argue that stable societies require stable, well-managed resource systems. Similar integrative resource-society models have been proposed by rural sociologists such as Harold Kaufmann, whose studies in the 1940s and 1950s treated ecosystem stability and instability as part of the larger cultural process and demonstrated that the forest political economy cannot be set apart. Other sociologists examined society-nature transactions, each from a different perspective, each seeking to understand change and stability in human society. Conceptual models of these transactions between society and nature have been devised and refined (see, for example, Duncan 1964, Burch 1971, Van den Berghe 1975, Humphrey and Buttel 1982, Fortmann 1985, Wolf 1986).

Political scientists have given attention to policy and organizational issues such as sources of institutional myopia (Dana and Fairfax 1980), the administra-

tive behavior of foresters (Kaufman 1960), and the relationship between politics and the environment (Wengert 1976).

A number of anthropologists have made significant contributions to our understanding of the holistic interdependence of human and natural ecosystems. Not only have age-old traditional systems of social forestry been examined (Dove 1985), but there have been systematic attempts to combine biophysical and sociocultural variables in a mode for rural development (Rambo 1984). Lovelace (1984) provides a useful human ecology model for community and social forestry programs, and Messerschmidt and colleagues (1984) have developed systematic, participatory tools for agroforestry activities.

Geography also has numerous examples of good models, but an outstanding example is Glacken's (1967) *Traces on a Rhodian Shore*, in which he examines how environmental and resource conservation practices do not really emerge until the resource is nearly gone—or is no longer a central aspect of the normative order.

Historians have also examined man and nature linked in a time-space context. For example, Hayes (1959) did a series of studies that provide insight on how the "cult of foresters' efficiency" trained them to see forests when others only saw trees. His insights remain universal cautions about how the best intentions can have unintended social consequences.

The field of psychology has contributed useful empirical studies on how individuals use, respond to, and are controlled by their environment. Altman (1975) does not have the historical depth of Lewis Mumford's studies on man and the environment, but he clearly connects natural ecosystem degradation with social ecosystem degradation and the impact on the individual's sense of well-being. Zube (1976) has done similar work on landscape perception that joins the individual, his social system, and the ecosystem as equally balancing elements. Barker's (1968) ecological psychology studies pioneered techniques of social observation.

Though this rapid tour through social theory touches only a small fraction of the relevant literature, it does demonstrate several fundamental points.

1) Each of the social sciences has a unique angle of vision for analyzing people-forest interaction.

2) There has been a substantial amount of intellectual activity and accomplishment in identifying the forces that affect the nature and outcome of these interactions.

3) The social sciences have been considering resource issues for a very long time.

4) Significant models for planning and designing agroforestry projects already exist.

5) The design of project training programs and curricula for agroforesters needs to incorporate these several facets of thought, rather than simply picking one favored discipline.

FINDINGS

Agroforestry does not suffer from limitations in useful and available social science findings. The failure to use such data in planning and implementing

forestry projects is a failure of will rather than a failure of social science. Thompson and Warburton (1985), for example, looked at thousands of numbers to express physical facts about the Himalaya, yet they found them less useful than social facts. They concluded from their complex scientific analysis that it is much more difficult to find useful and valid physical facts than useful and valid institutional facts.

Of course, this does not mean that we have enough valid and reliable social data, or that we do not need to improve our biophysical measures. What it does mean is that we cannot blame lack of social information for program failures, but rather our failure to act upon the implications of this information. Indeed, the volume by Michael Cernea (1985) demonstrates the substantial range of studies and findings on rural development. Further, social scientists have collected much information on social forestry alone (Field and Burch 1988, Lee et al. 1990) that could be used to improve agroforestry project design and implementation. I will discuss broadly five of these areas:

assessment studies
tenure studies
institutional studies
community studies
adoption of innovation studies

Assessment Studies

Romm (1980) identifies 13 ways in which the benefits and costs of social forestry can be measured and assigned to government project, village, and sub-village levels. Barnes and colleagues (1982) and Allen and Barnes (1985) provide a cross-country and cross-project comparison of benefits and costs and ways to systematically evaluate the accomplishments of projects.

Benefit-cost measures are not the only established means of assessing, monitoring, and evaluating social forestry projects. Perett (1980) provides examples of a wide range of behavioral science methods to use in project assessment. Their discussion and case studies cover uses from assessment and diagnosis, through feasibility analysis, appraisal, impact prediction, design, and impact measurement. Noronha (1982) provides a wide range of assessment uses of social science, and Noronha and Spears (1985) examine variables affecting forestry projects. Fortman and Thompson (verbal discussion reported in Burch 1984) identify a wide range of common problems in social forestry design and implementation and suggest specific social science techniques to deal with them. Chambers (1985) outlines techniques for rapid rural appraisal (RRA) to assess impacts of projects. Others who describe techniques for assessment include Budowski (1982), Gregersen et al. (1987), Murray (1981), Skutsch (1983), and Tucker (1984).

Tenure Studies

Perhaps the most substantial social science tools relate to tenure issues. The institutions of property rights have been a central interest of all social sciences, from economics and political science through anthropology and history.

Consequently, theory and methods for examining the influence of tenure upon the success of agroforestry programs and the techniques for dealing with tenure are well known. Cernea (1981) did an excellent case study on how and why behavior can greatly differ from formal norms, and his later (1985) analysis broadens our understanding of the influence of tenure upon social forestry projects. Fortmann (1985) clearly identifies how tree tenure norms influence agroforestry project success; Noronha and Lethem (1983) offer an excellent overview of the social anthropology literature on traditional tenure and land-use systems. Both clearly tell the reader how to incorporate such information into project design. The comprehensive overviews of tenure factors provided by Bruce and colleagues (1985) and Fortmann and Bruce (1988) are essential reading for the agroforestry student and professional.

Institutional Studies

The social sciences provide methods for gaining great depth of understanding about the motivation of individuals. However, such depth is often as unnecessary as it is time consuming. Salient levels of agroforestry participation are more likely to be collective, that is, at the village, tribe, clan, or household level. Consequently, the social structure itself provides motivation: the system of differential distribution of wealth, power, prestige, or information serves as a system of motivation. Households or communities that have wealth, power, status, or specialized information tend to strive to hold on to it; those without tend to work to attain it unless they have been impoverished so long that they are without hope.

Institutionalized structures serve to direct behavior, to channel random actions into routine behavior. Ashby's (1985) study of farming and erosion in Colombia demonstrates that tragedy is not intrinsic to the commons but, rather, results from a lack of appropriate institutional support. Farmers studied in Nepal (Thompson and Warburton 1985) show how institutional structures such as property rights and market forces direct behavior into detrimental patterns for which there are no technical solutions—only social solutions.

Indeed, the use of knowledge about the structure, function, and evolution of social institutions and their effect upon forestry projects may be one of the most detailed sets of "how to" knowledge in the social sciences. Blair and Olpadwala (1984) provide a thorough and highly useful overview of the literature and a series of superb case studies to help the reader learn how to apply institutional knowledge to specific project constraints and opportunities; Chandrasekharan (1985) identifies the nature of rural organizations affecting forestry programs; and Guess (1982) gives a political analysis of institution building. Thompson and Warburton make the clearest connection:

> If land and wealth are seen as virtually synonymous, and if the population that has to live on that land is increasing rapidly, then we have a negative-sum game from which the only possible relief is by way of population stabilization or increased productivity (or both). But, if the equation of land with wealth is severed, closure is no longer inevitable and it is possible (but by no means certain) that the game will be positive-sum. (1985:210)

They suggest a variety of ways by which some groups can spread risk and wealth getting from the land to other sources. Indeed, Thompson and Warburton are

rare in the development field because they suggest that a useful alternative to nature exploitation for wealth getting is nature-based tourism. As an example of this strategy, they point to Nepal's Sherpas, whose political economy is not unlike that of rural North Americans in depressed areas who depend for survival on a mixture of primary production, small-scale "mom and pop" tourist-serving enterprises, and welfare payments. It is significant that their paper is almost the only one to consider nature-based tourism as a desirable alternative product of forested ecosystems. Yet, as they clearly demonstrate, without the tourist as an alternative to land as a source of wealth, there is no way to protect forests in the long run.

Certainly, one would need to be totally fixated by "hard" production to miss that even the poorest of the poor have religious holidays, elaborate weddings, games, and other forms of recreation, many of which are associated with forest settings. Consequently, serving people from urban areas who enjoy the natural setting of hill stations and other rural areas is a logical economic use of forests that requires their retention rather than their removal. So our third example of a social science approach, institutional analysis, serves to link motives to social structure and suggests how students of agroforestry strategies can broaden their range of possible benefits.

Community Studies

The agroforestry literature suggests that forest professionals of donor and host countries are promoting at least four types of change for rural villages—technology, taste, rules, and values. First, rural villages are being provided with better tree species, better means to harvest them, and other technologies. Second, these technologies may require changes in matters of taste, for example, about smell and aesthetic preferences. Forestry projects often appear to tell the beneficiary communities to "like the looks of this foreign tree planted in unnatural rows, and don't worry about the smell when it is burning or whether it makes the food taste differently." Third, if Eckholm (1979) and others are correct, land tenure roles, certain wood-gathering roles assigned on the basis of gender and age, and the rules affecting relations between social strata are being altered. Fourth, seedling survival may require the adoption of "rationalistic" values by beneficiary communities in place of survival practices directed by traditional values.

As we move from technology innovations (better tree species) toward value changes (traditional to rationalistic) we move toward increasing resistance. However, much of forestry is short on such well-fitting physical technologies and depends more on changes in social practices and attitudes—different ways of organizing, planting, and harvesting, different systems of accountability for the commons, different perceptions of the connections between traditional resources practices and hungry children, different time orientation, and so forth. This discrepancy is no excuse for doing nothing; rather, it is an opportunity to develop, test, and use social technologies that require different techniques of transfer and, therefore, different types of knowledge.

One of the larger bodies of research literature in the social sciences focuses on the factors affecting adjustment to internal and external changes (innovations) by human communities. Burch and DeLuca's (1984) analysis of this literature suggests at least five patterns of adaptation:

1) In some communities, a continuity in basic norms permits a smooth transition to changed conditions. For example, Bruner (1961) reports that the Toba Batak of Sumatra moved from a small, mountain village to a westernized, urban setting with minimal personal and social upset because they retained kinship and patrilineal descent as the basis of interpersonal relationships and maintained their traditional life-crisis ceremonies.

2) Some communities have normative systems "primed" to take the induced change. Examples are Eskimo transition from dogsled to snowmobile, Plains Indians' adoption of horse and rifle, Maori acceptance of the European sweet potato. These communities had norms (long-established behavior patterns by which they organized themselves) of hunting, or mobility, or practice of a particular form of agriculture that made them ready for innovations that enhanced these norms.

3) Changes in the material structure alters the normative structure. For example, a large number of anthropological community studies report that extensive material changes are overshadowed by changes in outlook and social relations (Holmberg and Dobyns 1962).

4) More successful adoptions have changes in social norms that precede material changes. A large number of studies illustrate what happens when material changes outrun the normative changes; Saski (1956), for example, describes the failure to transfer modern farm techniques to Navajos because the prevailing norms favored smaller, subsistence farms.

5) In some communities, rapid change (whether material or normative, improvement or decline) produces social fragmentation. The study of boomtown communities—those with rapid growth and rapid decline, like gold-mining towns—provides ample evidence of the need for appropriate timing of changes if severe social disruption is to be avoided.

Not only are there different responses to different kinds of innovation and different kinds of community responses (Rao 1985) to internal and external disturbances, but the very processes and attributes vary in certain systematic ways. The following pages outline these processes.

Adoption Studies

According to Rogers (1971), five elements influence the adoption process:

the innovation
the change agent
the information source
opinion leaders
social status

Although each of these elements has been broken down into its specific attributes, only a portion of the range of studies and trends in empirical findings on this topic will be touched on here.

The evidence from nearly 100 studies shows that innovations that permit a trial run have the strongest initial local support. The perceived advantage and compatibility of the innovation, by contrast, does not seem to be a great consideration in adoption. Consequently, the soundest strategy may be to incorporate such trials in social and agroforestry innovations. In addition, if the

trial is not satisfactory to the client, it can be eliminated without great cost. Incorporating highly visible demonstration projects or high-tech items such as solar cookers seems to be important in gaining acceptance of innovations.

A change agent who has the right credentials and an innovation that is right for a target population still must inform the population of the innovation. There are two general and complementary sources of information: the media make an innovation known, while contact at the interpersonal level provides knowledge about the innovation. Not enough studies on adoption have been done, however, that analyze the influence of magazines, newspapers, television, and other sources or that access the significance of contact with friends, kin, or change agents. But 77% of 60 studies show that the strongest influence comes from personal sources.

CONCLUSION

These five types of studies—assessment, tenure, institutions, community, and adoption of innovation—provide an indication of the range of empirical studies that can help the agroforester plan, predict, and prepare for action and provide a basis for evaluating progress of the project. Furthermore, Hoskins' (1983) distinction between community forestry and social forestry is excellent because it directs our attention to the unit of adoption. Not all villages are communities—indeed, most villages (Critchfield 1983) are made up of household and individuals with social roles, relationships, and rules about appropriate and inappropriate behavior. The village elders may not like the idea of planting fast-growing trees, but the young women of the village might very much like some fencing material to keep the pigs out of the garden. Part of the task in agroforestry technology transfer is thus identifying the appropriate entry points for certain practices. In some places, it may be at the community level; at others, it may be at the clan, household or individual level.

The chapters in part two of this book identify some of the problem areas in Asian agroforestry where social science findings about these five topics may be applied. Rao touches on all five in a broad sweep of current governmental and nongovernmental programs in seven Asian countries, Shah considers institutional and culture-based community approaches, and Bentley emphasizes tenure and adoption of innovation approaches. These three chapters point us to both the broad and the narrow contributions of social science to agroforestry practices. Without the sound theory and systematic methodology of the social science, agroforestry development is likely to be a hit or miss proposition.

Though the findings we have reported in this introduction come from a wide array of social sciences, we will limit ourselves to four specific disciplines—social ecology, political science, economics, and anthropology—in part three of this book. We concentrate upon these four because they have been included more frequently in forestry curricula than other social sciences. Also, all four are regularly used in rural development activities and research. By that very fact they have become somewhat opportunistic, eclectic, and pragmatic, often including theories and approaches borrowed from geography, history, and demography.

Those readers who feel we have only given an appetizer when they wanted a whole meal can partly satisfy their appetite for social science by consulting a companion volume of excerpts produced by the Forestry/Fuelwood Research and

Development (F/FRED) curriculum project. This volume, published in 1989, is *Readings from the Literature of Social Sciences in Forestry* and is available from Winrock and F/FRED offices. The excerpts, which pick representative studies from these four disciplines in most of the countries in the region, will provide an idea of the nature and types of studies available for natural resources issues in the region.

The readers of the present volume will have a good overview of the agroforestry problems which social sciences can address, the theories, methods, and concepts of four social science disciplines, and some idea of available substantive findings. Along with the excerpts volume, readers can browse through the range of substantive findings by discipline and by country in the region. We think this combination can give the serious agroforester a solid introduction to the uses of social science in policy, planning, research, and management of agroforestry activities.

When systematic social knowledge is applied to agroforestry activities, it is to aid basic problem solution. That is, social knowledge is not included because it seems right, or it is part of current rhetoric, or the donor groups force us to include it, or local politics compel us to make the gesture; rather, social knowledge is included because

It is effective—the job gets done.
It is efficient—economic, social, and ecosystem costs are minimized.
It promotes equity—benefits and burdens are balanced among target populations.
It ensures sustainability—the people will continue the innovative processes long after we have left.
It increases flexibility—new information to the system can be incorporated and acted upon.

We thus use social science knowledge because it is *essential* to project success. Any other reasons are simply empty political gestures.

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PART TWO

Problems and Prospects

CHAPTER 2

Programs of Participatory Forestry Development in Asia

Y.S. Rao

HIGHLIGHTS

- Biological, technical, and economic considerations have been priorities of formal management of natural forests in Asia by administrative bodies, but these have had to be broadened as populations traditionally dependent on natural forests have grown and timber resources diminished.
- People's participation on a decentralized, self-help basis is required for conservation and rational utilization of existing forest resources as well as for reestablishing tree cover on degraded forest lands and introducing trees into traditional agricultural belts.
- Numerous and varied government programs exemplify the potential for more participatory practices in forestry and agroforestry. China, India, Indonesia, Nepal, the Philippines, the Republic of Korea, and Thailand all have instituted their own mix of programs to encourage participation in tree planting and tending and in related social/agroforestry activities.
- Action by nongovernment organizations (NGOs) is complementary to government programs in some cases and is a substitute for them in other cases. NGOs are particularly able to focus on issues, promote public awareness, communicate with and organize the poor (especially women and children), and remain flexible.
- Institutional, technological, and economic measures should be initiated to ensure that people's participation becomes a reality and to ensure greater success for forestry development programs.

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TRADITIONAL MANAGEMENT OF FORESTS

Formal management of natural forests in Asia traditionally has concentrated on achieving protection and production goals set by administrative bodies. The biological, technical, and economic considerations given priority in meeting these goals resulted in forest management practices that concentrated on three basic functions:

1) Establishing a "legal curtain" between people and forests in order to reinforce efforts to police the forest estate.
2) Establishing targets and increasing forest output for commercial log production without reference to such questions as who benefits.
3) Earning revenues for the state at the expense of sustained yield production, which has resulted in gradual erosion of the timber resource base.

These three objectives have been implemented on government-owned lands by exclusively using strategies and programs developed by government forestry officials without consulting local people. Local people are hired as wage laborers only; their role in safeguarding and rationally managing or utilizing the resource is ignored.

These practices may have seemed rational when population pressure was low, society perceived equity and justice as "might makes right," and biological criteria dominated social criteria in forestry decision making. As timber resources diminished and local populations that were traditionally dependent on natural forests grew, these management practices not only lost their relevance but alienated local people. Day after day, trucks went past their villages loaded with logs for consumption in urban areas or foreign markets, but what was left for them was a dramatically reduced forest resource that could no longer support their agricultural or household needs.

This is beginning to change. It is increasingly clear that for long-term success of all types of forestry programs, identifying the social factors that affect adoption by local communities is necessary. People's participation on a decentralized, self-help basis is required for conservation and rational utilization of existing forest resources as well as for establishing tree cover on degraded forest lands and introducing trees into traditional agricultural systems. If local people collaborate, forest cover can be safeguarded and the environment stabilized; tree growing can be integrated with, and extended to, lands beyond forest boundaries, such as private farm lands and communal lands. In addition, this integration of people into forest management programs facilitates the supply of forest goods and services to rural communities at more reasonable costs. How selected forestry programs in Asia use elements of local participation is the focus of this chapter.

GOVERNMENT PROGRAMS

People's Republic of China

China's mobilization of people for forestry development far outstrips similar efforts anywhere else in the world. According to available statistics, some 28 million ha of forests, including timber-producing forests, economic forests, and shelterbelts, were established in China between 1949 and 1981, averaging 869,000 ha each year. The forest coverage has gone up from 8.6 to 12% of the

total land area. Included in this is the spectacular shelterbelt system established in northern China, the Three Norths Forest Belt Project, which has entered its second phase. Over 546 million trees have been planted on the "four sides" (houseside, villageside, roadside, and waterside), over half of which were voluntarily planted by local people. The main tasks of the second phase of this project, which began in 1986 and will continue until 1995, are to (1) tend the existing forests, grassland, and vegetation; (2) plant trees on 6.37 million ha; and (3) aerially sow 170,000 ha to trees or grass.

Planting trees around houses, in villages, and along roads and riversides has long been practiced throughout China and has brought many benefits to farmers. Some 7.2 billion trees have been thus planted, and the average farm now has 74 trees. Trees shade 221, 976 km of roads (60.8% of the total length of rural roads) and have been planted along both sides of 175,000 km (55.1%) of waterways.

Flexible forestry policies have been adopted in recent years. An agricultural contract system has been introduced that gives forestry responsibilities to individuals and rural cooperatives. By early 1984, 20 million ha of barren hills had been offered to 50 million peasant households as allotments to set up small family forest farms and orchards. By late 1984, 4 million specialized rural households were engaged in forest operations and 175,000 cooperative forest farms throughout China managed some 17 million ha.

Afforestation has been pursued in all sectors of the country. In sparsely populated mountain regions where few roads exist, afforestation was accomplished by sowing tree seeds from aircraft. By 1983, 4.67 million ha had been sown by this method. Urban afforestation has been promoted vigorously as well—46.36 million trees were planted in cities in 1981 and 110.47 million in 1983. In fact, the "Resolution on the Unfolding of a Nationwide Voluntary Tree-Planting Campaign" (adopted by the 5th National People's Congress of China in 1981) stipulated that every able-bodied Chinese citizen is obligated to plant three to five trees every year. People in general, but particularly the youth, took part enthusiastically in the voluntary afforestation campaign. In 1984, it was reported that Chinese youth voluntarily planted more than 1 billion trees.

Thus, an important feature of participatory forestry in China is that people of all walks of life have been mobilized to carry out afforestation:

The army assisted rural communities to plant 140 million trees from 1982 to 1984, and the air force and civil aviation department played major roles in aerial sowing operations.

Chinese youth were organized by the Chinese Communist Youth League to carry out various afforestation activities.

Coal mine workers in 17 provinces planted trees on 330,000 ha, and oil field and refinery workers planted 38.29 million trees by the end of 1983.

Railway and highway workers respectively planted trees along 24,000 km of railway lines and 270,000 km of roads.

Pulp and paper mills acquired 66,000 ha of wastelands and planted trees on half.

The water conservancy departments planted tress on 50,000 ha.

Educational departments incorporated afforestation into their work-study programs. In Jilin Province, which has over 10,000 rural schools, each student planted an average of 70 trees.

India

India's national social forestry program is based on people's involvement and sharing benefits between the government and local communities. Some examples from the state of Gujarat are discussed below.

Over 18,000 villages of Gujarat are part of a village woodlot program designed to provide each with a 4 ha to 5 ha woodlot for fuelwood and fodder. Two types of schemes are used: self-help villages and supervised villages. In the self-help scheme, village *panchayats* (local governing bodies) bear the costs of, raise, and maintain the woodlots, and all benefits accrue to the villagers. In the supervised villages, the state forest department incurs investment costs. At harvest time, all direct costs, a fee of 10% for interest, and a management fee of 25% on direct costs are recovered by the forest department, with the balance accruing to the *panchayat*.

Strips of land along roads, railways, and canals are planted, using the general arrangements for village woodlots. Villages with strip plantations passing through their lands are allowed to collect minor products free of charge. Leaf fodder and fruit collection are organized and supervised by the village *panchayat* under the guidance of foresters. All other products from strip plantations are the property of the forestry department, which does the harvesting and marketing. However, net profits from the sale of fuelwood, poles, bamboo, timber, and other products are split on a 50/50 basis between the department and the villages close to the strips.

Under this scheme, landless tribal families are each assigned 2.5 ha of forest land for raising and maintaining plantations. All material inputs are provided by the forestry department. Each family contributes 25 days of labor a month and receives the equivalent of $27 (1981 level), subject to upward revision with price escalation, as remuneration. A 25% share in net profits at plantation harvest time is promised. Free housing materials, water facilities, and the right to collect minor forest produce for barter or sale from the surrounding forest is given to these tribal families.

A policy of free distribution of seedlings and provision of free technical assistance by government spurred private tree farming on an unprecedented scale in Gujarat. The larger and richer farmers responded enthusiastically and reaped huge benefits as fuelwood and pole-wood prices rose. One private farm reported a gross profit close to $6,000/ha (1978) through harvesting a seven-year-old hybrid *Eucalyptus* plantation. This encouraged others, including small farmers, to switch to tree farming. Between 1975 and 1985, it is estimated that close to 800 million trees were planted by the farmers of Gujarat on marginal crop lands.

Farmers belonging to scheduled castes or tribes, each owning not more than 3 ha of degraded land, are encouraged to raise small plots of trees. Key features of this scheme are:

- All costs of raising the plantation are borne by the government for farms of 0.5 ha to 1 ha in size.
- The owner maintains and protects the tree farm.
- The owner receives $27 annually for 10 years as compensation for ensuring a 70% survival of plants.
- Neither costs incurred nor allowances paid by the government are recovered from the farmer.
- The benefits go to the farm family.

The cost of the scheme to the government in dollars in 1980 was $90/ha for establishing the plantation and $27/year for 10 years as compensation to each farm family.

The government supplies materials (for example, polypots, seeds, manure, and implements) to schools, trains children to raise nurseries in their spare time, and eventually buys back the seedling from the schools to use in afforestation programs. Through this program some schools earn up to US $250 a year. There are other benefits of this scheme as well: Government overheads and bureaucratic machinery is reduced for raising seedling in central nurseries. Nurseries at village schools are closer to planting sites. Children gain self-confidence and resourcefulness and a greater awareness of ecology and environment.

The establishment of the National Wasteland Development Board (NWDB) in 1985 created a single nodal agency for monitoring the entire program of social forestry in India. Several of NWDB's policy guidelines stress participation:

At least 50% of the total seedling should be raised through people's nurseries run by such groups as farmers, schools, women, and youth. Furthermore, these nurseries should be spatially decentralized so that a nursery is available to each village at a distance of not more than approximately 10 km.

Tree growers' cooperatives should be promoted and provided with inputs, technical guidance, and harvesting and marketing support.

All Indian states must formulate tree patta schemes (leasing forest lands to people with rights to use the forest products grown by them). A specific target for each year must be prescribed and achieved.

All laws relating to planting and harvesting of trees, leasing of land, usufruct rights, and the like, should be examined in the context of amendements that may be needed to motivate the rural poor and other institutions for afforestation.

Although the roles of NWDB, the state forestry departments, and state extension agencies in social forestry are in flux, programs with clearly defined social objectives, based on local participation, are being implemented. The following four examples were undertaken by NWDB:

During 1986-87, 2,000 million seedlings were grown in decentralized nurseries by groups such as farmers and schools.

To involve NGOs at the grass-roots level, about US $4 million was allocated during 1986-87 to fund aforestation work by NGOs on about 10,000 ha.

At the request of the NWDB, the National Dairy Development Board began a pilot project in 252 villages in four states to establish tree-growers' cooperatives on the same basis as the dairy and oilseed cooperatives promoted it already.

Projects to supply fuelwood needs of 10 cities have been drawn up.

The magnitude of social forestry effort in India is evident from the fact that Rs. 500 crore (approximately US $400 million) was allocated in 1986-87 towards implementation of these programs. In addition, in 1987-88, 23 state forest development corporations were encouraged to utilize institutional

financing to each develop 5000 ha of wastelands each. The sources of institutional financing include the National Bank for Agricultural and Rural Development and state land development banks.

Indonesia

Many successful types of agroforestry activities involving people's participation have been developed in Indonesia. Among them are:

planting dry rice or corn in young tree plantations
growing elephant grass under pines
growing medicinal herbs under mature teak
interplanting teak for wood and *Acacia* for fuel
planting trees as fence rows and along roads for protection of crops and fuelwood
terracing and planting hills with trees for control of soil erosion and wood

The Indonesian experience shows, however, that although community forestry activities can be beneficial, introducing such activities is difficult if rural communities lack more basic human needs. This is why Perum Perhutani (the Java Forest Development Corporation) has simultaneously launched other rural development programs that are not directly related to forestry. Examples include dams for irrigation, capture of drinking water, village industries, and adult education in health care, folk art, and crop commodity-marketing schemes. Perum Perhutani's community forestry program in East and Central Java thus has two main objectives: to protect the state forests and to improve the standard of living of people around the forests.

It is now accepted that community forestry implies two-way communication and activities. Foresters are allowed to go into the village to promote tree planting on agricultural lands, while villagers are encouraged to go to the forest to plant food crops. The government is actively seeking people's participation through the four main components of this program:

1) Intensified *taungya* or *tumpangsari* involves growing trees in combination with crops. Improved agricultural practices (using seed of superior varieties, fertilizers, and pesticides) can double the harvest of dry rice and improve the growth of young teak trees.

2) Fuelwood species are planted in belts around the forest area, especially near villages and in firebreaks. To encourage planting firewood species in their gardens and compounds, villagers are provided with seeds or seedlings and necessary technical advice.

3) Beekeeping may encourage local participation by giving people living around the forests an additional source of income by selling excess honey.

4) Sericulture provides employment for family members in the home, where the worms and cocoons are tended.

Some 250,000 laborers and 13,000 officials are directly employed by Perum Perhutani; with their families, this affects about 2.5% of Java's rural population.

Republic of Korea

Korea provides an example of how innovative organizational structure can

mobilize people's efforts. Village forestry associations (VFAs) act as bridges between the Office of Forestry and villagers in afforestation areas. They disseminate management technology, distribute project funds, and on behalf of forest owners, execute forest operations. This third function is an innovation introduced by the Korean forest service to ensure that all forest land is put to proper use by the people in accordance with the guidelines of government.

The objective of any VFA is to protect existing forest cover and to reforest through cooperation of the villagers. An association's membership encompasses all householders and forest owners within the village. The main program carried out through the VFAs is reforestation, principally to provide villagers with their own supply of fuelwood. However, the importance of fuelwood has decreased following improved standards of living in rural areas and the success of fuelwood substitution programs. An important subsidiary program was the development of income-earning activities. The VFAs also protect the forest by patrolling the forest under their jurisdiction (which can include public forests assigned to them), reporting damage by man or pests, controlling forest pests and fires, and preventing illegal use of the forests. Their projects rely principally on village resources and inputs—land, labor, and village development funds. The VFAs also have access to various subsidized inputs, such as planting stock and technical advice, made available by the government.

The usual concept of agroforestry—raising trees in conjunction with the production of food crops or raising food crops in association with forest plantations—is not practiced in Korea. However, various modifications of the concept (that is, production of food and saleable products from tree plantations) are very much in vogue:

cultivating mushrooms on oak wood
planting multipurpose trees that yield edible fruit and timber
improving tree growth by using farm manure
using forest products in cottage industries engaging local labor

Multipurpose production within the forest areas is vigorously pursued. This creates incentives for participation of private individuals and forest associations in forest plantation establishment and management.

Nearly three decades of dedicated soil conservation and reforestation work by local people resulted in success to such an extent that today the forestry service is able to claim that there is no bare land in the country. Some 66% of the land area is now covered by forests, about 6.5 million ha. The estimated average growing stock in these forests is 26 m^3/ha. About 70% of the forest area is privately owned and was established through the efforts of some 20,000 VFAs whose membership is now approximately 2 million people. The contribution of forestry to the national economy has increased by approximately one-third from 1965 to 1984.

Nepal

While community forestry on public village land has been gaining ground in several Asian countries, Nepal has taken a pioneering step in returning forest land to the people, to be owned and managed by the *panchayats*. Two land tenure options have been created: (1) *Panchayat forest*, under which each *panchayat* (population of 2,000 to 4,000) is given 125 ha of forest land, the

entire produce and income of which belongs to the *panchayat*; and (2) *Panchayat protected forest*, under which each *panchayat* manages 500 ha of forest and receives 75% of the income. Villagers manage the entire operation from nursery to harvest with technical support from the forestry department. The plan calls for planting 250,000 ha under this program in the next 20 years. The program will provide fuel and fodder to the villagers within the *panchayat* and also generate considerable productive employment. (See also Blair, this volume pp. 148–149.)

Philippines

Community forestry projects in the Philippines cover communal tree farming, settlement of shifting cultivation communities (forest occupancy management), family reforestation, and upland conservation.

An outstanding example of people's participation in the Philippines is drawn from the private sector: the Paper Industries Corporation of the Philippines (PICOP) has designed and implemented a program to stimulate tree growing and rural development by small farmers living in the vicinity of PICOP's pulp mill on Mindanao Island, South Philippines. The program began in 1968 with 22 smallholders planting 220 ha of *Albizia falcataria*, a fast-growing species suitable for pulp. By 1984, this number had expanded to 868 farms.

The important advantages of a smallholder tree-farming program are that it is simple, practical, economical, profitable, replicable, and above all, appropriate for and attractive to the poorer segments of rural society. PICOP has institutionalized this development scheme through training and by sensitizing its agroforestry staff in what was termed "the tree farming extension philosophy." Strict adherence to concepts of this philosophy is considered by PICOP the paramount requirement for success.

The plantations raised through cooperative efforts of villagers under the dendrothermal power systems program are another example of successfully involving people in the rebuilding of forest resources in the Philippines.

Thailand

In Thailand, the Royal Forest Department and the Forest Industry Organization are establishing forest villages as part of a people-oriented forestry program. There are three basic features of this model.

1) Evacuate squatters from watershed and forested areas and settle them in villages where they elect a head man and a panel of councillors for each village.

2) Set aside 2.5 ha of land for each forest village family for housing and raising crops. Title and rights of sale are not given, but the families are allowed free tenure for as long as they choose.

3) Provide assistance for the villagers in the development of their water supply, roads, schools, and sales of crops.

The residents of forest villages are employed as laborers, and forest plantations are established using the *taungya* system (raising agricultural crops between trees when the plantations are young and the canopy is open). In order to reduce traveling time from the forest village to the planting site, the village site is selected so that is lies in the center of an area large enough to permit raising plantations for at least 10 years. The following incentives are provided to

the villagers in addition to free housing and a plot of land around the house for raising agricultural crops and vegetables:

One member of each family is permanently employed at current wages as a laborer in the forest plantations.
After the first three years of participation in forestry work, a villager is entitled to a bonus of $70.
Beyond three years, if the villager continues to maintain 1.6 ha under *taungya*, he is entitled to yearly bonus.
Free school uniforms and sports equipment are provided for children.

NONGOVERNMENTAL ACTION

Despite the examples cited above, experience has shown that participatory approaches have not yet become a normal part of the development activities of forest services in the Asian region. It is not always possible to reconcile administrative actions and the requirements for ensuring sustained people's participation, partly because administrative action operates through a framework that has become rigid and authoritarian through rigorous application of rules. The limitations of government programs in this context are also the result of people's mistrust of government outsiders. The fact that there are frequently no peasant-government interactions at the local level does nothing to overcome the problem.

Local organizations are needed to bridge the gap between government institutions on one side and the rural people on the other. Whereas many changes will be brought about by the governments themselves, nongovernmental actions can play a supportive role to hasten the changes that governments wish to implement and that countries so desperately need. Nongovernment organizations can provide an effective link between the people and their governments, but their task is not easy in a system where people often expect everything to be given to them by the government, and departments and agencies tend to function in neutral isolation.

Strengths of NGOs

In Asia, NGOs successfully operating at the local level and dedicated to constructive action have several characteristic strengths:

They have an easy approach to the local communities.
They communicate with facility and are generally accepted by the rural people; in several situations, they are seen as a new and better substitute for rapid and radical social change.
Their operations are generally limited in scope but are usually carried out by a core of adherents who live among the people.
They need not claim infallibility for the techniques they are teaching and even can change them quickly without attracting severe criticism.

Weaknesses of NGOs

The work of many NGOs is characterized by "adhocism," which is unavoidable to some extent because it stems from uncertainty in their resource position

(funds, people, and materials). Another weakness is that, although NGOs have proliferated in recent years, there does not seem to be much exchange of ideas and experiences among them. The tendency to work in isolation results in wastage and duplication as well as the failure to conceive of their efforts as part of a common movement.

Many external factors have also limited the functioning of NGOs. Resistance from vested groups is a major hurdle—when any voluntary effort meets some success, it also meets opposition from those who feel that their own power base is being eroded. In addition, NGOs have to face apathy or lack of cooperation from local government officers concerned with development.

Selected Examples of NGO Action in Forestry

The programs of NGOs cover a wide spectrum of activities: agriculture, health, construction of wells, developing village and cottage industries, dairy farming, spinning and weaving, and adult education. Although forestry is a late entrant into this list, in recent years there has been a surge of NGO activity in both forestry and the environment. The examples selected here are mostly from India and relate to NGO action in promoting awareness, group organization, and encouraging participation of women and children in community forestry efforts.

Promoting Awareness

One of the most vital contributions of NGOs has been to convince people that environment and development are inseparable for human progress and that development priorities need not be in conflict with environmental considerations. An internationally known example of an NGO campaign to protect the forests of the Himalaya is the Chipko (literally, hug the trees) movement. Dasholi Gram Swarajya Mandal is the NGO behind this movement. In the last 12 years, the mandal had spread the message of forest conservation through innumerable food marches, meetings, and discussions and gained widespread public support, especially among women in the hill districts.

The Chipko movement has spawned in its wake several NGOs in India that are engaged not only in environmental awareness campaigns, but also in constructive action to rebuild forest resources with people's participation. Eco-development camps and afforestation camps conducted by NGOs are now a common feature in the Himalayan region of India.

Organizing the Rural Poor

It is now well recognized that, if given a stake in the future and if organized into groups, the poor will respond psychologically and materially to engage in constructive activities of their own, thereby sustaining an essentially self-reliant effort. For instance, in Nepal, one *panchayat* started its own reforestation scheme, covering a vast stretch of hillside belonging to the contiguous wards stretching over 18 km. It requested the government to desist from putting a barbed wire fence around the forest because the villagers themselves had taken responsibility for guarding the forests and for stall feeding their livestock whenever possible.

In some countries, governments are encouraging the establishment of nurseries by local communities as part of their social forestry program. NGOs have a useful role in organizing groups of landless people and enabling them to establish these nurseries by seeking available government inputs. The gestation period in raising tree seedling is short, and an assured market for the seedling exists: both the forest departments and private farmers buy seedlings for forest department block plantations or for farm forestry.

Organizing Women

Many women, especially in Asia, depend on collecting, transporting, processing, and/or marketing forest products as their major or only source of income. In many countries, women and girls with piles of fuelwood on their heads or backs line the paths from hillsides to town. Women trek long distances every day to collect leaves for fodder and manure and fuel for their cooking. In order to actively benefit women, it is essential to examine their specific interests and needs while the problem is being articulated. One forester has successfully identified probable priority areas for woodlot projects simply by making a map showing the distances women of different localities have to walk to collect wood.

Various measures can be adopted by NGOs in order to enhance the participation of women in forestry programs. One striking example is from India. In the Sukhomajri watershed development project in the Haryana Siwaliks, women in 72 families took the lead and implemented "social fencing," preventing grazing through social awareness and stall feeding. Simultaneously, the women of the village started using smokeless chulhas to conserve fuel and made ropes from the bhabbar grass they began to plant on the slopes. Another NGO, Doonghati Shikshan Sansthan, in Uttar Pradesh, India, is organizing plantations of fuel and fodder trees in the foothills with the help of its women's group. As a result of motivation by this organization, women in the locality have decided not to fell any trees but use only fallen branches and leaves as domestic energy for cooking and heating.

Organizing Youth and Children

An eminently successful program in Gujarat, India, concerns backyard tree nurseries in school compounds. Some NGOs in India are providing every child in selected villages with saplings to plant at home and look after, for which they maintain growth records. At the end of a given period, the child judged as the best caretaker is given an award.

MEASURES FOR ENSURING SUSTAINED PARTICIPATION

The examples of efforts by governments and NGOs cited above are by no means common in the region. Several measures on a broad front—institutional, technological, and economic—should be initiated and continued with increasing momentum to ensure that people's participation becomes a reality.

Institutional Measures

The more important institutional measures required to accelerate the process are:

informal and formal education and re-education
extension services
promotion of local organizations
decentralized decision making
appropriate linking mechanisms
government policies and legal instruments

Informal or formal education and reeducation.—Education in general is important for (1) creating awareness, positive attitudes, values and motivation; (2) stimulating self-confidence and self-reliance; (3) expanding the "aspiration frontiers" of the rural poor; and (4) improving the participation capabilities of target groups through generating respect for, and faith in, people's power. Reeducation is also relevant for government officials, politicians, and social leaders for acquiring new skills and orientations. Education and reeducation processes provide leadership training to enable people to take their own initiatives, nonformal education for women, and field-level workshops and seminars for farmers and community members to encourage articulation of their problems. Education also encourages social communication and effective dissemination of information; where forestry specifically is concerned, inclusion of forestry in school curricula and imparting skills of management to the community through education and demonstration centers.

Extension services.—Motivation and group action, important factors in local participation, are affected by extension agents, para-professionals, opinion leaders, change agents, and group organizers. They have different but related roles that may overlap. These difficult jobs require special qualities such as humility, commitment, self-confidence, and communication abilities. Motivated youth and women have a potential to serve as opinion leaders and change agents.

Promotion of local organization.—As well as improving the effectiveness of existing self-help organizations, promotion of local organizations is vital for sustainable participation. These organizations, which enable local people to reach out and effectively use services that are delivered, should be allowed adequate self-determination because the self-confidence of the people and strong leadership are important for the growth and effectiveness of local organizations. The role of NGOs in promoting participation should be encouraged.

Decentralization of decision making.—Local participation is reinforced when government agencies decentralize decision making, especially about financial matters. At the same time, unnecessary proliferation of local branches of central bureaucracy should be avoided. Responsibility for projects should be delegated to local organizations wherever feasible.

Appropriate linking mechanisms.—Joint councils of government and community representatives with access to governmental bodies enable governments to share responsibility with people's organizations and NGOs in such activities as monitoring and evaluating programs and assessing the viability of proposed activities. Although direct consultation with people may take more time, it guarantees even better results.

Government policies and legal instruments.—Bureaucratic and legal regulations should not make it difficult to establish local development organizations or enable participation by women and landless poor in the development process. Rather, where possible, preferential access to resources should be given to these groups. Policies that allow local communities to retain a share of forest revenues and give them authority to spend such revenues on local development can help build participatory activities rapidly. Legal instruments for resources control and conservation need to be realistic. Procedures related to implementation of policies should be simple and clearly understandable.

Technological Measures

Demonstration of appropriate and adequate technology can attract participation where such innovations address local physical constraints. Applied research with active farmer involvment can focus on problems related to species, sites, plant mixtures, and methods of planting, tending, and managing trees. Such measures help integrate forestry with other forms of land use to obtain optimal results.

Economic Measures

Economic measures are, those meant to ensure adequate incentives, credit facilities, delivery of inputs, markets, and marketing arrangements. Availability of credit or other financing mechanisms, such as rural banks with flexible collateral requirements or revolving funds for collateral-free loans for groups, is crucial for meaningful participation. The Grameen Bank of Bangladesh is an excellent example of an institution with such a credit mechanism.

It is necessary to analyze local and regional markets for wood and wood products and to explore new markets so that investment in tree-planting projects will have adequate returns. A system of price supports for wood, as for certain agricultural products, is necessary in some cases to encourage tree planting. It also may be possible to link wood production with processing industries through appropriate integration and to capture faraway markets through organized cooperative marketing.

CONCLUSION

Local participation can help conserve natural forest resources while increasing production. As a dynamic concept, it can incorporate different social, institutional, and land ownership systems in a manner where people willingly cooperate to conserve and share the benefits from forests. Participation provides the motive force for cooperative action. It implies elimination of patron-client relationships and police-criminal attitudes that typically have characterized dealings between governments and the people in relation to forests.

Programs of forestry development have the best chance of success only if people's participation is secured. However, securing the involvement of local people requires overcoming such obstacles as resistance of vested interests, caste divisions of society, and backwardness of the areas. No single method can be considered *the* method of securing involvement and participation of the people: both government agencies and NGOs must reinforce each other to serve the people.

CHAPTER 3

Wasteland Development in India: Political, Institutional, and Sociocultural Imperatives

S.A. Shah

HIGHLIGHTS

- In response to increasing degradation of its natural and common lands, India has created the National Wasteland Development Board.
- Major policy, legal, administrative, economic, educational, planning, sociocultural, and technology transfer issues must be addressed in the effort to promote rehabilitation and development of wastelands.
- It is particularly critical to understand sociocultural and organizational factors, such as choice of species, institutional support, equitable distribution of benefits, and the role of women, if development programs are to become more than popular retoric.
- Meeting people's needs must be the major focus of any wasteland development strategy. In fact, different packages of strategies are needed to (1) meet the varying objectives that people have as they pursue tree-growing activities; (2) reflect different patterns of ownership and control of land and tree resources; (3) accommodate local institutional arrangements for management; and (4) blend technologies with the local sociocultural, economic, and physical environment. Strategies should thus be situation-specific and adopted only after local needs are identified.

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COMMITMENT TO DEVELOP WASTELANDS

More than half of India's land resources suffer from some form of degradation. Approximately one million hectares of forested land are being destroyed annually by fuelwood gathering, excessive grazing, agricultural encroachments, and uncontrolled fires. Many areas in recent years have been hit by both floods and droughts that have contributed to decreased production and productivity. Average agricultural production is approximately 1 t/ha, and forest production is .25 m^3/ha—among the lowest in the world, though the potential is substantially higher. This scenario suggests a future of ecological and environmental disaster that may have significant impact on the security of the nation itself. Thus, it is not surprising that during the 1980s development of wastelands came to be viewed as a means to improve the environment and eradicate poverty. There is little doubt that a clear and overwhelming political commitment was made at the highest level for this national activity. Nevertheless, there now exists widespread frustration among the beneficiaries, nongovernment organizations, and state government agencies alike.

The National Wasteland Development Board was specifically created to spearhead India's attack of the wasteland problem, and monetary incentives and assistance were provided to promote wasteland development, yet little progress has been made. Even registered societies of tribals and the landless have not succeeded in securing any wastelands, nor have they obtained easy and quick access to existing facilities, technology, and advice regarding a wide range of problems confronting them in wasteland development. Nongovernmental organizations designed for development and village reconstruction (such as the Nehru Foundation) are becoming skeptical about the declared intentions of the government. This problem is particularly serious because it is happening when public interest and enthusiasm are at an unprecedented level and because it does not arise out of a lack of funds, or nonavailability of suitable land, or the lack of appropriate technology. Rather, the major contributing factors, as identified below, are deep-seated political, legal, and social issues that are not likely to respond to quick, superficial measures.

MAJOR PROBLEMS FACING WASTELAND DEVELOPMENT

Policy, Legal, and Administrative Issues

The Indian government has not adequately addressed a number of policy and legal issues relating to land use, tenure, and the allocation of distribution of wastelands. (Even when such policies are adopted, they are rarely implemented in a timely fashion.) For example, there is no policy to survey encroachment on forest lands, although it is a common problem in all villages. Thus, there is no way to determine the magnitude of the problem or to officially identify the "grabbers." Even the civil laws and administrative rules governing tree ownership, harvesting, processing, and transporting of tree products often discourage landowners and others from planting and caring for trees.

The government has not recognized and accepted, let alone encouraged, village access to and management of village resources because village participation is given a low priority in most government activities. Even the classification, mapping, and demarcation of village land and resources are

incomplete and incorrect. What information does exist is typically inaccessible to individuals and agencies interested in tree growing. Where districts and blocks have responsibility for implementing local decisions, the centralized structure of planning and decision-making processes do not encourage and enable village-level planning—local bodies must implement decisions, but they do not make the decisions. The result is inappropriate and cumbersome procedures that are unresponsive to the needs of wateland development. Much needed technological support is not available at the right time and the right place, and there are no problem-solving and quick response services at district and block levels.

A credibility gap therefore exists between people and their representatives on the one hand and between people and the various government agencies on the other. No formal or informal mechanisms exist for continuing exchange of ideas, experiences, problems, and plans. Problems and difficulties persist, often because government agencies make unilateral decisions without local participation on the erroneous assumption that their perceptions of problems and opportunities for wasteland development are the same as those of local people.

Economic Issues

The primary target groups of wasteland development programs, the poor and landless, often only partially perceive the long-term economic, social, and cultural benefits of trees to them and their communities. Trees most obviously are a source of fuelwood, food, and fodder. They provide raw materials for housing and cottage industries, thereby generating employment. They are insurance policies for the costs of educating and marrying children, even for unforeseen expenses such as illness and accidents. Trees can increase overall agricultural production and stabilize farm income. They also provide flood and erosion control and help purify the air and water. With all of the benefits that trees provide, why are they not grown by every farmer?

Part of the answer is that tree-growing communities are starved for technological, administrative, organizational, and fiscal information. Because extension and communication institutions are fragmented and do not communicate information, mistakes are often repeated. Credit, loan, and subsidy facilities are limited and often do not well serve the underprivileged, causing vulnerable groups and individuals to give up tree growing because of failures and fear of financial losses. No agency in the country analyzes, synthesizes, and disseminates relevant information to those who need it.

Agroforestry is a good example. About 40 million ha of Indian farm lands have become wastelands. However, ecological and environmental problems of private agricultural lands have received scant attention. The traditional interdependent relationship of farmer and tree has broken down under the impact and influence of high-input, intensive agricultural development. The government has not provided people with enough information about how they can grow more food and wood on the same land, at the same time, and even improve the productive capacity of the land. Where owners of large landholdings can afford to learn about and try new techniques and secure loans if needed, owners of small and marginal farms often have no access to this system, and the benefits and subsidies meant for them rarely seem to reach them. They are not organized and lack institutional support such as access to demonstration farms from which to learn the message of agroforestry.

The role of industry, which has tremendous financial, managerial, and planning resources, has not been addressed adequately. Wood-based industries naturally have a great stake in wood production, but the government makes no effort to attract and motivate them to promote and assist tree planting by small and marginal farmers as PICOP did in the Philippines (see Rao, this volume).

Of course, the economic problems of the landless are a separate issue. Because they constitute the bulk of the rural poor in India, as a group they have the potential to contribute a great deal to wasteland development if given access to land, credit, and technology. They are now the primary agents of forest destruction, but this is because they lack alternatives to meet their basic necessities. Group farm forestry efforts in West Bengal have demostrated what miracles can be achieved as wastelands are transformed in the process of alleviating poverty.

Another related issue concerns the needs of women, which are substantially different from those of men. They make up about half the population, yet their economic interests are often ignored by their government. They not only shoulder the burden of providing fuelwood for the families and fodder for the livestock, they also are responsible for certain agricultural activities such as transplanting paddy. Yet, they are rarely a part of decision-making processes, and they lack access to resources, bureaucracy, and technology. Just as importantly, they can largely control and contain population growth if given access to appropriate information and health services, and this will have a long-range sweeping impact on economic issues.

Education Issues

There are two main education issues affecting agroforestry. First, target people must be educated about the need for wasteland development and how they can profit by participating. Second, research and training programs must be adjusted to fit today's needs for the multipurpose trees and minor forest products that are vital to the rural economy in general and to the sustenance of the poor in particular, rather than continuing to focus on traditional timber production for industry and commerce.

One of the most potentially powerful tools for reforestation is the schoolchild. Although some areas have begun to tap this reserve with success, the teaching community has not been mobilized, and the process has not been institutionalized.

On the issues of research and training, the government has not acknowledged the potential of many nontimber forest products or supported them to encourage employment generation of the right type, in the right places. Because training still follows largely traditional patterns designed to meet entirely different objectives, such as serving large-scale commercial forest operations, many problems faced by the expanding tree-growing community are unsolved. Multidisciplinary and multi-agency research approaches are still missing, and NGO involvement, so critical for wasteland development, has been largely neglected. The NGOs have nowhere to go for training their field functionaries.

Planning Capabilities

Microplanning is central to the mission of wasteland development, yet the

infrastructure for preparing plans is nonexistent, and these capabilities are not being developed. Planning institutions that have traditionally handled local planning decisions have been allowed or forced to deteriorate and are consequently ineffective or defunct. New institutions, which often are largely dominated by rural elites (see Blair, this volume), fail to perform this function.

Sociocultural and Technology Transfer Issues

Transfer of both sociocultural and technological innovations require new dimensions of the practice of forestry. Sociocultural considerations have hardly, if ever, been assigned the importance they deserve. They are not inputs in planning and implementation of development efforts for wastelands: how else could one explain more or less uniform management and institutional models for the whole or a large part of a state given the diversity of peoples and cultures within states? How can one explain the absence of sociologists from most of the state forest departments? Nevertheless, cultural traditions supported by institutional structures and market forces direct behavior for which there are no technical solutions, only social solutions.

Until recently, forestry operated for commercial purposes on government-owned, well-demarcated, and legally (Indian Forestry Act) protected lands. Management was entirely the responsibility of the forest department. Thus, there was neither interaction with local people nor a need to transfer technology to them. The people were presumed to know how to plant, culture, and protect trees. In other words, technology has been taken for granted. That presumption has left us with no syllabi for different aspects of wasteland development, few training materials, fewer trainers, and above all, no institutions designed for training and technology transfer. We now find ourselves putting the cart of wasteland development before the horse of training and technology transfer.

Steps taken to change the policy, legal, and administrative problems touched on above will be effective only if they are based on sound and sensitive understanding of the sociocultural milieu in which they must work.

SOCIOCULTURAL CONSIDERATIONS

The structure and organization of forest development activities are inadequate for today's diverse and changing forestry functions. Sensitivity to the culture and the arts and crafts of local people, and understanding their perceptions are among the weakest aspects of government administration. Even where policies and programs are designed specifically to benefit local people, government attempts at public relations are mistrusted.

Why do the Bishnois of Rajasthan protect trees and wildlife even at the cost of their lives? Why are the temple groves protected religiously? Why does a particular section of people in Gujarat, Rajasthan, and Maharashtra worship a particular tree on Deshera day? Why do the tribals in the Khasi Hills broadcast seeds of pine before moving to a new plot of land for their shifting cultivation? Why do the religious rites of some of the tribes in Gujarat, Maharashtra, Rajasthan, and Uttar Pradesh revolve around mahuwa (*Madhuca indica*)? Why

was Chipko born in the western Himalaya? Why did Bastar tribals oppose introduction of tropical pines? Why do tribals of Bihar oppose introduction of more valuable teak trees to replace sal (*Shorea robusta*)? These questions illustrate beyond a shadow of a doubt that rural and wasteland development efforts must consider more than fuelwood, fodder, and employment. Less obvious sociocultural issues are often more important to target peoples but are viewed as unimportant by decision makers and planners. The perceptions of local people about sociocultural matters are sometimes so different from those of outsiders that outsiders find it difficult even to conceive of them.

Beneficiaries have both much wider and more specific views of benefits than do planners. For example, a banyan tree may be just a tree providing shade as far as a planner is concerned, but for the villagers, it may be where community discussions are held and vital decisions made. In Orissa, a community wanted vegetation restored in their neighborhood—not for fuelwood, timber, fodder, or any other forest product. They wanted to bring back to life a stream that was their only source of drinking water. The villagers of Kanjari, Gujarat, wanted *Eucalyptus*, not so much because it was valuable, but because it masked the smell of a tannery in the neighborhood. Such examples are numerous.

Three Critical Issues

Choice of species, institutional support, and equitable distribution of benefits are three ciritcal issues of wasteland development. These are the very issues that are largely influenced by the local sociocultural environment.

Trees, shrubs, and herbs (not trees alone) need to be integrated into the lives and livelihoods of the local people. The process of integration is governed by social, cultural, and ethical values of the different sections of the village community. Even if policies and laws provide for the integration and utilization of the products by target groups, the actual process of integration and access to the benefits may be prevented by the social forces operating at the village level, regardless of legislation against untouchability and alienation of tribal land. These evils still persist—so strong are sociocultural forces.

The power structure in rural areas is largely a product of social inequalities emanating from the traditional caste and cultural differentiations. The poor are, by and large, obligated in some way to the rural rich and work for the latter. leakage of benefits to untargeted groups, therefore, is very common (see Blair, this volume). Social inequalities are accentuated by skewed land distribution and by the existence of local elites. It is therefore imperative that wasteland development efforts recognize and operate within the realities of a given sociocultural, political, and organizational system. Burch (personal communication) has pointed out that salient levels of participation in social forestry are more likely to be collective—village, tribe, clan, or household. The motives for participation are found in the social structure itself, that is, in the system of differential distribution of wealth, power, prestige, or information (see Burch and DeLuca 1984).

Social foresters should attempt to increase the production of socially desired benefits on a sustainable basis from the development of wastelands in order to secure local involvement. As important as this task is, it is extremely difficult. In a few villages of Andhra Pradesh, tamarind and bamboo are associated with ghosts; some tribals believe that specific trees invite death. *Sisoo dalbergia*

(rosewood) is traditionally regarded as an excellent fodder tree in the Punjab and Uttar Pradesh, but not in Gujarat. In Rajasthan, leaves of *Ailanthus altissima* (China sumac) are fed to animals, but not in Gujarat. Social foresters have to understand such cultural preferences, prejudices, and beliefs before they can hope to succeed in earning the confidence of local people.

The Role of Women

The role of women is dictated by the culture and traditions of a community. Even within a village, the tasks entrusted to and performed by women vary. In quite a few cultures, women not only look after the household but also perform most of the agricultural operations. It is for this reason that Chipko was born in Garhwal. It is primarily women who collect firewood and fodder and various nontimber forest products. In wasteland development, therefore, considerations of culture and tradition warrant giving preference to women's, rather than men's involvement.

Technology and Tradition

People are generally more receptive to technical innovations that permit improvement of traditional practices. Burch (personal communication) has said that new technology should be "easy fitting" rather than dependent on changes in cultural taste, social rules and values, ways of organizing work and leisure, harvesting, and the like. In short, concern for how sociocultural traditions affect technical aspects of wasteland development has not been given much thought. The consequence has been low rates of success.

PROPOSED STRATEGY AND ALTERNATIVES

The saying, "Take care of the people and the trees will take care of themselves," is appropriate guidance for the poverty and wasteland problems of India. No administrative reorganization, no program for people's participation, no amount of training will be able to influence behavior that creates or aggravates wastelands in the long run if the needs of the people are not met. And in order to meet these needs, understanding *why* the traditional relationship of interdependence and respect between farmers and forests and between people and trees has broken down is central to the formation of a successful wasteland development strategy. The factors may include one or more of the following: sociocultural, economic, environmental, political, religious, and historical. More often than not, cultural and historical aspects are either ignored or downplayed by government planners, but if long-term success is to be achieved, these factors must be taken into consideration. If they are not, enlisting people's participation becomes a slogan only, not a reality, as the people continue to order their lives as they always have.

Different packages of strategies are needed to (1) meet the varying objectives that people have as they pursue tree-growing activities; (2) reflect different patterns of ownership and control of land and tree resources; (3) accommodate local institutional arrangements for management; and (4) blend technologies with the local sociocultural, economic, and physical environment. Strategies should thus be situation-specific, adopted only after local needs are identified.

Local situations are diverse and change abruptly. This makes generalizations or blueprints virtually impossible. The need for judicious personal evaluations and judgments based on local knowledge cannot be overemphasized. The planner must relate project strategies to specific situations, then evaluate available alternatives, and finally introduce appropriate interventions.

Incorporating Sociocultural Factors

Every wasteland development activity should begin with a study of sociocultural environment to answer basic questions:

1) What are the social and cultural perceptions of the products and benefits from trees, shrubs, and herbs?

2) What species of trees, shrubs, and herbs can satisfy these values to the maximum extent? (Answering this is a difficult task indeed because values may be complementary or conflicting, may be direct or subtle, may or may not have economic value, may or may not be monetized.)

3) What are the sociocultural factors that have contributed to the destruction of forests?

4) What changes in attitudes are the result of ill-conceived development, population growth, breakdown of social relationships, and the like?

A thorough analysis of these aspects alone could lead to an appropriate strategy for wasteland development tailored to specific local sociocultural environments.

Tapping Local Potential

The potential of rural people to get things done is often greatly underestimated. The landless, for example, can make great contributions to wasteland development, but they need special incentives. Nothing motivates more than a sense of security and the possession of even a small piece of land, even if only on a long-term lease. West Bengal has demonstrated the usefulness of such a measure. Privatization of public lands must become an acceptable solution if the landless are to be incorporated into the solution rather than remain a cause of the wasteland problem.

Other incentives to enhance the contribution of the landless to the rural economy and to their own welfare include ownership of trees, NGO involvement, technology and training support, marketing support, and, importantly, credit on easy terms delivered at their doorstep as the Grameen banks of Bangladesh and Pakistan do. (For more information on this credit institution, see Hossain 1988.) In addition, the landless should be organized into cooperatives, clubs, or groups.

Small and marginal farmers have also been neglected. They frequently do not receive the benefits intended for them. In fact, they suffer from many of the same problems faced by the landless and can benefit from many of the same solutions, including being organized into cooperatives with special credit facilities provided.

Rural women must be fully and actively involved in wasteland development. They should be involved at all levels of development projects by revising recruitment rules to suit their specific needs. Cultural and educational barriers, family commitments, inappropriate training programs, even selection of tree

species, all currently contribute to keeping women from active participation in the development of wastelands. However, if job descriptions are altered to permit two women to work together or to work part-time, if illiteracy is not made a barrier, if training is decentralized, and if they receive their share of the benefits, women will be motivated to participate in planning, implementing, and deciding about the distribution of benefits.

One last, but important, group that can contribute to the development process is the student community. School teachers should be given a well-thought-out program of education, motivation, and training so that they can develop educational activities for their students that require minimum outside support. Every educational institution as far as practical should be encouraged to create a school forest on community land set aside for this purpose. In this manner, not only will students become aware of trees and environmental issues and identify with the tree-growing effort, they will also contribute to the production of seedling for distribution in their community.

Using Local Organizations

Villages should have complete social control of and access to *all* village resources, including all categories of government wastelands such as *panchayat* land and revenue and degraded forests. Village institutions should be vested with full authority for their management within practical, but flexible, guidelines, widely published by the state and the district. Nongovernment organizations should be promoted and encouraged to assist village institutions according to their needs. This may require technological, research, training, and marketing support for NGOs at the village, block, and district levels through the organization of *van vigyan kendras* and by restructuring public forestry organizations.

Van vigyan kendras (district-level forestry centers designed for education, extension, communication, and demonstration) can easily be adapted to promote tree planting as a profitable economic activity. Agroforestry as a land-use system that can increase production, profitability, and stability of agricultural and tree crops should be given pride of place in tropical countries. District social forestry organizations can also play an important role in such efforts, for example, by delivering seedlings to farmers at planting sites.

Focusing Research and Training

These local organizations do not operate in a vacuum, however. Even those involved with the tree-growing community require information on government policies, programs, incentives, and facilities; procedures for establishing cooperatives; rules governing harvesting, processing, and transport; NGO programs and experiences; sources of seed supply, planting materials, and technical information; and names and addresses of experts in various fields. A separate institution at the national and state level and *van vigyan kendras* at the district level should be supported to gather, analyze, and disseminate this information to those who need it.

Field-level training for NGO employees and others in the nongoverment sector should be decentralized and entrusted to competent, willing NGOs. Training should generate self-confidence, self-reliance, and a new sense of

awareness. It should be practical and related to the preferred technology in each particular area. Each innovation should relate to the local socioeconomic and cultural environment, and it should blend with local experiences, resources, skills, and management capabilities. Conservation and improvement of the land's productivity and fertility should be built into the technology package.

Research, therefore, should be based on need and designed to enhance the production of multiple products. Efforts to improve local multipurpose trees, nutrient-poor soils, and bamboos deserve special attention. The focus should be on realizing optimal production potentials of the local species. Technical packages, such as solar seasoning of timber integrated with mobile preservation and processing units in rural areas, can provide substantial saving of timber and improve rural housing. Easily implimented methods need to be developed so that rural society moves gradually to self-reliance.

Promoting Industrial Participation

The needs of wood-based industries for raw materials far exceeds indigenous production. Industry should be motivated and encouraged to assist and stimulate production of industial trees on small farms. This can reduce pressure on government forests, which can then be managed more for environmental purposes. To do this, granting tax and credit concession, as well as subsidies and incentives, is justified (see Mercer, this volume). Industry should work with government to remove various constraints faced by farmers by providing programs for sustained income generation with attractive prices, quality planting materials delivered at the farm gate, harvesting and transport facilities, and accessibility to appropriate technology. Titaghar Paper Co., Rayalseema Paper Mills, and WIMCO have demonstrated the feasibility and profitability of this kind of activity. Privatizing public lands also merits trial, particularly on degraded forest land and revenue wastelands. In such an effort, industry can make significant contributions by making local people partners in planning, managing, and distributing profits and products.

Changing Administrative Emphasis

Government agencies should confine themselves to providing support services to people and their organizations either directly or through NGOs or private voluntary organizations. District social forestry organizations should be restricted, their functions reassigned and redefined. A cadre of "barefoot foresters" created to guide and assist local-level implementation of wasteland development activities could be much more effective. Members of the cadre should receive in-service training every year and be encouraged to undertake private consultancies. Their earnings should be related to their work performance to ensure quality service.

Decentralization of the process of decision making regarding all aspects of wasteland development at district, block, and village levels should be encouraged within the framework of guidelines issued by the center, state, and district. A single agency at the state and district levels should deal with and decide all issues relating to wasteland development. Appropriate institutions responsible and responsive to the needs of the people should be built gradually and progressively from the bottom up.

A forum for continuing interaction between government agencies, NGOs, the people, and their elected local and district-level representatives must be supported. These should be linked horizontally and vertically.

Implementation

Policy, legal, fiscal, and administrative decisions designed to put into operation the above strategy are required at appropriate levels. A single multidisciplinary agency for formulating, monitoring, and reviewing policy at the national and state levels is needed to make and implement decisions about all aspects of wasteland development, including land and tree tenure, land-use policy, and diversion of government wastelands to other uses. Decisions must be implemented, monitored, and reviewed continually. It is therefore imperative that pragmatic distribution and demarcation of responsibility and accountability exist. Any attempt to put off this difficult exercise is self-defeating. However, a successful wasteland development strategy will work only if population control is also achieved. Otherwise, whatever development is accomplished will be nullified by the increased population.

These issues are so vital for the ecological and economic development of the country that they should be based on a consensus of all political parties. They are indeed difficult, but surely not intractable, given political will and courage.

CONCLUSION

History shows that in the face of common danger, even the most bitter enemies unite. In order to demonstrate how the nature and severity of the wastelands problem undermine agriculture and industry, decision makers, planners, elected representatives, and opinion leaders must be educated about the cost of not making appropriate decisions immediately. It must be stressed that time is *not* on our side; every passing day witnesses degradation in a geometric progression. Unfortunately, even now ignorance and misinformation are widespread. Not only is little being done, but where programs are undertaken, they are inappropriate, even counterproductive, because sociocultural and institutional factors are given less consideration than technical factors. The result has been that wasteland development has not measured up to expectation, although there is ample land, a sellers' market for the products of reclaimed wasteland, acute need of those who eke out a living on wastelands, and no lack of money or technical manpower.

In short, the theories, methods, and substantive findings of social science become the sufficient and necessary means for accomplishing the policy goals of biophysical and technical professionals. It then becomes the moral and national duty of the press, academics, environmentalists, NGOs, scientists, and forestry experts to launch an aggressive campaign based on accurate understanding of what the people need and how they live. The message should be unmistakable and clear and should be so delivered that target groups are able to comprehend it and willing to adopt it. Without acceptance by them, wasteland development will not happen.

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CHAPTER 4

Social Science Research in Agroforestry and Other Land-use Technologies

William R. Bentley

HIGHLIGHTS

- Use of social science theories and methodologies promotes diagnosis of the structure of technology development problems.
- Development and transfer of technology is improved by better diagnosis because clients are more accurately identified and clearly understood. More effective research is the result.
- Improved diagnosis also improves the quality and usefulness of the research on which policy and planning decisions are based, and it helps promote new ideas with target beneficiaries.
- Improved application of research should cover supply and demand relationships, household and village decision making, the role of institutions, and organizational behavior.
- Because most situations in which agroforestry systems are useful are created by changes in social, not technical, factors, research that integrates the social and biophysical sciences is the key to successful implementation.

SOCIAL SCIENCE AND TECHNOLOGY DEVELOPMENT

My purpose in this chapter is not to summarize the roles that social science can play in the study and application of agroforestry systems. It is, rather, to argue for a broader perspective on the use of these roles in technology development. Consider, therefore, two general ways in which the social sciences contribute to technology development:

Directly through technology development and transfer of information
Indirectly through policy analysis and planning of programs and projects

The initial clientele for the results of social science research are either researchers in forestry and other land-use technologies or administrators of policy and planning programs. In both cases, however, the clientele shifts over time to more fundamental clients, from the technical researcher or analytical specialist to farmers and rural poor on the one hand, and to makers of policy on the other. Farmers are the critical clients for technical research, and politicians and policy makers are the critical clients for analytical and planning assistance. This shift from research and analytical professionals to primary clients is the result of identifying and diagnosing the structure of problems, rather than dealing with just symptoms.

It is this diagnostic role that fosters awareness of the need for understanding social phenomena, identifying critical social information needs, and integrating the social and biophysical sciences. Although the social sciences have no exclusive claim to questions concerning social or human values, their very focus on people makes the social scientist sensitive to questions of value. Often, the result of social science research, especially when it is controversial, is explicit discussions about human values by scientists, professionals, and the general citizenry.

I will illustrate these diagnostic roles with some examples from India following brief descriptions of the technical development and transfer role and the policy and planning role. My discussion also includes a few comments on methodology and some observations on ways in which the social and biophysical sciences can be integrated in the context of land-use technologies.

TECHNOLOGY DEVELOPMENT AND TRANSFER

Improving the transfer of technologies is the traditional reason for incorporating social science, most particularly production economics, into research programs on forestry, horticulture, and other technology systems. In simple form, the working hypothesis is that, by understanding farmers, better information about technologies can be packaged in a more easily understood form or will be more acceptable to the clients. In the early years of the green revolution, the high-yielding varieties improved productivity so much that extension efforts and the social science research on which it was based often were not important in transferring technology. However, where farmers were not readily adopting appropriate technical research results (for example, forestry and low-input technologies), even with substantial extension efforts, application of social science research became popular.

Farming systems research and extension methodologies were developed for contexts where either the farmers were resource-poor, or the possible productiv-

ity improvements from technological changes were small, or both. Farming systems concepts were built on specific crop or animal agricultural technologies, and again, the social sciences were added to help transfer technology. Because resource-poor farmers often are at least partially subsistence producers, production, transformation, and consumption operate at the household level. Consequently, a broad array of social sciences became useful in developing the "new household economics." Also, more cultural barriers exist between middle-class researchers and their clients, which enhances the need for the behavioral social sciences. In many cases, farming systems research requires concepts and methods from rural sociology, applied anthropology, and a variety of economic specialities.

The introduction of a stronger social science component into farming systems research and extension shifted attention from technology transfer to identification of the critical needs of farmers as clients. Diagnosis of causes rather than simple identification of symptoms leads to focused research and more effectively designed solutions. Better solutions, defined in terms of the clients' problems, are much easier to transfer than marginal improvements, let alone changes that have negative consequences from the farmers' perspective.

Similar shifts have occurred worldwide in forestry research for both public agencies and industrial firms. Many horticultural advances in the tropics were initially made by research teams working for colonial enterprises concerned with plantation and fruit crops. Indeed, some of the rationale for applied research was developed in contexts where the client was an obvious and concrete organization, and then transferred to the more elusive context of farmers as clients. For example, I used such a client-oriented approach for setting research priorities while managing a large American industrial forestry research organization during the 1970s. I looked for leverage points—amount of area affected, volume or value increase per hectare, or immediate impact on net cash flow—that would benefit the corporate divisions, which were my clients. The more well defined the client group for research results, the more effective the targeting of research questions and subsequent answers. This is nowhere more true than with particular groups of resource-poor farmers on marginal crop lands.

POLICY AND PLANNING

The role of social science is more obvious in policy and planning than in technology development, but politicians and other policy makers have rarely been enthusiastic about applying science to their activities. Policy analysts, planners, and professionals historically have been technocrats by training and professional culture, and while more attuned than politicians to science as a basis for rational thinking, they have not always been receptive to the results of social science research. Whether in developed or developing countries, it is a fact that neither politicians nor administrators appreciate being confronted with their faults or weaknesses.

One factor that has helped overcome this antipathy and has resulted in the incorporation of social science in more policy and planning processes is that social science can help policy makers and program planners sell their ideas to prospective beneficiaries. This role, first and most explicitly developed in marketing research to guide advertisement campaigns and similar social marketing research, helps guide campaigns to convince citizens of the merits of such

social goods as family planning and oral rehydration therapy. Social surveys and analyses often guide political decisions and all too often the choices of top elected officials.

The reasons, however, for the rapid integration of social science research into policy-making and planning processes are the rapid improvement in the quality of results and their consequent usefulness to policy makers and planners. Also, many problems that technology can help solve at the farm or small watershed level are created more by social factors than by technological forces. Unless the social factors are changed, applying improved technology will have limited, if not negative, results. This point, the need for social change to be integrated with technological change, brings me back to the diagnostic role of the social sciences.

DIAGNOSTICS

The term "diagnostics" is here used much as a physician uses it. When faced with certain symptoms, the first step is to determine what are the possible causes of these symptoms. In the context of science, this is the process by which new hypotheses are generated, a process as difficult and as rigorously objective as testing hypotheses. Unfortunately, most scientists are far better trained in methodologies for testing hypotheses, which often define the bounds of their disciplinary specialities, than they are to carefully observe symptoms and assemble realistic, objective information that leads to the formulation of hypotheses.

The simplest understanding of diagnostics is the method of asking questions that compare and contrast the evidence: What is the symptom? What isn't the symptom? Where is the symptom observed? Where is it not observed? When? When not? How many? How few? After several iterations of such questions, the diagnostician has uncovered most, if not all, the objective information known about this set of symptoms. At this point, the diagnostician may pose some hypotheses that explain the observed symptoms and fit the answers to the initial questions. The details of this method and its more sophisticated variants are beyond this discussion, but Kepner and Tregoe (1960) and Miller and colleagues (1991) provide useful descriptions.

It is useful to demonstrate this approach, however, with brief descriptions of two cases where the diagnostic step led to testable hypotheses about the role of social and technical factors in solving some problems that include agroforestry. Both were local problems in northern India, but each led to more general policies for India.

Soil Erosion in the Lower Shivalik Hills

In the mid-1970s, some of the more well-to-do citizens of Chandigarh, the capital of the states of both Haryana and Punjab, noticed that the keels of their sailboats were touching bottom in the local artificial lake. This symptom was quickly attributed to the rapid silting of the lake, and the proximate cause correctly identified as soil erosion in the hills immediately above the city. Government agencies responded with a series of small engineering structures to slow the water runoff and catch the silt before it entered the lake. This response was ineffective. The hills were badly degraded from overgrazing, and there was little vegetative cover to hold the soil during the winter and monsoon rains.

Further, the people of the upstream village, Sukhomajri, distrusted the government agencies, and actively countered the soil conservation measures by destroying the structures and continuing their overgrazing practices.

After some time, the government agencies realized that a more complex solution was needed that dealt with the local villagers' problems as well as the problems of the Chandigarh citizenry interested in sailing. The village of Sukhomajri was quite poor, and the local people had little choice but to overgraze the protected forest common lands adjacent to their rainfed crop lands. Regulating use of the grazing resource could only be accomplished if some new resources were made available. Part of the solution was to construct small tanks, or reserviors, near the village to prevent rapid water runoff during intense rains. To this point, the solution was fairly obvious. The innovative part of this solution was in recognizing that the tanks could also provide irrigation water for winter crops. In the dryland area of Sukhomajri water is a valuable resource. In exchange for it, the villagers shifted from grazing to stall feeding of the animals, planted grasses and trees, and engaged in other soil and water conservation measures.

Such an effort could not succeed unless all the villagers cooperated, and here another innovation was designed into the system. Rather than allocate the water by land area, each family hearth received equal shares. Thus, both richer and poorer families benefited from the new resource because the poorer families with little or no land could trade their share of the water for fodder, access to crop lands, and other needs.

The Sukhomajri case was more complicated than presented here, and the process of diagnostics was not easy, quick, or always straightforward (see, for example, Seckler and Joshi 1982 and Levine et al. 1986 for more details). However, it illustrates a situation in which the symptoms were the immediate result of biophysical phenomena—steep, highly erodable soils were denuded by overgrazing—but the more fundamental causes were social in character. The solutions were also social in character, but they worked only because technical results followed social change. The technical package was a rich mix that included soil and water engineering structures, small-scale irrigation, introduction of improved wheat varieties and (later) irrigated alfalfa hay and rehabilitation of forest and grassland, as well as the small-scale engineering structures, some of which initially had failed. On the other hand, these technical changes were only possible because the basic social relationships had been altered.

Implications at the national level

There is considerable disparity among estimates of the amount of India's degraded land. Chambers and colleagues (1989) estimate that, of 264 million ha that could be under cultivation, 84 million are degraded, but the National Commission of Agriculture's estimation was more than twice this figure in 1976, and several other authors have offered estimates between these two figures. Even the definition of what constitutes wasteland is not commonly agreed upon, and potential productivity is difficult to measure. Nevertheless, all students of land degradation in India agree that degradation is common, and all signs are that it is inceasing with time, not decreasing. The case of land degradation and reclamation in Sukhomajri is applicable in whole or in part across much of India.

The most common symptoms of degradation are soil erosion and increased

water runoff. The principal cause involves removal of vegetative cover directly by overgrazing or overgrazing following timber and fuelwood harvesting (Bentley 1984). Further diagnosis leads to the hypothesis that common access grazing land, whether marginal rainfed crop land, cutover public forest, or revenue common land, represents an institution that almost invariably leads to degradation and, at the extreme, to wasteland status. If this hypothesis is true—and the tests suggest it is—then rehabilitation requires institutional changes as well as technological inputs.

The institutions for making these changes do not have to be the traditional ones, such as the landlords of pre-independence, and they need not be based on private property rights, especially as generally understood in the United States. As the Sukhomjri case illustrates, a nontraditional distribution of rights, in this case water rights, can open up superior solutions to degradation problems. Village associations and various other institutional devices can be used to allocate land-use rights and control over harvesting. Innovative institutions can provide incentives and structures that favor investments in increased future productivity. It is the lack of investment in the future, not current overharvesting, that is the true tragedy of the commons. Sukhomajri illustrates that the tragedy can be reversed, that a new kind of green revolution can emerge based on major social changes and technological improvements.

Agroforestry Design in the Mid-Hills

The second case follows an exercise conducted in 1984 at Fakot village above Dehra Dun based on the diagnosis and design (D & D) methodology of the International Council for Agroforestry Research (ICRAF) that asks a number of critical ecological and social questions in the context of a given site and particular user group (see Raintree 1986 and Messerschmidt, this volume). It was done to help assess the Central Soil and Water Conservation Research and Training Institute's (CSWCRTI) research priorities in such social and ecological settings. Because trees, grasses, and related resources are critical to villagers in this agroecological zone, the implicit hypothesis was that improved agroforestry technologies would help improve village welfare. The D & D exercise was the means to identify specific agroforestry research topics of use to the clients.

The results were negative. How trees within the village and fields were being used seemed appropriate, and few obvious opportunities existed for improving the available agroforestry technologies. The CSWCRTI research staff had been somewhat dubious about D & D, and this confirmed their fears that it was not a useful tool. However, closer inspection of the results suggested a more complex conclusion. The reason few improvements seemed useful on village fields was that the villagers used adjacent protected forest lands to meet most of their tree and fodder needs. When this was pointed out, the CSWCRTI researchers responded that work on forest lands was not in their purview. And the Forest Research Institute personnel, also at Dehra Dun, said that their client was the state forestry department, not villagers, even though villagers had legitimate rights to uses of the forest.

National implications

Again, this case has wider implications for India. The basic symptom was

that opportunities for useful research existed, but no organization had responsibility for conducting the research. Because no one saw this symptom, no one worked to resolve the institutional dilemma that had created it.

The reasons why this gap was not recognized and dealt with are complex, but they include a reluctance to admit that resource-poor farmers and villagers are valid clients for applied research. How much of this ignoring of a potential clientele is caused by class and caste differences between researchers and clients? How much of this is because the results of such research seldom are spectacular in terms of either physical productivity or added value? While both are factors, estimates of their relative importance would merely by speculation on my part.

UNDERSTANDING SOCIAL PHENOMENA

Just as agroforesters need to understand biophysical phenomena to conduct good research on agroforestry and related land-use technologies, so also do they need to understand social phenomena to improve the application of their research. Such application provides good contexts in which to learn more about basic phenomena, both biophysical and social. Given the ecological complexity of plant and (often) animal relationships in agroforestry systems, new knowledge will surely be generated about basic competitive and complementary relationships.

Economic and social relationships at the household and village levels, for example, can be both competitive and complementary. Examining gender roles of households in dynamic markets often reveals how households adjust to scarcity of forest resources and privatization of common-access property. Likewise, choice of plant and animal regimes in the farming system reveals how the farmer perceives and chooses to avoid risk. Examining how the farmer responds to the social institutions that regulate timber prices, credit, tree tenure, and other factors of production reveals how the individual, the household, the community, and society interact at any given point in time. Thus, one important reason for incorporating social sciences into agroforestry research is that they promote basic inquiry.

Four specific topics stand out in terms of their importance and their promise for yielding useful research results. These four are briefly characterized below.

Estimating Supply and Demand Relationships

Supply and demand relationships, the central focus of microeconomics, are often overlooked by applied economists who are expected to concentrate on production economics applied to agroforestry or other technologies. This is an unfortunate example of clients of technology not looking after their own interests. There are substantial lags between investment decisions about capital-intensive forms of agriculture, such as agroforestry, horticulture, and livestock, and production for market. Misunderstandings of market behavior can lead to disastrous over- or underinvestment. The consequences are aggravated if the markets are strongly influenced by public agencies, such as forest services that manage public timber, or policy makers who determine property rights, taxation, and other critical institutional factors.

Household and Village Decisions and Behavior

Agroforestry is a set of land-use technologies that is most suitable for marginal croplands farmed by resource-poor families. These families and the villages they live in make many production and consumption decisions, so understanding the farmer as client requires understanding village decision and behavior patterns in terms of objectives and constraints. In particular, the response to risk factors must be better understood. The results of this line of research are essential to the technology transfer role of the social sciences.

The Role of Institutions

Rural societies are dominated by traditions; in most older societies, the critical traditions are codified into institutional structures such as property rights, tax laws, and credit arrangements. Neoclassical economists often reject their institutional and political economy heritage, but they do so at the risk of not testing their theories against empirical reality. A modern institutional economics would do much to help our understanding of land and watershed rehabilitation using agroforestry and other systems.

Organizational Behavior

Two human activities have historically led to the emergence of large organizations: waging war and building and managing large-scale irrigation systems. Today, virtually all nations have large agricultural and forestry research systems and large agencies for managing forests, soil and water conservation, and extension. They also often have large private sector firms to harvest and process the primary products of land-use technologies. While organization theory has developed and been applied to these organizations, especially to private corporations and some public bureaucracies, little application has been made to organizations concerned with rural development and the application of land-use technologies.

SOCIAL VALUES

A few general comments may help make explicit the values most agroforestry, forestry, and agricultural scientists implicitly hold, but often confuse. Because it is concrete and measurable, improved productivity—increasing production, for example, in terms of cubic meters per hectare per year—may seem like an objective rather than a value criterion; but it is, in fact, the concrete side of such recognized values as increasing social welfare, and it can be measured in reasonably objective terms. Sustainability is another value, but measurement criteria for it are considerably less well developed. Equity, or "fairness," of distribution is another value that should guide agroforestry research and implementation. Measurable criteria of this value are even more elusive, but it is important in agricultural and rural development for two not unrelated reasons. First, it is difficult to defend productivity improvements in land-use technologies paid for by public research funds that accrue to the rural rich or middle classes, but not to the poor. Second, and more pragmatically, implementation of agroforestry and other land-use technologies on marginal crop lands, common lands, and forest lands is much more likely to be

successful if the poor benefit as well as other classes (this argument is explored in more depth by Levine et al. 1986, Miller et al. 1991, and Blair, this volume).

INTEGRATED RESEARCH

Such questions of value return us to the need for integrating social and biophysical sciences. The social sciences are fragmented into disciplines, specialties, and professional applications. Economists break themselves into macro and micro disciplines (an almost infinite variety of specialties from the very practical to the very esoteric) with as many applications as there are activities of economic concern. Anthropologists are now classical and applied, perhaps a more significant psychological chasm than specialties per se, and many have ties to other social sciences like economics and sociology and to areas of application like forestry, farming systems, and nutrition. Similar taxonomies can be described for rural sociology, political science, social psychology, and other fields relevant to the problems of rural people in the context of agroforestry systems. The common ground among these fields is that their research focuses on social phenomena, on concern with problems as defined by people. This concern, however, is far from universal, even among the more humanistic fields of inquiry.

The reasons for fragmentation are many. Theory and methodology are among the most critical. In economics, as an example, a core body of neoclassical theory has an elegant and often mathematical logic that may easily overwhelm researchers charged with testing results in specific contexts. Rural sociology, applied anthropology, and certain branches of political science have refined the empirical methodologies of questionnaire and sampling techniques to the point where they often obscure the hypotheses. For observers outside the social sciences, the breakdown into subdisciplines has generally gone too far.

The more radical notion for scientists and professionals who are specialists in technology is that in many cases social sciences provide the reason for conducting biophysical studies. The reason is simple, and I have already stated it: most contexts in which agroforestry systems are useful are created by changes in social factors, not technical factors. A reasonable understanding of these situations helps define the most useful technical questions to study, including the criteria for new agroforestry technologies and improvements in existing systems.

The chain of causal forces from social factors through biophysical expressions of symptoms to social effects is not an argument for doing less technological research and more social science research. It rather argues for better science, for science that integrates what is often split into biological or "hard" science and social or "soft" science. The essence of science is objectivity in the development and testing of hypotheses. If phenomena such as the degradation of Asia's tropical forests, range resources, and upland agricultural lands and watersheds are caused by the interaction of social and biophysical mechanisms, useful scientific results will result only from an integration of disciplines and professional perspectives.

SUMMARY

The role of social sciences in agroforestry is determined by the very character of

the problems to be solved by land-use technologies. Often, our technical problems are expressed in biophysical symptoms, but the primary causes are social, not biophysical. Consequently, solutions must be social in character as well as technically sound. In the process of designing solutions, social science can direct technical research toward the client's problems with the highest payoffs. Also, social science can help clarify the values that define payoff in productivity, sustainability, and equity terms from a broad social as well as client-defined perspective.

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PART THREE

Approaches and Applications

CHAPTER 5

Toward a Social Ecology for Agroforestry in Asia

J. Kathy Parker
William R. Burch, Jr.

HIGHLIGHTS

- Numerous agroforestry projects are unsuccessful because they are "socially underdesigned." Agroforesters, therefore, can benefit greatly from social ecological concepts, theories, and information that address a range of issues which integrate and complement those of the biological and physical sciences.
- Social ecology helps explain the nature and magnitude of human use of natural resources and ways to influence this use. It also helps predict the outcomes of certain actions that we undertake to develop and conserve those resources.
- Social ecology provides more information about who may participate; where, and when, and how they may participate; how they may be affected by participation; how others may react to discourage or encourage them; and how the benefits may be distributed among those who participate in the agroforestry projects that we help develop and fund.
- A wide variety of tools and methods (including rapid rural appraisal, participatory action research, censuses and sample surveys, and case studies) exists to obtain information about social and agroforest ecosystems, value orientations of local people, social structures of local groups or communities, and mechanisms by which resources are distributed. This information can be used for description and diagnosis, for planning, and for policy development.

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WORKING WITH PARADOX: AGROFORESTRY, SOCIOLOGY, AND THE ART OF DEVELOPMENT

> The largely frustrating history of attempts to do the "right" thing has left some valuable lessons in its wake, but a great deal remains to be learned. Many meticulously planned projects have turned out to be totally inappropriate, and even counterproductive, when measured against their stated goals. (Thompson and Warburton 1985:204)

Many paradoxes confront development practitioners: (1) Wrong things are done for right reasons because "grand design" solutions are constructed without enough understanding of a given problem or its causes (Thompson and Warburton 1985). (2) Biologically or technically correct, but socially or economically incorrect, solutions do not solve the problems of tree production because they focus on only one aspect of complex household production systems. (3) Promotion of successful models of local social institutions from one culture to mediate the land-people relationship in another culture may actually accelerate the destruction of that relationship and the environment that supports it.

Paradox is the reality of all development activities because we seek to change systems we only partially understand. On the one hand, our intentions are benign, on the other, the consequences can be disastrous. Often the emphasis upon the rationality of science as the sole guide to development decisions blinds us to the larger social purposes and realities in the daily lives of people. In order to be effective within paradox, we must begin by asking different questions in different ways to elicit different answers.

If we accept the traditional definition of forestry as an applied science dealing only with biophysical phenomena, we could limit out concerns to appropriate species for specific sites, preparation practices for different soil types, techniques and timing for planting, and technologies for harvesting. However, if we acknowledge that forestry, like other natural resource practices, is a science and an art that deals with human activity involving social goals and organizational structure and values, then we may be interested in tree species that meet people's priorities for food, fodder, and fuel; in patterns of social organization to establish, maintain, protect, transform, and distribute the goods and services provided by forests and trees; in seasonal conflicts that affect people's participation in tree-planting activities; in skills needed for the successful adaptation or adoption of forest technologies; and in access to and control of certain trees at harvest time depending on species, or even height. In addition, we recognize that "the way a question is asked limits and disposes the ways in which any answer to it—right or wrong—may be given" (Langer 1951:15).

As agroforesters working at the household and village level, we must bring out the best of the explorer and the artist in ourselves. As scientists, we are explorers who seek different ways of defining a problem or set of problems. We must determine whose problem it is. We must be data collectors of the how, why, when, what, and where of agroforestry systems. We must use different levels of information and a range of tools to look at different kinds and levels of agroforestry-related problems. And we must find better ways to obtain insight into the ways in which people view the world and behave collectively. In this effort, we need to integrate the disparate pieces of data and information that the

explorer has brought to us so that we can transform, portray, and translate them into new knowledge and ideas. This is part of the art of social ecology. We must provide alternative solutions, not just a single answer. We must look at the broader implications for decision making, project design, and implementation of the complex and interrelated factors with which we are dealing.

The concepts and theories of social ecology serve agroforestry planners and practitioners as mental maps. They provide outlines of what we already know; they explain the nature and magnitude of the issues that we are trying to address; they indicate where our knowledge begins and ends; and they help us predict the outcome of the actions that we undertake. Better concepts and theories are major steps toward the solution of problems because they directly address causes, not merely the symptoms, of problems.

Information and facts are the pieces of the puzzle that reality presents to us. Many right answers exist, depending upon what we are looking for and whom we are asking (men or women, high castes or scheduled castes). Much good information is available around us, which can be gleaned with a range of techniques such as social mapping or oral histories of local people. However, such techniques can take us only so far. We need to think about the larger implications of what we are doing and think more clearly about those small events that might have a large impact on a project activity or on the range of alternatives we might suggest to substitute for traditional practices.

CONCEPTUAL FRAMEWORK FOR A SOCIAL ECOLOGY OF AGROFORESTRY

In order to understand the nature of the interaction between people and trees in agroforestry, it is important to understand certain concepts and theories. Of course, these concepts and theories have not been formalized or accepted by everyone in the field of agroforestry; nor has their universality been tested over great periods of time and in varied places. They are drawn from other branches of sociology, some of which are relatively new, all of which are constantly evolving: rural sociology, the sociology of natural resources, and social anthropology. Some of the most common and relevant concepts in sociology are characterized below.

Society and social goals.—A society is a group of people within specified territorial bounds who interact in certain patterned ways (for example, interdependence, association) so that the group endures (Tumin 1973). Agrarian societies, fishing societies, and industrial societies exist all across Asia, each having different technologies, different values and norms, different organizational structures, and different means of meeting its general goals. The primary goals of most societies are to meet human needs and expectations, specifically survival, growth, and development (Lenski and Lenski 1974). Humans have evolved many means for meeting them.

Social system.—A system consists of a reasonably coordinated set of relationships among its units (individuals, households, communities). These relationships are coordinated both with one another and with the system itself (Lenski and Lenski 1974). The importance of understanding existing social systems is that, as in other ecological systems, changes in one part of a coordinated system may affect other parts of the system. Additionally, certain

regularities of a social system, especially social order, social cycles, and resource flows, exist that help us understand the structure and function of the system.

Social order.—Social order, the way in which groups and social relationships within a system are sustained, depends on hierarchy, territory, and norms. *Hierarchical systems* are patterns of unequal access such as status, class, power influence, and other mechanisms of stratification that determine who gets what within the system. The stability and legitimacy of such distribution minimizes internal conflict. *Territories* are the spatial arrangements (agricultural lands, urban areas, parks, parking lots) for the distribution or assignment of human activities. And *norms* are rules or laws that "establish the limits of appropriate and inappropriate behavior for particular social roles" (Burch and DeLuca 1984:29). They routinize and give order to complex social relations such as a particular group's customary expectation that women do the cooking and men manage the cattle. Another group could have an equally likely expectation that reverses the roles of men and women—men do the cooking and women manage the cattle. There is nothing inherent in genes or gender, rather reality and necessity shape the social norm.

Social cycles.—The cyclic patterns of work/nonwork, myth, life, and exchange affect the exploitation of resources to meet demands being placed on them (Burch and DeLuca 1984). *Work/nonwork cycles* for agricultural communities are diurnal or seasonal (Conway 1986). Understanding these cycles helps us identify when there may be greater competition for labor or when certain activities may not occur because of holidays or religious practices.

Myth cycles have been developed by human societies to help explain events or activities that are otherwise inexplicable (Burch and DeLuca 1984). Myths stabilize relationships because they explain why things are as they are (for example, why adults perfom certain roles while children perform others).

Life cycles, biologically set from birth, progress from childhood, puberty, adolescence, into young adulthood, middle age, old age, to death. Social values, norms, and human expectations mediate the way we interpret and deal with these periods of our lives. In an industrial society, children go to school and are economically unproductive. In an agrarian society, children may go to school, but they are involved in a variety of tasks that contribute to the productivity of the household.

Exchange cycles reflect the tendency to obtain desired items in exchange for other, perhaps less desired, items. The major kinds of exchange are "interregional transfers (such as natural resources for capital); market transfers (such as corporate mergers); political transfers (such as party turnovers); and interpersonal transfers (such as household formation through marriage or other alliances)" (Burch and DeLuca 1984:46).

Resource flows.—In addition to social order and social cycles, one other element of a human resource system must be considered, and that is resource flows (Duncan 1964). The main kinds of resources that must be considered are energy, materials, nutrients, and information. *Energy* is an essential part of any agroforestry system and must be measured not just in terms of its availability, but in terms of who has access to and control over certain kinds of energy for productive uses. *Materials* include fiber, nonfuel minerals, and construction materials (Burch and DeLuca 1984). Human *nutrients* are closely linked to food

production and distribution systems for calories. People who produce their own food are most vulnerable to local climatic conditions, but those who depend on food from other regions are vulnerable to what happens in those regions and on the system of transportation (Burch and DeLuca 1984). *Information* is the fourth resource. For the human species, senses and symbols are the essence of information. The means by which people give and receive information (such as by word of mouth), the source of information (whether directly from an extension agent or from other farmers), and the kind and shape of information all affect the flow and quality of the information in different situations.

Social and Biological Ecologies

Our definition of social ecology thus uses both the biological and social science tradition: *Social ecology* is the study of the relations between human communities (groups or populations) and their respective environments, especially their physical environments.

For the most part, sociological human ecology has emphasized synecology (relations between communities and their environments) rather than autecology (relations between individual organisms and their environment), which has been considered by psychologists such as Irwin Altman and Ken Craik. In this discussion, we give most attention to sociological or synecology studies. Rambo and Sajise's (1984) definition of human ecology seems closest to our view of social ecology:

1) Human ecology employs a system viewpoint on both human society and nature.
2) Human ecology describes both the internal behavior of social systems and ecosystems and their interactions with each other in terms of transfers of energy, materials, and information.
3) Human ecology is concerned with understanding the organization of systems into networks and hierarchies.
4) Human ecology includes the dynamics of system change.

Conceptually, social ecology encompasses the nature of a population—its size, distribution, and demographic configuration—and the way it combines with biophysical resource elements like soil, water, plants, and animals. These are the essential inputs into the system. The interaction of population characteristics and ecological characteristics influences the human social relationships (social bonds) that result. Social bonding mechanisms are structured by the values of household, kinship, friendship, or other intimate human associations to create and sustain loyalty toward that association. Such mechanisms also encourage performance of age, gender, and status roles—the basic building blocks of larger, more general associations such as the institutions of a community. Social solidarity is structured by values that make individuals feel shame, guilt, or pride in their role performance. Since only a small proportion of human behavior is programmed genetically, there is the constant need to inculcate or coerce conformity. At the community level, solidarity is sustained by accepted and ritualized collective explanations of the unexplainable (myth). Thus, myth both internally binds and externally differentiates social entities one from another. Social integration is structured by shared values regarding necessary roles and social roles (and clusters of roles

or institutions). That is, our streets are cleaned and policed and our crops are planted, harvested, marketed, purchased, cooked, and consumed in certain regular ways. Trees are chosen and planted, guarded, and harvested by specific persons of certain age, gender, and caste. In the metropolitan world, children are schooled and airplanes guided to landing through specialization and a functional division of labor that operates with such effectiveness that we are only aware of such integration during the rare times when there are strikes, accidents, or similar crises. Enduring societies have this base of expected and routine fulfillment of function. Disintegrating societies exhibit none of this assumed predictability.

Figure 5.1 provides an idealized map of the variables we are considering. As in all ecological studies, we are operating at the level of whole systems, rather than reducing our analysis to individual particulars. Consequently, like biological ecology, social ecology is a historic and synthetic discipline that deals with collectivities rather than individual organisms or their component parts. That is, though we are necessarily dependent upon these component organizations, whether they be cells, atoms, genes, or individuals, our understanding of them is insufficient to permit us to understand the behavior of the whole.

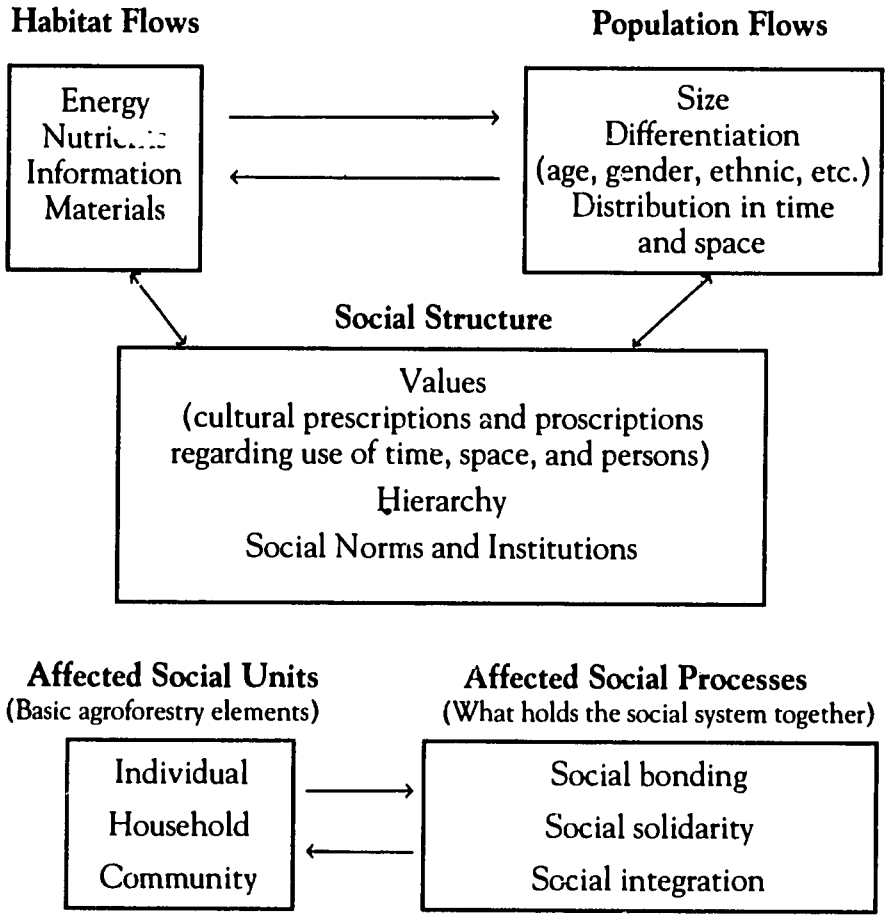

Figure 5.1: A heuristic model of social ecological system processes and structures.
Source: Field and Burch 1988.

Like biological ecology, the basic questions of social ecology revolve around how unity is created out of diversity and what the relations are between structures of order and processes of change. Biological and social ecologists also share two assumption: (1) the whole is greater than the sum of its parts, and (2) in the examination of relationships, we cannot understand the behavior of A and B unless we understand their mutual relationship to C. These basic questions and assumptions focus our attention on the forms of hierarchy that regulate patterns of dominance between species and individuals over access to particular niches because hierarchy is universal in all ecological systems.

Furthermore, people, like all social species, share certain patterns of regularity and predictability, of which the following are examples. They are not mutually exclusive.

1) The presence of conspecifics (beings of the same species) is essential for survival.

2) The exploitation of environment is mediated through organizational forms (Fortmann 1986, Leuschner and Khaleque 1987).

3) These forms tend toward hierarchy—individual dominance patterns or dominance by one social strata over another (Molnar 1986, Noronha 1982).

4) These forms generate a high degree of predictability regarding the behavior of individual members (Christanty and Iskandar 1985, Van der Poel and Van Dijk 1987).

5) These organizational forms are membranes that serve as intermediate environments between individual organisms and the external environment they exploit and adapt to (Dembner 1986, West 1984).

6) Social species vary on a continuum. On one side, primary transfer of information is predominantly genetic, on the other, it is predominantly symbolic (Thompson 1985, Daosukho 1988).

7) In developing survival strategies to cope with the dynamics of ecological and social change, all social species create nongenetic means of information exchange. In human society, culture is the coin of that exchange.

Space and Time Dimensions

Social ecology documents how the regularities in human use of space and time map particular social relations, constraints, and opportunities as clearly as they map biophysical patterns. Intimate and distant social relations, high and low social classes, favored and despised ethnic, occupational, and caste groupings all have assigned, clearly regulated measures as to when and where those relations should not occur. Consequently, time and space are not simply physical standards of measurement, they are filtered through a prescribed and predictable system of cultural measurement as well. (For further details, see Field and Burch 1988.)

Social ecology asks how human space-time dimensions overlie or conflict with the physical dimensions of ecosystems. Further, as in nonhuman ecosystems, there is a third driving force in social ecology—the energy that operates by certain laws of physics and that affects human time-space processes. In human systems, the nature, types, and amounts of energy greatly affect patterns and processes of time-space factors as they sustain a given normative structure. For example, if we substitute human energy or renewable energy (such as wind) for fossil energy, this change is reflected in the human organization.

Part of the attraction of the city is that per capita consumption of fossil energy is higher than in a rural village, and this is part of the reason it has a different organizational form. Human social systems have developed an abstraction by which value is assigned to energy, time, space, and their products—money. Consequently, each person, household, or community has four regularized measures of structure and functioning—space, time, energy, and material (money)—which to a certain degree can be substituted for each other.

Table 5.1 summarizes suggested units of analysis of the time-space dimension and how the four resource budgets are measured and included within a social ecological paradigm. It is important to note that the examples provided here are central to the literature, not specific to any particular scholar.

USING SOCIAL ECOLOGY CONCEPTS AND MEASURES IN AGROFORESTRY APPLICATIONS

In order to make use of the concepts discussed above, it is important to identify what is most important for us to know about the human side of agroforestry, but some caveats about information are necessary. Some data simply do not exist, others are not credible. Some cannot be extrapolated easily from one situation to another or from one level to another, and still others are subject to interpretation in a variety of ways, depending on any number of personal biases (Parker 1988).

With that in mind, we will attempt to provide some guidelines on the most important variables in the social ecology of agroforestry as it is characterized in an assessment cycle (figure 5.2). Each of the six steps in this cycle is important; in this chapter, however, we focus on information needs of the first four: society-forest ecosystem, value orientation, social structure, and allocation mechanisms (table 5.2). Aspects of the last two will be dealt with in more detail in other chapters of this book (see Blair, Mercer, this volume).

Agroforestry Ecosystem

We need to understand the structure, functions, and processes of trees within farming systems in order to understand the biophysical resources that we have at hand and their constraints and potentials to contribute to human welfare. To understand this agroforest ecosystem, we need to know what the important elements of an ecosystem are, its climate, topography, soils, animals, and vegetation and how these elements function and affect each other. We also need to understand the complex processes of energy flows, biomass production, nutrient cycling, and genetic codes.

Social System

The structure, functions, and processes of the social system are equally important if we are to understand the existing human resources and the constraints to and potentials of trees and tree-related products. We thus need to identify the important elements of the social system. Sociodemographic characteristics (popul tion size, numbers of households and communities, numbers of men and women) and trends (population growth rates, directions

Table 5.1. Illustrative measures of key social budgets for agroforestry monitoring and evaluation (examples only)

Individual	Household	Community
Time—Stage of Life Cycle		
Daily/weekly time allocation to various tasks, e.g., work, play, subsistence	Stage of family life cycle	Stage of social evolution
Frequency, duration, intensity of specific interactions	Daily/weekly/seasonal regularities in time allocation by person to functional tasks	Celebration and ritual cycles
Space—Personal Location		
Of work, play, rest, etc., square meters per person and activity	Space allocation within residence, e.g., parents—children, between status and class groups	Formal functional spaces, e.g., village square relative to space for commerce
Property rights in certain personal space/objects	Distribution of land ownership amounts, type, etc.	Informal functional spaces, e.g., village well
Energy—Kilocaloric		
Intake-expenditure by certain tasks	Fuel sources by BTU	Distribution by fuel sources
	Per capita BTU consumption	Total annual BTU by function
Material—Personal Income		
Percent spent on various functions	Total household income	Total village income (taxes), in-kind income, government subsidy, etc.
Nonmonetary or in-kind income and its expenditure	Nonmonetary resources, e.g., garden food	
Rights and obligations of access to material and spiritual resources of collectivity	Allocation to basic functions	Total village expenditures by specific function

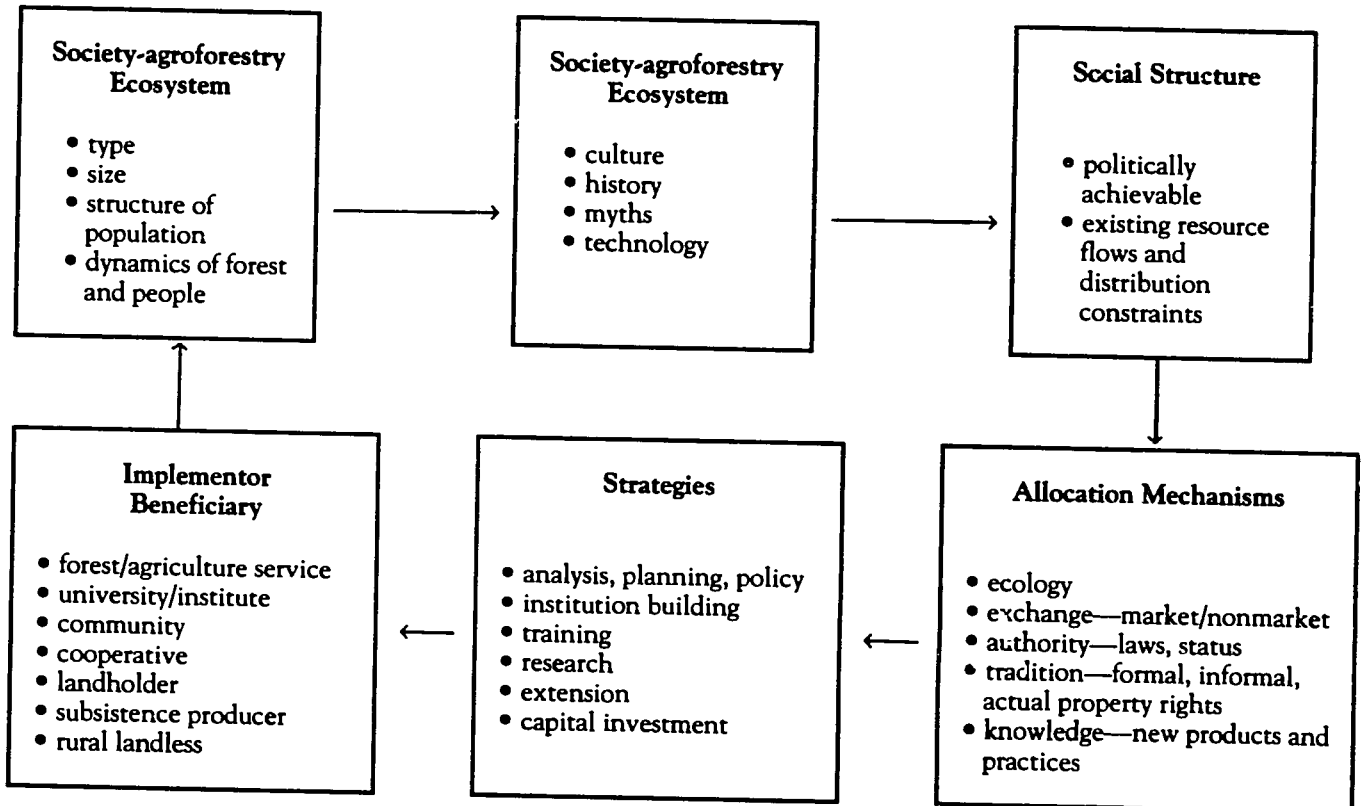

Figure 5.2. Social assessment cycle in forestry for rural development.

Table 5.2. Information needs for the sociology of agroforestry

Category of Information	What It Can Tell Us
1. Society-agroforestry ecosystem Type of system(s) Size of populations Dynamics	1. Inventory of what exists and its potential Human Natural
2. Value orientation Culture History Myths Technology	2. What is valued? What is demanded? What is considered to be a resource?
3. Social structure What is politically achievable Existing resource distribution constraints	3. Who is likely to gain or lose, be encouraged or discouraged?
4. Allocation mechanisms Ecology Exchange Authority Tradition Knowledge	4. How will resources be distributed?

and rates of rural-urban migration), economic activities, cultural practices, existing physical and social infrastructure (roads, schools, hospitals), all provide critical information.

Sociodemographic characteristics and trends are important sources of information for agroforestry project designers. Information on population by age, sex, ethnic distribution, the social mosaic of a caste system, population growth rates, and the like help us understand existing and future demands, both direct and indirect, for wood products (food, fuel, fiber) and other goods and services that can be obtained from agroforestry systems. This information also helps identify what labor is available for planting and managing trees and existing units of production on household or community lands.

An example may be taken from rural Thai society where village woodlots might be promoted in 11 structural social groupings: "extended family, bilateral kindred, neighbors and neighborhoods, cooperative labor exchange groups, junior-senior relationship, entourage, faction, class divisions, natural village settlement, administrative apparatus of the state, and the Wat" (Srisawas 1984:127). It is necessary to know that members of extended families might use trees as windbreaks or for fuel; that neighborhoods are likely to adopt tree planting activities earlier than whole communities; and that *Wats* (Buddhist monasteries) are important centers of Thai community life through which effective agroforestry and other rural development activities may be actuated. The message of this kind of information is that "if sustained growth or viability of the local system is needed, then the village woodlot should be integrated into elements of the rural social structure of Thai society" (Srisawas 1984:133).

Population growth rate data help predict the impact of population pressures on the resource base. This information, in turn, permits us to make predictions about intensification of agriculture, opening new lands for agriculture, and

demands for construction material, fencing, and income generation that drive the demand for land and wood production. Data on other sociodemographic trends, such as migration, permit prediction of the labor supply potential during certain periods of the year for a range of agroforestry activities.

Data on the political economy of an area identify the existing skills of local people; competition for on-, off-, and nonfarm uses for labor; incentive structures for individuals, households, clans, and other social groups; and sources of direct or indirect income (for example, handicrafts, bakeries) from commercial wood production practices. The inventory of these economic activities is not the complete picture of the rural economic system; however, it provides a framework for understanding potential constraints to and potential opportunities for development of new tree-related activities within agroforestry systems. If tree planting has never been an income-generating activity of people in a specific area, or if a forest is nearby from which they freely obtain the range of wood products they need, local farmers may have little interest in investing their labor, land, and other resources in a potentially risky new enterprise.

An inventory of cultural practices identifies the ways in which household production units exploit their environment to reduce risk and to ensure stability of production. These practices typically are diversified and resourceful. In other cases, however, they are not particularly resource conserving. In the Buhi watershed of the Philippines, neither agroforestry nor other techniques to conserve soil and water are likely to be adopted because many of the tenant farmers have little incentive to plant anything more permanent than annual crops. The fact that these crops are also less apt to be adversely affected by the typhoons that periodically hit the region (Alcantara et al. 1986) is an additional disincentive to tree planting. Such knowledge identifies why people plant particular species of trees; why and when people adopt new technologies such as alley farming; and how they manage trees for one objective as compared to another, or how they manage them for multiple objectives.

Descriptive information identifies the nature and location of the resource base, both nonhuman and human. These data also identify the opportunities for and constraints on agroforestry development. We can identify how many people are going to be making demands on their forests; what people actually do to exploit a forest or tree resource; where they do it; when they do it and with whom; where they are most likely to have the greatest impact (for example, near human settlements, along roads); what endemic species they have to choose from; or what endemic or exotic species they want that will actually grow given soil and site conditions. These, however, are only part of the equation. What we must also understand is what people value.

Value Orientation

The culture, technology, history, myths, and superstitions of people reflect their value orientation. For example, what one individual or group defines as a resource may not be a resource to others who have no technology to exploit it. The Mesabi Iron Range of the United States illustrates this

concept. Indians first used the forest lands to hunt, farmers later converted these same lands to agriculture, and most recently, miners have used sophisticated technologies to extract iron from the land. The iron always existed, but it was only when it could be exploited that the iron was defined as a resource. Technology was the major cultural tool that made this redefinition from *element* to *resource* possible (Burch 1971). New technologies in forestry may also redefine the value of trees from household to commercial use.

The value orientation of a society is illustrated by a society's sacred groves. These groves are protected areas of land, usually ranging from several hundred square meters to fifty hectares in size, dedicated to a specific deity. Although they are typically unexploited, some sacred groves, such as the *Orans* in the Arvalli hills of western India, are open to fuelwood collection as long as the wood is not removed with metal tools (Gadgil 1987). Such nuances in value orientation are common.

Food preparation practices are another highly important aspect of value orientation:

> Food preparation is one of the most culture-bound of human activities. The fuel used for cooking is not necessarily whatever fuel is closest or cheapest. Interwoven with fuel use are more complex attitudes and beliefs regarding taste, dietary prohibitions, traditional cooking methods, and the sacred and profane. There is also a definite conviction that different types of fuel affect the taste of food; in India, for example, food cooked with wood is thought to taste much better than food cooked with charcoal. (Noronha and Spears 1985:238-239)

Though local value orientations must be understood and taken into account, the government also has value orientations that affect the way agroforestry programs are introduced and managed by forestry departments and agricultural ministries. In Southeast Asia, for example, governments have always placed emphasis on the production of commercial timber. This activity has made the nations of the region the producers of approximately 75% of the world's hardwoods. Forestry institutions in these countries typically have been oriented to production and custodial protection. This regulatory perspective characteristically makes it difficult for institutions and bureaucrats to effectively support new programs in social forestry, community forestry, and agroforestry because they usually lack the range of skills needed, they rarely have incentives to encourage and enable local participation, and they are normally perceived by local farmers as being police officers rather than rural developers (Parker 1984).

Social Structure

One of the key aspects of integrating biophysical and socioeconomic factors to improve agroforestry project design and implementation is understanding how society is ordered and what the regular cycles of life are as humans work, rest, maintain themselves, attend festivals, and deal with major life events such as marriage or completion of a level of training.

Most simply described, society is ordered by hierarchical, normative, and spatial arrangements. Hierarchy establishes who gets what in a system, norms (rules of conduct) define role and ensure some degree of conformity, space (territory) minimizes human conflict by distributing activities (Burch and DeLuca 1984).

Hierarchical forms

In agroforestry programs and projects, these forms can be investigated by looking at governmental structures, principal organizations, roles of outside groups, reputational leaders (like priests and elders), elected leaders, and household decision-making arrangements. Centralized decision making also may be used by some societies in an effort to control resource management by many disparate and conflicting groups. For example, *The New York Times* reported on 27 December 1982 that tribal inhabitants of the Singhbhum district in India were in conflict with government foresters over replacing sal trees (*Shorea robusta*) with teak. The sal are used for cattle fodder, construction material, and household tools. Teak is used purely for commercial timber. After a year of petitioning the government, the tribal people began destroying not only teak saplings in government nurseries, but also forestry buildings to press their demands. A confrontation in 1980 resulted in the deaths of 16 people, including three policemen.

Such an example raises a question about the patterns and processes of social order in any society where our agroforestry activities are conducted. "Does it appear that the current structure and leadership would support the organization of groups or individuals to participate and if a project used this channel, would the benefits be likely to reach the poor who are identified as desired beneficiaries?" (Hoskins 1979:7). (For a related discussion, see Blair, this volume.) Getting a positive answer to this is particularly difficult when the beneficiaries are located on the most marginal and least productive lands. Indeed, improvement of these lands may, in fact, make the beneficiaries more vulnerable to the well-to-do and powerful.

Norms

Norms are guidelines or standards by which we organize our action in specific social contexts (Burch and DeLuca 1984). They reflect an effort to ensure integration of groups within a society by coordinating and solidifying the interaction among individuals whose interests are becoming increasingly more diversified. Some of the key indicators of norms are local laws permitting or prohibiting cutting of fuelwood, zoning regulations for forest management to regulate conflicting uses (such as harvesting from regeneration), and crime rates (which may be estimated by substitute, or indirect, indicators). The rate of illegal logging in Thailand, for example, is reflected in the price of elephants in rural markets because elephants are only used for illegal logging (Honadle 1982). Adoption of agroforestry may also be affected by norms or laws, particularly those regulating land uses. In eastern Uttar Pradesh, farmers were not willing to plant trees on their own plots when new land consolidation laws were proposed (Noronha and Spears 1985). And agroforestry may itself affect traditional rights since trees . . .

> take much longer than food crops to mature. Thus, the person who plants trees must have both the right of entry and the right to the produce for a much longer time. These rights could result in a change in traditional systems. . . . Under traditional systems in Malaysia, the time frames of land use differ with the type of tree planted—the time allowed being related to the time the trees take to mature. (Noronha and Spears 1985:243-244)

Space

How space (the third aspect of social order mentioned above) and its derivatives are used affects forestry and agroforestry in many ways. The location of forest roads, areas of intense exploitation, patterns of land use, and organization of natural and man-made features all play a part. Space, therefore, can be "conceived of as an instrumental resource analogous to others, such as wealth, information, status or brute strength, which clearly can be used by man in attempts to gain social goals" (Williams 1978:65). On the very local level, the location of home gardens near the house or compound suggests the importance of tree planting. In Bangladesh, the direct benefits to labor by women come from the products near the household rather than outside the household compound. Tree species that do not fulfill personal incentives or meet daily household needs will not be acceptable to the planters and maintainers of the seedlings and thus will not be planted if they are proposed for home gardens. These spatial arrangements, in effect, reflect priorities and household values.

Spatial considerations, such as the siting of nurseries, also affect community-level activities.

> If some segments of the target population cannot reach the nurseries—because of the topography of the country or lack of time—the nursery will fail to fulfill its purpose. In Nepal, for instance, hill dwellers were not served by nurseries on the plains, and this siting is perceived locally as designed to direct project benefits to the wealthier, politically more powerful plains dwellers. (Noronha and Spears 1985: 252)

An inventory of existing infrastructure, both physical and institutional, can also help us understand the constraints on and potentials for current or future forestry activities. The amount of existing physical infrastructure (such as roads and nurseries) helps us understand the potential environmental, social, and economic costs for development and maintenance of these structures. If a road exists, it must be maintained. This requires labor costs that must be donated or paid for. It takes organization of labor to ensure that tasks such as making repairs are undertaken and accomplished. It requires additional materials and tools to ensure that the task can be completed. The spatial implications of certain activities, therefore, play an important role in plans for agroforestry.

Space should also be thought of in terms of the internal and external factors, and their linkages, that affect agroforestry. Observers in India suggest that looking only at internal factors of what is happening in the backward hill areas of Uttar Pradesh, without focusing on the socio-political imbalances of society that cause environmental destruction, leads

to the myopic view that local people are the only ones to blame for deforestation. They suggest that, in reality, external forces may be the fundamental causes, not the local people, who are most often the victims (Sanwal 1986, Griffin 1988). More research is needed that focuses on linkages over time, space, and the multiple and complex parts of a political economy.

Social Cycles

As already noted, there are also variable measures of social cycles: myth cycles have been mentioned in the section on concepts and theories; exchange cycles will be addressed in the following section on allocation mechanisms; here we look at work/nonwork and life cycles. These important and regularized patterns in all communities may be intimately linked with tree production activities.

The location of any wood resource will affect the amount of time used in collecting it. In the highlands of northern Luzon, men from one village daily travel several hours each way during the dry season to collect fuel. In a neighboring area where wood is more plentiful, people spend less than a half hour daily collecting firewood (Wood et al. 1980). Agroforestry might have a very positive impact on those who typically have to collect wood at greater and greater distances as demands for firewood and charcoal increase and supplies decrease.

However, substituting fuel from agroforestry for fuel from unmanaged forests may be resisted in some societies. In many countries, for instance, women collect fuelwood. If they consider fuelwood collection as a social time with family members or neighbors (Wood et al. 1980, Waring 1988), they may not be particularly interested in agroforestry. Understanding the time budgets of women also helps agroforestry planners identify opportunities for women to participate in planting and related activities. If women are overworked and have little hope of participating in or receiving the benefits of agroforestry activities, they are unlikely to participate. Agroforestry, like any other agricultural practice, is a work-related activity, yet it can also make contributions to nonwork activities such as eating an evening meal and provide opportunities to socialize, tell stories, gossip, and make the time pass. These are important aspects to consider in the design of agroforestry programs.

Another aspect of work/nonwork cycles is the indirect work of secluded women. While not able to work directly in agroforestry, women in some cultures who can never leave their compounds do teach their children about the kinds of berries, leaves, and other tree products that they should select since their mothers cannot go with them. In fact, "secluded wives are often in charge of sorting the seed to store from the grain and nuts to be consumed thereby further affecting future crops and land use patterns" (Hoskins 1983:2). Their indirect activities therefore must be understood and incorporated into project designs.

Life cycles are also important to consider. For example, researchers in Thailand recommend that designers of woodlot programs in project areas should work with the young teachers and monks who are more likely to cooperate and participate in the programs (Srisawas 1984). Another

example is the impact age has on wood collection activities of young girls in parts of India: when they are big enough to carry loads of wood on their heads, they no longer are able to go to school (Hoskins 1983). The implications of this for the future are that illiteracy will limit female participation in extension programs that might otherwise improve the quality of their lives and enable them to manage resources better (Parker 1989).

Allocation Mechanisms

To a great degree, the success of a project and the eventual distribution of its benefits will be determined by various mechanisms that allocate resources. Most fundamental are natural mechanisms that are features of the environment—its physical and ecological structure and dynamic that make certain biological resources available, at certain times of the year, in certain places. Thus, the timing and amount of rain, the fruiting of trees, seasonal or continuous leaf drop, all affect (that is, allocate) the kinds of resources that are available to people.

More commonly, however, we respond to mechanisms of social allocation, such as exchange, authority, tradition, and knowledge. Exchange, as an allocation mechanism, may include barter or market systems where tree products are demanded and supplied in kind for other services or for money. In Indonesia and Thailand, women raise mulberry trees from which they gather leaves to feed to silkworms, which is a major source of income since women also participate in making thread, dyeing the silk, and weaving it into cloth (Hourihan 1987).

Authority and tradition can also allocate resources. Authority does this through laws regulating resource use or through unofficial power that by force or influence, rather than by law, permits one to take what one wants. Tradition does this through unwritten, but long-understood and agreed to, arrangements such as property or tree tenure rights. A project for community (*shamlat*) forestry in Pakistan illustrates the distinctions. Legally, the *shamlat* lands belong to the community, but in fact, they are used as private land by more powerful farmers.

> It appears that the tracts of *shamlat* being offered for planting—and assumed by the project to generate benefits for village communities—have surreptitiously changed their tenurial status, and in fact are managed on a strictly private basis. Their *de facto* owners hope to get their "Shamlat" lands planted at full government expense, and without making any repayment commitments. (Cernea 1981:19)

The project was designed as a community forestry activity, but activities were (de facto) targeted at individual farmers who would plant on communal land as if it were their own land and who would eventually accrue the benefits, rather than the community as a whole (Cernea 1981).

Knowledge (including technology) also allocates resources because it provides holders of that knowledge with access to information about where resource may be located and how technologies may be developed to transform the resources into new products. The lack of such knowledge precludes access to other resources. For instance, where women do not have

access to the knowledge of extension programs, they are not able to access new techniques and technologies for food, fodder, and fiber production through agroforestry systems (Parker 1984).

All of these details about allocation mechanisms must be ascertained, as Ghosh of the Indian Forest Research Institute confirmed.

> If the land is to be used efficiently on a permanent basis, the distribution of uses must correspond with: (1) its inherent capabilities, as determined through the appraisal of soil, topography and climate; (2) its possibilities of improvement through restoration, conservation, irrigation, etc. (3) other factors influencing the land-use pattern, such as population pressure on land resources, population relocation, land tenure, watershed protection, road infrastructure, essential demands, distance to market, etc. (1982:27)

Methods to Obtain Information and Facts

The choice of methods to obtain information depends upon the end use of the information (whether diagnostic for action, comparative for planning, or evaluative for policy making) and the level of application of the information obtained (national, state, regional, community, household). Table 5.3 provides a set of representative methods arrayed by end use and level of application.

The appropriate kind of information must be focused on the appropriate level of social organization, and the various kinds and levels of social organization have different needs for information and different capabilities to generate certain kinds of information.

> At a planning level, comparative analysis is important to extract the apparent causes of success and failure and to translate them into guidelines for both planning and diagnosis. At a policy level, an understanding of specific cause-effect relations is required, i.e., an access to experimental or quasi-experimental results that establish a basis for prediction and for selection of variables to be assessed in cooperative studies at lower levels. We need different kinds of research at different levels to ensure effective use of research information. (Burch 1984:9)

Table 5.4 indicates different information needs at different levels of agroforestry activity: policy, planning, and action. In the real world, such distinctions may not be clear or may be fused in the person of a district forest officer. However, it is crucial to realize that we require different kinds of data, have different means of testing data, and use different approaches to determine the reliability and validity of the data as we carry out these distinctly different functions.

While it is not possible to provide details on the full range of social science methods that can obtain useful information for the design and implementation of agroforestry projects, four major methods may be briefly characterized: rapid rural appraisal, participatory action research, censuses and sample surverys, and case studies. It is essential to note that each of these methods can develop measures of budgets (time, space, energy, money) for specific units of analysis (individuals, households, and

Table 5.3. Representative methods for information collection by kind of information and level of application

Methods	Kind of Information			Level of Application			
	Diagnostic	Comparative	Evaluative	Nation—State	Regional	Community	Household
Airphoto analysis	x		x	x	x	x	x
Listening surveys	x		x			x	
Participatory action research	x	x				x	
Rapid rural reconnaissance	x		x			x	
Key informant interview	x		x	x	x	x	
Proxy indicator studies	x		x	x	x	x	x
Review of literature and documentation	x			x	x	x	
Group interview	x		x			x	
Sondeo	x				x	x	
Gaun sallah	x	x		x			
Sample surverys	x		x	x	x	x	x
Fly overs	x		x		x	x	
Financial/economic measures		x	x	x	x	x	x
Long-term ongoing monitoring			x		x	x	
Spatial analysis		x		x	x		
Adoption/diffusion studies		x	x	x	x	x	x
Policy research studies		x	x	x	x		
Organization behavioral studies	x	x	x	x	x	x	
Ongoing locally based monitoring			x			x	

Source: Adapted from Burch 1984.

Table 5.4. Information levels, kinds of research, socioeconomic research issues and possible methods

Information Level	Kind of Research	Socioeconomic Research Issues	Socioeconomic Research Methods
Action level	Descriptive/ diagnostic	Who, what, when, how questions, e.g., who uses what tree-related resources with what frequency, in what amounts, and for what uses?	Rapid appraisal Household budgets, e.g., time, energy Participatory action research Listening surveys In-depth interviews
Planning level	Comparative	Participation questions Property rights questions Gender role questions	Case studies Institutional analyses Cost/benefit analyses Secondary literature review; archives
Policy level	Experimental/ evaluative	Interrelationships between different development strategies, e.g., agroforestry vs. plantation forestry Distribution questions—who pays, who loses	Census Surveys Cost/benefits analyses

Source: Adapted from Burch 1984.

communities) as indicated in table 5.1. In this way, the agroforester can measure trends in relative worth for various activities.

Rapid rural appraisal.—This method of appraisal (Khon Kaen University 1987) is a set of exploratory field survey techniques that follows a review of secondary data. Interviewing and observation are major techniques. It is an interdisciplinary method that provides the reconnaissance team with a general view of an area or site (such as a farm) so that its members can identify problem areas and points where more data are needed.

Participatory action research.—Designed to solve problems and develop new approaches or new skills in a specific situation, it relies on observation of behavior and participation of group members in an adaptive and experimental approach to problem solving.

Censuses and sample surveys.—Surveys provide baseline data as well as data for continuous monitoring. Both methods are descriptive of events or situations and are not necessarily geared to explain or predict. Censuses cover an entire population, while sample surveys cover a representative sample of a population. Both, however, involve the collection of statistics on a selected set of variables. When used over time, these methods are descriptive and diagnostic tools that may suggest where change is occurring in selected variables and may help identify problem areas where change is negative or too slow.

Case studies.—In-depth studies of a group, institution, or community

provide a coherent picture of the unit under study. A case study looks at a larger number of variables than a census or sample survey and tries to identify interactions between variables. Case study techniques may include use of literature review, interviewing, and participant observation. Case studies are useful as a basis for planning because they are intensive and shed light on important variables, interactions, and processes that may constrain or promote proposed agroforestry interventions. With a basis for comparison, significant similarities and differences between site-specific units can be identified and generalized to what can be done to effect change (Isaac and Michael 1971, Evaluative Studies Branch 1985, Kearl 1976, Conant et al. 1983, Shaner and Phillips 1982, Chambers 1985, Rocheleau 1985).

FROM UNDERSTANDING TO INNOVATION

The explorer and artist in each of us can help take the world apart and put it back together in realistic and helpful ways. We can also construct a more appropriate image of the needs and potentials of the social units we work to develop. Additionally, we are forced to modify the traditional development process of "doing to" local people to "working with" and "doing by" locals (FAO 1985). This involves every step, from problem and project identification, through planning and implementation, to monitoring and evaluation.

It also involves a change in the modus operandi from the "penetration model" to "participatory model" of development. The former is associated with the often negative concept of intervention, the latter with innovation:

> Picture intervention as a wedge or funnel driven into existing social and resource systems in the Third World. Into this funnel, development agents (mandated by policy makers and national planners) pour new and presumbly "better" technologies ostensibly designed to improve local conditions. . . . Innovation means change, but with the incorporation of extrinsic human resources, by linking appropriate changes to local knowledge, custom, and need, there exists a greater potential to ameliorate the innate instrusiveness of outside assistance. (Messerschmidt 1987:383–384)

Intervention may come in many forms from public initiatives by local governments to force people to plant trees, to colonial initiatives such as the *taungya* system, to many of the current development projects supported by bilateral and multilateral donors. Obviously, not all interventions have totally adverse impacts. For instance, in 1932, the local government of the Amarasi region of Timor legislated that shifting cultivators plant *Leucaena* trees on the contours of their lands before they abandoned their plots. The government also required that fruit trees be planted, specific grazing areas be observed, and that areas for other farming practices be established. This part of Indonesia eventually began to export food instead of being forced into the typical cycle of degradation (FAO 1985).

An innovation-as-development model potentially has more positive implications. This approach promotes a "purposive planned intervention

for accelerating development" (Cernea 1984). Again, an Indonesian case illustrates the point.

> In Indonesia, government officials were originally of the opinion that Hevea rubber could only be properly cultivated in large estates. Nonetheless, swidden cultivators quickly incorporated rubber trees into their systems, partly because of high prices for rubber, but also because of encouragement and seed supply from Chinese traders. Recent studies have indicated that some swidden cultivation practices in Indonesia have been found to be superior to plantation management practices . . . . and the government is now actively promoting smallholder cultivation. (FAO 1985:36)

Several lessons arise from this case. First, the elements that made the adoption of new practices happen included prices, encouragement, inputs (such as seeds), and the experience of farmers to develop superior practices. These and other elements identified in other situations indicate that it is necessary, but not sufficient, to focus on getting prices right so that farmers will produce more in spite of donor and government efforts. A more fundamental lesson of this example is the value of communication between farmers and a government open to hearing and seeing what smallholders have to offer.

The not so subtle challenge of all this is to find the means to constructively intervene with innovations that are responsive not only to the biophysical environment of farmers, but also to their sociocultural context. This may incorporate elements of Benor's and Harrison's training and visit extension programs that acknowledge the central role of risk in farmer decision making and that focus on small-scale demonstrations in the farmer's own fields so that new practices can be compared with traditional ones (Singh 1979). It may include the use of local motivators to work with their neighbors to adopt new technologies or varieties (FAO 1985). It may include Nepal's village dialogue, or *Gaun sallah*, process where interdisciplinary teams of professionals surveyed the biophysical and socioeconomic resources of a community, focused particularly on existing resource management systems, worked with local people to provide input into the definition of problems and the identification of potential solutions, and planned with district officers the kinds of activities that appear most appropriate for the community (Messerschmidt 1987). Or it may include variations on the farmer-back-to-farmer model (Rhoades and Booth 1982) or the farmer-first-and-last model (Chambers 1985), or variations on all of these themes. All have some input from the often overlooked noneconomic social sciences.

Criticisms of most of these approaches are that they are more costly in terms of time and money. However, much of this criticism is blunted because experience has shown that when these methods are not used the social component of many programs is underdesigned and the programs have higher rates of economic, technical, and sociopolitical failure (Cernea 1984). According to Gellar, the more socially designed and successful programs are those that ensure

> There is sufficient understanding of the rural milieu in the project area.

There is sufficient time to work out the project design in collaboration with the local populations.
Project priorities are determined by the participants.
Project participants are not taken away from other activities that they consider to be socially or economically more desirable.
Participants are free to work out their own management system.
Participants are free to dispose of the benefits derived from the project as they see fit (1985:27).

CONCLUSION AND SUMMARY

Agroforestry is no different from any other development activity in that it requires integration of sociological and other social scientific knowledge with biophysical knowledge to help us understand who may participate; where, when, and how they may participate; how they may be affected; how others may react to discourage or encourage them; what they may need to participate; and how the benefits may be distributed among participants of agroforestry projects we help develop and fund (Illo 1988).

This chapter has provided an introduction to the potential of social ecology. We have suggested some conceptual and theoretical approaches from social ecology for agroforestry policy, planning, management, monitoring, and evaluation. By following our suggestions and examining the references we have listed, the agroforester can go far toward connecting the social and the biophysical dimensions of his work. The five specific steps provided by this chapter are:

1) *Identify* how the technical interventions are driven, affected, and constrained by the elements of the social ecological system (figures 5.1 and 5.2).
2) *Determine* the level of information and the kinds of data required (table 5.4).
3) *Choose* the appropriate method(s) for collecting the required data—rapid rural appraisal, participatory action research, surveys, case studies, and so forth.
4) *Measure* the relative worth and consequences for each category of beneficiary (table 5.1).
5) *Balance* theories, concepts, methods, and measures with creative extension that goes beyond the merely measureable.

The contributions of social ecology to agroforestry in Asia are dependent upon the professional, whether called forester, agroforester, social forester, or any other name, who must be both explorer and artist. It takes the explorer/scientist to work with people to identify and define their local problems, to raise relevant questions, and to discover the many and sometimes contradictory answers that face Asian farmers. It takes the artist to sort out all of the answers, pull them together with the help of those who know their reality best, interpret the answers in a range of meaningful ways, and portray them to other planners and decision makers in ways that reflect realistic solutions in which agroforestry may play a role.

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CHAPTER 6

The Uses of Political Science in Agroforestry Interventions

Harry W. Blair

HIGHLIGHTS

- The "political" in political science refers to the making of rules and laws for a place, institution, or organization. Thus, opting for one policy (for instance, excluding local citizens from a reserved forest) and rejecting a different policy (allowing such citizens access to the forest) is always a political decision, even though politicians and administrators may try to disguise it.
- The subfield of political economy focuses on the connections between economic resources and political power, shedding light on why it is that wealthier elements at national and local levels so often receive the lion's share of development project benefits.
- Public administration offers prescriptive guidance on designing better projects and managing them more effectively. Learning from mistakes, including citizens' views and values, and incorporating local people's knowledge are all emphasized here.
- Public choice theory explains how and why decentralization strategies can be effective in facilitating local control over forest resources—citizens can cooperate to both conserve and utilize these resources at the local level.

POLITICAL SCIENCE AS A DISCIPLINE

Political science and the related field of public administration have never been of central interest to foresters. In the United States, this may be partly because the founders of forestry, like Gifford Pinchot and Bernard Fernow, were themselves policy innovators on the national stage and scarcely needed advice from academic analysts to help them formulate and implement their policy ideas. Subsequent forestry professionals may well have thought that with this rich legacy of policy involvement they could handle such issues without guidance from specialists outside the field. Whatever the reasons, political science in the United States today has roughly the same place (and prestige) in the forestry field as Greek literature or art history. The same is also true, by and large, in the developing world.

However, political science and public administration practitioners have formulated and cultivated quite a few useful insights, lessons, and initiatives in the rural development field over recent decades. A number of these should be both practically and theoretically useful in agroforestry, particularly as forestry continues to move beyond its traditional focus on protection and production into the realm of social forestry, where it must relate to the rural citizenry along new and different lines.

To begin, it is appropriate for the reader of this book to ask, "What *is* political science, and how does it differ from the other social sciences that are presented in this collection?" Second, it is also reasonable to inquire, "What is the *use* of it, so far as forestry is concerned?" This second question is the more important, but an answer to the first will lead into an answer to the second.

The fundamental issue of political science is how the power of the state should be arranged and deployed to enhance and obtain justice, fairness, and equity. But what is "the power of the state"? It is the *capacity to make rules that are binding* on the whole citizenry of a political system. In what is arguably the most thorough discussion of the nature of politics in this century (Easton 1953), political power is defined as the capacity "to authoritatively allocate values," which is another way of saying to make rules that apply to everyone in the society.[1] To issue money, make laws, decree and collect taxes, and prevent (or allow) access to reserved forest areas are all examples of state[2] action, or intervention, in the lives of citizens. Sometimes, of course, the state is unable to enforce its rules. In Argentina during the early summer of 1989, for instance, inflation had grown to the point (14,000% a year) where many people refused to accept the national currency as legal tender—they insisted on payment in "hard" foreign currencies. Laws can be ignored or government regulations can be flouted at various levels of state authority. For instance, at the low end of the hierarchy, the boundaries of reserved forests can be penetrated by bribing forest guards to allow fuelwood gathering, or at the high end, a minister may be corrupted to permit illegal logging.

How does political science differ from related disciplines in the social sciences? Its hallmark, as we have just seen, is a concern with *power*, generally with state power at national or local levels (provinces and

villages can make rules for their citizens, just as nations can). Economics, on the other hand, focuses essentially on *exchange*. Microeconomics, trade, and labor economics are all centered on exchange of various commodities. Sociology addresses itself to *human relationships*, usually (though not always) in a fairly wide setting (like corporations, social classes, or religious groups). And lastly, anthropology also studies human relationships, but does so on a *narrower basis* than sociology. Castes in an Indian village or gangs in a Japanese city are examples here.

The dividing lines between these fields are often more than somewhat hazy as between anthropology and sociology, which often overlap. Sometimes, two fields can be combined, as in a political economy analysis focusing on the relationship between wealth (a function of exchange accumulated over time) and politics (the rules and laws that encourage or discourage that accumulation).

Political science has generated two offshoots within the last 40 or 50 years: international relations and public administration. The first carries the approaches of political science to the international sphere and thus does not concern us here. Public administration is of great use to forestry professionals, however, with its central focus on the organization and functioning of bureaucracy and its abiding interest in policy implementation. In recent years, a whole subfield of "development administration" has arisen to address third world development issues. In this chapter, political science, public administration, and development administration are covered as a single field.

This chapter also gives some attention to political economy, where political science and economics come together. Although this interdisciplinary field could be covered just as well in the chapter on economics, economics as a field in forestry has tended not to focus on political economy, and this tradition is followed in the economics chapter of this volume.

Political science, like economics, is both a descriptive and a prescriptive field; that is, its practitioners analyze what they find occurring on one hand, while on the other they suggest goals for public policy and urge strategies for implementing such policies. The analytical side of the field is here examined first, then its prescriptive aspects.

ANALYTICAL POLITICAL SCIENCE

If political science is the study of "the authoritative allocation of values," or the making of rules binding on all, then it follows that politics must be virtually everywhere. A decision to continue a policy represents a political determination; a bureaucratic resolution to pursue a "technologically sound" solution to a problem in forestry is likewise a political decision. How is this the case when so often we think of technical solutions as being particularly nonpolitical and we think of politics as "intruding" on the "best" technical answers to problems of natural resource management?

The answer goes straight to the heart of what political science is largely all about: if political decisions are those that are binding on everyone, then it follows that a governmental decision to accept the best technical solution is fully political in every sense, for it means that the

power of the state is marshalled in favor of that solution and against all other would-be solutions. And what, after all, is the best technical solution? Who decides it? Why is one decision taken (that is, one solution accepted by those in charge of the state) and others rejected? Perhaps technological factors were overwhelmingly on one side of the case when the decision was made, but even here, there is much room for doubt.

Examples of Political Decisions

A good example is the disastrous fires that engulfed Yellowstone National Park in the United States during the summer of 1988. In the wake of these unprecedented fires, many observers wondered if the cause had been an unfortunate combination of park management policies that were each separately thought to be technically and environmentally sound. Until 1972, all fires had been suppressed, but in that year the policy changed to allow natural fires to burn themselves out. In a dry year like 1988, forest conditions were perfect for the eruption of difficult-to-control fires because of the long accumulation of dry material. Whatever the merits of the two different management policies may be, it is clear that the decisions to pursue first the suppression policy and then the "let burn" policy were really political decisions. In each case, a rule was decided upon and alternative rules rejected.[3]

Another example is logging practices in many third world countries. A policy restricting logging in state-owned reserve forests to large-scale operators perhaps can be justified on grounds of efficiency, economy of scale, economic viability of the contractors, and other reasons. Yet small-scale loggers might be better in terms of actual costs and employment generation because of their more labor-intensive practices in a labor-surplus and low-wage society, and in terms of their ecological impact because of selective felling (as opposed to the clear cutting done by the bigger operators). In either case, favoring one group over the other is a political decision.

A third example is the long-simmering conflict between forestry departments and indigenous forest dwellers. The former pursue policies designed to maximize conservation and sustain yield, while the latter seek a significant part of their sustenance from forest products. The former try to protect the resource against interlopers, while the latter often perceive such policies as systematic exclusion and/or destruction of their forest by corrupt outsiders.

These three examples illustrate the difference between what is politics and what political leaders often label as politics or political interference. In fact, although the decision to pursue any forest policy anywhere is political, the interest of those in charge generally is to present it to the public as apolitical or nonpolitical—as the technologically superior decision that will best serve the public good. In other words, political leaders almost always try to present their decisions as having been made on objective grounds. Why? Principally because to do so allows them to characterize opposing policies as "political" and thus less acceptable or somehow suspect. President Ronald Reagan, who made (and every year remade) the political decision to build up military

spending at the expense of the civilian sector, spent his entire term in office accusing those who argued with him of "politicizing" the security of the country. His tactic (which, by the way, was largely successful) was to present his own policy as objectively necessary for the country and paint his opponents' ideas as self-interested, divisive, and partisan. The fact is, however, that he had one approach for "authoritatively allocating values" (which was deciding that larger government expenditures should go to the military), while his opponents had another (reversing the military/civilian priority). Both were fully political, but President Reagan was able to impose his political program, whereas his opponents were not.

Similarly, the management policy decisions at Yellowstone National Park or in the forestry ministry of a developing country are eminently political. This is not to suggest that all policies are inherently equal in merit or that their worth is merely relative to the assumptions of the observer. The point is that all rule-making decisions are political, even those that maintain the status quo; opponents, therefore, cannot really politicize an issue because every decision of the state (even a decision not to change something) is innately political in the first place.

Influencing Political Decisions

Once the all-pervasive nature of politics is comprehended, policy and its determinants become much more easily understandable. Many voices seek to influence government policy in different ways. Some are more powerful; others are weaker. Still other voices never get a hearing or are unable to articulate their views at all. The landless, needless to say, usually belong to the last group.

An excellent example is offered by the social forestry programs initiated in a number of the Indian states in the early 1980s. Though at least one state got an early start,[4] the major impetus for India's social forestry effort came from a central government decision to respond forcefully to the twin crises of diminishing fuelwood supplies and advancing ecological deterioration. Various states then undertook their own social forestry projects, generally with international donor support. There was some opposition, most often from within the forestry departments themselves, because forestry officials saw the new initiative as distracting attention and resources from their traditional and primary missions of protection and production. Most forestry department personnel tended to see working with villagers on small-scale plantations as wasteful and unproductive efforts when compared to the large-scale operations in reserve forest areas that comprised the central focus of their profession.[5] In other words, the government made a political decision to take up social forestry, but there was also internal political opposition to this effort to mobilize and allocate the resources of the state. While state leadership wished to make new rules that would steer public money and effort into social forestry, forestry professionals preferred to continue previous public forestry policy.

As might be expected, the leadership prevailed in imposing its political view, partly through its control of the bureaucracy (which meant it could issue direct orders to forestry professionals to participate in social

forestry programs) and partly through incentives. Officers posted to social forestry projects in many cases were given early promotions, special housing and dearness allowances, and guarantees of reintegration into their regular forestry careers after a posting in social forestry. In the end, there was an agreement, albeit with some continued footdragging, that the state would undertake social forestry programs.

As the stronger constituency, the state leadership imposed its will, but in their role as the weaker constituency, the forestry professionals were nevertheless able to extract some concessions. Other groups, however, were never consulted at all, an omission that proved eventually to be costly to project success.

Social forestry advocates assumed from the outset that a top-down enterprise was sufficient for success. National and state leaders perceived shrinking forest resources and environmental deterioration as problems that could be solved by deploying the state forestry departments to mobilize and instruct the rural citizenry to plant trees on community public land, along roadsides, and in their own private fields. In other words, the government assumed that villagers could simply be told what to do, and they would do it: they could be ordered about, just as indigenous dwellers had customarily been directed by forestry officers; there was often noncompliance and malingering to be sure, but generally the work would be done.

In fact, villagers had their own ideas. They planted trees in community woodlots, on roadsides, and in their own fields, often far in excess of project targets, but they had very little interest in using the produce for fuelwood as called for in the project designs. Rather, they saw an opportunity to make much more money by selling trees for construction poles and, in some areas, as feedstock for paper mills, with fodder as a second priority.[6] For them, fuelwood was at the bottom of the list, if it was there at all. The state, in the form of its social forestry project officers, was unable to induce participants in the projects to use the produce for fuelwood;[7] its political power was thus limited. If the potential tree growers had been consulted, the state might have changed its own priorities, perhaps toward projects that intentionally included all three end uses: construction timber, fodder, and fuelwood.[8] While fuelwood might still have been the lowest priority in such projects, some fuelwood production might have been forthcoming. As it was, because the rural citizenry was denied any voice in project planning, it asserted its voice in the implementation stage where land and labor are crucial project ingredients and thus severely challenged the project goals.

But the political story does not end here, for there was yet another constituency that was not consulted in the project design—the women who cook the food and gather the fuel with which to cook it. Women should have been major beneficiaries of social forestry efforts because they would need to spend less effort gathering fuel and would be able to cook with wood, rather than with the lower-quality twigs, dung, and crop wastes used in the absence of wood.[9] Unfortunately, however, domestic politics stepped in here. Men, as heads of households, set the rules and priorities (the home can be considered a political arena, just like the nation, the province, or the village), and their priority was to increase family income

rather than relieve female fuel-gathering chores. So even if social forestry officials had been concerned about including women's priorities in project planning, male domination would have made it difficult, perhaps impossible, to implement.[10]

Choosing Priorities

Other levels of political reality exist on the state and national scene as well. Using trees for construction poles and feedstock for paper mills diverts wood from fuelwood use. But what should be the proper objectives for a social forestry program? Like most Asian countries, India needs new sources of cooking fuel to replace the forest resource that continues to be destroyed with such intensity; it must have construction materials as the expanding population seeks housing; and it requires more newsprint as rising literacy rates within a growing population means more people reading. Which of these needs is most important?

The fulewood and ecological crises are well known to foresters, and many forestry practitioners who have worked in social forestry have come to appreciate that adequate housing is a high priority for the growing number of those who can afford it. Less well known is the fact that in most developing countries newsprint is in chronically short supply. In the summer of 1989, the supply in India shrank relative to demand even more than normal, to the point that opposition political parties were charging that the government had intentionally reduced the supply of newsprint in order to deprive them of their major platform for publicity in the parliamentary elections to be held later in the year. Their charge was that the government controlled radio and television and could employ this monopoly to inundate the country with publicity for the ruling Congress party, whereas the only way for the opposition to reach the public through the media was via the press (Crossette 1989).

Which is more important? Solving the fuelwood/ecology crisis, furnishing construction materials for a growing population, or providing the means for open political debate in one of the very few developing countries to enjoy an open democratic political system?[11] This is not an easy question to answer because, at least in the near future, expanding tree production will not be enough to meet all these needs. Thus, promoting tree growth for construction materials means that the fuelwood crisis will continue unabated, while prohibiting the use of trees from social forestry projects for paper mill feedstock means fewer newspapers and a smaller chance for opposition parties to get their message out to the voters at election time. The choices clearly are political.

Political Economy

The reality that political decisions mean benefits for some and costs for others leads us to our second major topic under the heading of analytical political science—political economy. One of the uncomfortable truths of the overall development experience during the last several decades has been that, if they succeed at all (and of course all too often they do not), development programs and projects benefit the rich far more than the

poor. If the poor get anything at all, it is most often a pittance. Why should this increase in income disparity so frequently be the case? If the pattern is so common and well known, why are development practitioners unable to put together projects that will produce different results? And in particular, why cannot forestry projects, which are relatively new to the development scene, take advantage of all this unhappy experience and do a better job at distributing project benefits?

The field of political economy[12] offers a coherent and often compelling explanation both for this pattern of continued failure to combine equity with development and for a good portion of the repeated project failure that is so often observed. Political economy begins with an analysis of class structure and class interest and then goes on to explore the dynamics of how these factors play out both politically and economically, with the guiding assumption that politics and economics are inevitably intertwined.

Short- and long-term objectives

As in all political systems, third world regimes have as their first priority their own succession in power. In some countries, the major fear is retribution from a discontented citizenry at the polls, but in others, the major concern is with a coup d'état in the short term and insurrection in the longer term. In the democracies, power is secured between or before elections by keeping enough voters happy through such measures as enhancing economic prosperity, avoiding excessive inflation, and overcoming crises, all of which require much subtle and often quite indirect attention. In many developing countries, on the other hand, the strategies employed are a bit more immediate. The regime must neutralize, appease, co-opt, or somehow "buy off" those classes and groups capable of overthrowing it, which essentially means the urban sector. The army, of course, is most important here, but labor unions, government employees, and students and intellectuals are all powerful constituencies that can cause much trouble. Recent events in Burma, China, and the Philippines illustrate this kind of challenge to authority. In the first two cases, the army was willing and able to stave off and crush widespread protests from the other four groups, while in the Philippines, the army elected to side with the protesters. It is the specter of this latter possibility that induces governments in so many developing countries to shower largesse on their military establishments. Almost any third world country can supply examples of this concern for the short-term future.

It is the longer-term interest of regimes in self-preservation that is germane to our considerations in this chapter, however. In the short term, coups d'état usually occur in the capital city, but the longer-term danger lurks out in the countryside. This is where insurrections begin, and though successes (in which insurrections become revolutions overthrowing the state, as in China or Cuba) are rare, long-simmering rebellions are much more common. Parts of Burma, India, and the Philippines, for instance, have been in revolt against the central government off and on for many years and even decades, which is worrisome enough in itself, but the real danger is that the conflagration could spread. Even in countries that are more or less free from serious rural unrest, there is always the uneasy prospect

that it could break out at any time. For all these reasons, governments are very much concerned with maintaining stability in the countryside.

The role of local elites in national politics

How is this to be done? For all practical purposes, the answer is an almost astoundingly simple one: the regime supports local village elites in return for which the local elites support the regime in power. In the process, they keep order and stability in their respective domains. As far as rural politics is concerned, there are essentially three groups, or classes, that matter: national elites in the capital, dominant local elements (generally the larger landowners), and almost everyone else (including the landless, near-landless, and most smallholders). The interest of the national elites, as we have seen, is to retain their power in the capital, while that of local elites is to hold on to their own power at the village level. Since the locally dominant families own the largest share of the scarcest and thus most crucial village resource (land) and since the lower strata have to survive by relying on their own chief resource (overabundant and thus cheap labor), the task of remaining in control has been reasonably easy. Village elites keep the subordinate groups in line through low wages, sharecropping arrangements, and moneylending (with enforcers for collection). Even when new opportunities arise, such as local elections or contracts for construction of local infrastructure, the dominant groups have remained dominant by building on the control they already have. Landlords use their hold over their laborers, sharecroppers, and borrowers to obtain their votes, and they use their wealth and influence to make sure construction contracts come their way. Furthermore, each sphere reinforces the other so that electoral power gives the dominant group the political muscle to steer contracts their way, while the money siphoned off from the contracts helps them dominate future elections.

Why do not the village poor and landless rebel against such explotiation? In rare instances, they do, but most of the time they are held in check by the fact that the state supports the landed class. The state may talk about social justice, land reform, abolition of debt peonage, and the like, but there is seldom any follow-through on promises of change because the state needs the support of local notables. Thus, if a squabble between a landlord and his workers arises over tenant rights, the state will move in its police constabulary to support the landlord.[13] This system can be depicted easily, as in figure 6.1.

The effect on rural development

Our analysis also explains much of the apparent failure in rural development efforts. If it is true that the primary goal of the state in its relationship with the countryside is to maintain stability by cultivating local elites, who in turn keep the peace through their traditional linkages to the lower strata, then it follows that rural development resources are an excellent tool to accomplish that end. If most of the benefit from a project gravitates into the hands of the local rich, helps them solidify their control over the poor, and increases an already grossly unequal income distribution, then the regime has succeeded from its own point of view in promoting rural development, in that it has strengthened its linkages with village elites.[14]

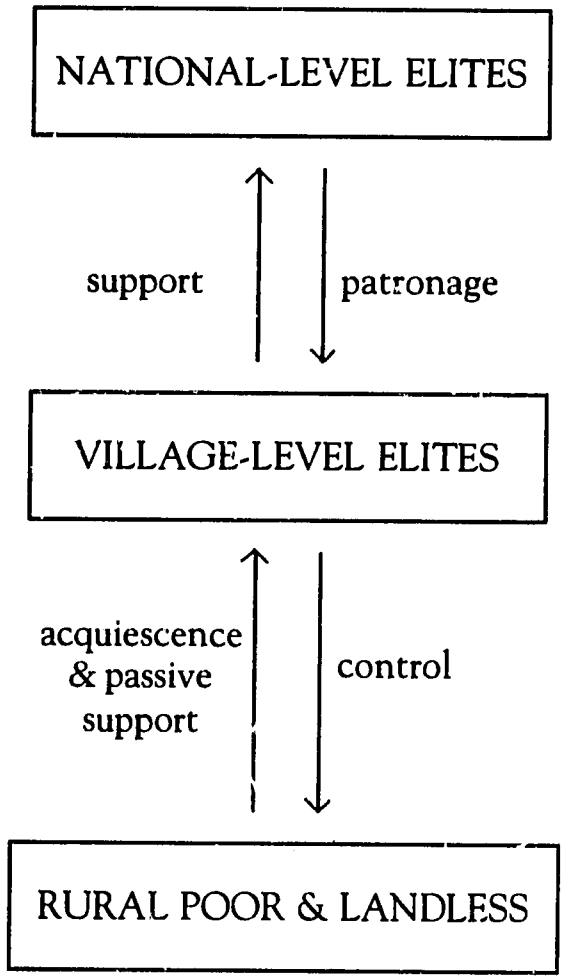

Figure 6.1: Rural political economy in most less developed countries.

Likewise, land reform never seems to make much headway. Any number of analyses have shown that agricultural improvements in peasant agriculture assume scale-neutrality—that is, that small and large landowners alike can similarly incorporate and benefit from new technologies like the green revolution. In fact, there is every reason to think small farmers should do better, for if they acquire the equivalent physical inputs per hectare (seed, fertilizers, water), they will invest more labor[15] and produce higher yields. It then makes sense in many countries, in terms of both social justice and production, to break up the larger landholdings and redistribute them to the land-hungry (see, for example, Prosterman and Reidigger 1987). Yet, except under extraordinary conditions like revolutions (China) or military occupations (Japan, Korea), serious land reform virtually never takes place. The reasons are clear: governments do not want to risk alienating their main base of support in rural areas.

Forestry projects fit very well into this model of development behavior. For example, Michael Cernea (1981) writes of a forest plant-

ation project on common land in Pakistan in which, once the wasteland resource began to acquire value, the local gentry seized control of it and steered the project benefits to themselves. In terms of improving the lot of the rural poor, the project was an abject failure, but in terms of building linkages between national and local elites, it was quite likely a significant success. If our model has any validity, such results are scarcely surprising.

It should be pointed out here that the political economy approach does not assume any conspiracy between national and local elites. Nor does it assume that those at the national level intentionally divert development assistance into the hands of the rural gentry. And further, it does not assume that all those in the central government see things the same way; indeed within most governments, there exist considerable differences of opinion on what rural development strategies to pursue, with at least a few politicians and bureaucrats insisting that projects should and must target the rural poor, but usually their voices are weak.

Rather, the point here is that developers continue to do development business the way it has been done because it seems to keep things stable. The regime at the center stays in place, and unrest at the periphery stays more or less under control. In the very long run (decades and more), it can be argued that such approaches are likely to be counterproductive, as the alienated rural poor become susceptible to the call of insurrectionary movements that may grow too large to be easily suppressed by the state.[16] Unfortunately, the "long term" for a government in power usually means only the next two or three years, and the policies of expediency that steer project benefits to the rural rich while ignoring the poor fit all too well into such a definition of the long run.

Some urge revolution as the only solution, but this is not a strategy that many international donors, let alone incumbent third world governments, would embrace. A more workable solution is that somehow dominant elites and their regimes at national and local levels must be made accountable to the general population. Popular democracy can do the job at the national level, as it has done for many decades in India, and is now struggling to begin to do in such countries as Pakistan, the Philippines, and South Korea. But that is outside the scope of this chapter. For our purposes, the local level is what is important, and here accountability must involve some kind of decentralization, a strategy that is explored later in this essay. Suffice it for now, though, to say that there is significant evidence that decentralization strategies can make local governments accountable to their citizens in ways that do promote rural development benefiting the poor.

PRESCRIPTIVE POLITICAL SCIENCE

The analytical side of political science that we have been examining is useful chiefly as a diagnostic to help ascertain what goes wrong with development efforts and why similar problems seem to emerge from a succession of projects. Given the very mixed record of achievement in the development field over the past several decades, this is no mean accomplishment, but it does not greatly help in showing what to do. That task falls to public administration, which focuses on the nuts and bolts of

implementing policy and managing bureaucracy. Public administration also offers some analytical insights, and while perhaps not as penetrating or profound as those offered by the political science we have been looking at, these insights are helpful in an applied context. For purposes of development forestry, it could be argued that public administration is more useful than the wider field of political science, for it concentrates on more solvable managerial problems.

Public Administration

Let us begin with what is arguably the most frequently encountered problem in the development business: the failure of projects for non-technical reasons. Part of this failure can be explained by the political economy analysis given above, but there is another large part that is essentially administrative in nature. While the political economy problems in the end demand serious structural reforms (of the sort that development practitioners find difficult to think about, much less implement), many of the administrative problems can be dealt with through less ambitious (but nonetheless potentially effective) administrative reform measures.

Adaptive development administration

Of all the thinking in development administration over the last 10 or 15 years, the most relevant to agroforestry is undoubtedly what might be called adaptive development administration, or ADA.[17] The underlying idea of ADA is that the traditional top-down hierarchical management practices followed by nearly all development bureaucracies, in which everything is run according to a prescribed blueprint and everyone is actively discouraged from reporting problems upward, is not only nonproductive, but actually counterproductive. This is self-evident, some might say, for superiors like to be obeyed by their underlings, and bureaucrats at all levels are loath to admit error, especially when it is pointed out by those below them in the hierarchy or—worse yet—those outside the organization altogether. Yes, would reply ADA's advocates, it may well be self-evident, but it is also almost universally ignored in government, with especially corrosive effects on development projects. We should therefore heed it, they insist.

The central issue here is that by their nature, development projects are even less amenable to careful planning than ordinary bureaucratic activities, simply because there are many more unknowns involved. Despite this uncertainty, however, development agencies put great effort into planning projects as meticulously as possible. Indeed, as concerns for such matters as environmental degradation, income equity, and women's issues came to the forefront in the 1970s, planning became more and more elaborate, with environmental and social impact analyses being required as part of the planning, more stringent "conditions precedent" being attached to project approval, and so on.

The more detailed the project blueprint, however, the greater the chance of project failure because the capacity of project managers to respond to the unanticipated setbacks that inevitably occur is curtailed.

And if managers do not want to hear about things going wrong from their own people in the field (who would be considered insubordinate) or from outsiders (who would be seen as interfering if they are persons of status or dismissed as ignorant if they are not), there is virtually no chance at all that problems will be corrected and things set back on track. The ADA prescription is to change the incentive structure within the development bureaucracy, beginning with the design phase of a project. The incentives should encourage designers to solicit criticism and suggestions from lower-ranking officials within the organization and clients (or "consumers") outside it throughout the project cycle. Their input should be incorporated during the planning, implementation, and evaluation stages, so that there is a premium put on discovering potential and actual errors and malfunctions in projects. Managers at all levels should, in the words of one ADA scholar, "embrace error" as a chance to redesign and improve project performance (Rondinelli 1983). How can this be done? Quite simply, say ADA advocates: if managers are rewarded for finding mistakes and suggesting improvements, they will begin to do so.

Nowhere is ADA more important than in its emphasis on soliciting and developing what Chambers (1983) has called "local people's knowledge": the cumulated understanding of agricultural and ecological practices that rural people have developed over the centuries, which is often at odds with what development professionals "know" to be "scientifically true." Such knowledge can often be quite crucial to project success. Project managers and field agents should be rewarded for discovering such knowledge and moving it through the system so that it can find its way into the technical knowledge base of the project itself.

What is the relevance of all this for forestry? Over the years, forestry professionals have developed a scientific approach to production that in many ways has been highly successful in achieving the goals of a sustained yield management. Some of the consequences of these efforts are that (1) forestry management is more hierarchical than most bureaucracies, (2) the relationship between foresters and the citizens they deal with is essentially one of command and control (giving orders to their forest workers and keeping others from desecrating the forest resource), and (3) it has been convenient to assume that forest inhabitants know nothing of consequence regarding their environment.

Unfortunately, these administrative structures, practices, and assumptions are considerably less appropriate in agroforestry, to the point in many cases of being severely harmful to project success. This is so for several reasons. To begin with, rigid hierarchies rarely exhibit flexibility and willingness to learn from mistakes. Second, the civilians involved are not forestry workers on a payroll who can be ordered about; they are citizens who do not like to follow gratuitous orders from government officers. Not only that, but they are likely to raise objections and even political protest if they feel they are being pushed too far. And finally, villagers have a great deal of technical knowledge about their locale that outsiders should not ignore. Some examples follow.

Learning from mistakes.—The Paper Industries Corporation of the Philippines (PICOP) launched a project in the 1970s for farmers to grow

pulpwood trees on company land.[18] From the very beginning, serious problems emerged with the project. First, although the plan called for participants to phase-in plantations over a four-year period (so that harvesting could be similarly phased), the practicalities of land clearing and tree planting led farmers to plant all their trees at the same time. Second, the scheme had envisioned farmers intercropping foodcrops among the trees. But banks would not give loans for mixed plantings, so in many cases, the participants were frustrated in what should have been an especially attractive part of the project. Third, many farmers ignored the technical package, finding that they could make do with less fertilizer and weeding than recommended. And last, because simultaneous planting meant simultaneous cutting at harvest time, the temporarily severe labor shortage had to be eased by bringing in expensive contract labor from the outside. All four problems provided a number of ADA opportunities, which, if seized, would have greatly improved the PICOP effort.

Citizen reaction.—The well-known Chipko movement in the Garhwal Hills of the Indian Himalayas is an excellent illustration of what can happen when local needs and desires are ignored.[19] In this case, loggers and forestry officials formed a typical alliance for a large-scale offensive against a forested area that was the core resource for a recently organized wood products cooperative. Local women responded to the threat by tying themselves to trees to protect them from being felled by the outside concessionaires. At the same time, local leadership developed that successfully articulated the movement's themes, publicized them, and created widespread sympathy for the Chipko women. Chipko became something of a cause célèbre in international environmental circles, so much so that the government of India found itself having to declare a moratorium on concessions for tree cutting in the area.

Local people's knowledge.—Farmers are indefatigable experimenters, particularly those whose holdings are small enough that they do their own farming.[20] In agroforestry, farmers have tried innumerable little experiments in intercropping different foodcrops with various tree species and tested a number of tree spacing regimes, thinning schemes, and the like. Many of these tests fail, but some succeed and become part of the local stock of agronomic wisdom.

Local inhabitants know a great deal about the flora in their immediate vicinity. FAO studies show, for example, that in Nepal the average household owned 28 trees, about a third of which had been planted and cultivated, while in Bangladesh, rural households had planted or naturally regenerated an average of 68 trees (FAO 1985a), reflecting a quite respectable understanding of arboriculture. Yet for the most part (there are exceptions, to be sure), forestry professionals tend to ignore this vast base of knowledge because they assume that ignorant peasants cannot learn anything by themselves. But if these professionals know that their superiors are eager to learn what farmers are actually doing, then they would pick up a great deal of useful indigenous knowledge.

What adaptive development administration is really all about is participation from the bottom up, both within the bureaucracy and outside

it. While this goes against the grain of forestry experience, as it does with experience in other professional fields,[21] it is often an essential ingredient of project success (see, for example, Uphoff 1986).

ANALYTICAL AND PRESCRIPTIVE POLITICAL SCIENCE COMBINED: PUBLIC CHOICE, DECENTRALIZATION, AND DEVELOPMENT

As we have seen, analytical political science offers great insight into how and why things go wrong in development strategies, particularly in the area of political economy, but it proffers relatively little in the way of better strategies. Prescriptive political science, on the other hand, especially in the form of public administration, gives us many ideas for improving the performance of public institutions that are central to any successful development effort. But it does not give much guidance for overcoming the severe constraints identified by political economy analysis. Neither political analysis nor public administration has much to suggest about how the oppressive dominance of rural elites might be ameliorated in order to bring the benefits of development to the rural poor and landless in Asia.

Analysis of the political economy type tend to generate calls for revolution, which—given the unlikelihood of such a remedy occurring and the high probability of its turning into a dictatorship if it should occur—really amount to cries of despair. Public administration, for its part, all too often amounts to tinkering with the bureaucratic machinery while hoping that overall economic growth will trickle down and bring some relief to those at the bottom of the socioeconomic spectrum.[22]

But there are other methods of analysis within political science. Public choice theory is particularly useful when combined with a decentralization strategy, for it offers a way to confront the political economy issue and, at least in the longer run, to assault it in the name of greater equity.

Public Choice Theory

Public choice theory has been a familiar approach in economics for several decades and has more recently gained a foothold in political science.[23] Although usually associated with the very conservative thinking of Nobel Prize-winner James Buchanan, the theory itself can serve as a vehicle to promote equity-oriented development just as well as the growth-first approaches advocated by most public choice theorists.

The basic theory is easily outlined, as in figure 6.2. Goods (and services as well, though we will be primarily dealing with goods) can be categorized along two dimensions: "exclusivity," or type of good; and "jointness," or type of use. On the first dimension, a good is *exclusive* when its enjoyment may be restricted, customarily when those who own or control it make it available to users in return for a fee. On the second dimension, the degree of *jointness* depends on whether use by one person precludes use by another. A loaf of bread is exclusive (I must pay for it) and is characterized by individual or alternative use (what I eat, you cannot); it is a private good. A cinema is also exclusive, but it has joint use

TYPE OF USE	TYPE OF GOOD: EXCLUSIVE GOODS	TYPE OF GOOD: NONEXCLUSIVE GOODS
Individual or Alternative Use	**Private goods:** bread, farm forestry	**Common pool resources:** village well, poorly managed public forest
Joint Use	**Toll goods:** cinema, well-managed public forest	**Public goods:** sunlight, swidden forest

Figure 6.2: Types of goods and their use.

(I must pay to see a film, but my watching does not prevent you from paying a similar fee to see the same film, and a large number of people may enjoy seeing it together, up to the capacity of the cinema hall); it is a toll good. Between these two clear examples are many other goods such as a restaurant and a taxi. A restaurant is similar to a cinema hall, except that it fills up more quickly; it is thus somewhere between a private good and a toll good. A taxi is close to being, but is not exactly, a private good because it can accommodate more than one rider; and a "share taxi" like those found in many cities functions very much like a toll good, except that it can be shared only by three or four riders, as opposed to the several hundred that can fit into a movie theatre or the many dozens that can be accommodated in a middle-sized restaurant.

In contrast, *nonexclusive* goods are not suited to user charges; anyone can use or appropriate them. They also may be subject to either individual or joint use. Public goods like sunlight are available to all without charge and in unlimited amounts (subject to cloud cover), while a common pool resource, such as a village well, can be used by anyone, but once water use exceeds the recharge capacity of the aquifer, too much water taken out by one drawer means that much less for others.

Forestry fits nicely into the taxonomy of figure 6.2, and it is easy to formulate illustrative examples. On the exclusive goods side, farm forestry is an obvious private good, for the individual landowner grows the trees and sells the produce to consumers who purchase poles or fodder or fuelwood for use exclusively by themselves. A well-managed reserve forest area constitutes a toll good: consumers can be charged for use

(whether formally by selling rights to cut or informally by accepting bribes to let illegal cutters in), and a number of users can be accommodated at the same time (though obviously not an infinite number, just as with the cinema hall, which has a finite capacity).

A swidden regime illustrates nonexclusive goods: it is a public good in that use is free (for nobody is selling or buying the right to slash and burn), while at the same time there is enough of the resource for a number of people to use it simultaneously without detracting from use by others. A poorly managed public forest is a common pool resource because, although it is nonexclusive (would-be users cannot be kept out), pressure on the resource is great enough that use by some means less to be used by others. These distinctions, of course, are inevitably somewhat vague and arbitrary. What is the exact dividing line, for instance, between a toll good (such as a well-managed forest) and a common pool resource (such as a poorly managed public forest)? Still, it should be clear that there are four very different, if not completely discrete, categories of goods.

Nepal offers an excellent case study to illustrate public choice theory.[24] Until 1957, local woodlands were considered to belong to their villages, and they were managed by the communities that traditionally owned them. This meant both that outsiders were excluded and that local people could share the resource equitably, as long as local users were not too numerous. In 1957, the government nationalized all forests with the idea of protecting them as a public resources. The result, however, was that in the perception of the villagers the forests became common pool resources belonging to no one and open to all. In consequence, they began to disappear rapidly. Finally, in 1978, the government transferred many of the village forests back to their former control, so that villagers were again willing to take charge and exclude outsiders from "their" resource, which once again could be managed for sustained local yield.[25]

Decentralization of power

The Nepal example shows the promise of decentralization as a development strategy for forestry management. When control of the forestry resource was centralized, as happened between 1957 and 1978, management became extremely difficult. The central authority could not direct affairs at the periphery. When the government decentralized authority to the village, however, it once again put control into local hands (village governments) that were accountable to a local constituency (the villagers themselves).

Central governments are good at making rules for system-wide use, but this very ability effectively prevents them from looking after local affairs well, where each place and each case is unique. System-wide rules are fine for collecting national excise taxes and keeping up the national army, but they are not much use in maintaining village forests where, in the end, it is the local citizenry who will preserve or destroy the resource.

Can such a decentralization scheme really work? Does not the political economy analysis discussed earlier in this chapter give strong evidence that decentralization merely offers more power and resources to already dominant local elites who will just appropriate any additional benefits to themselves at the expense of the poor and landless? In many—even most—cases, the answer is probably yes, at least in the short run.

Decentralizing power to local authorities will in all likelihood reinforce the dominant role of local elites. This was the experience in India in the 1960s, when the *panchayati raj* reforms created local self-governing bodies at three levels.[26] Within a few years, it became clear that the program was serving as a funnel for power and patronage to local notables. Similarly, a decentralization initiative in Bangladesh undertaken in the early 1980s has had much the same initial effects.[27]

In the longer run, however, it can be argued that decentralization can lead to, and in fact has produced, greater political accountability of officials to a wider range of constituencies at the local level. In the Indian case, while local elites initially did monopolize power simply by translating their economic and social dominance into its political equivalent at the ballot box, other groups soon began to perceive the potential of mobilizing their greater numbers to gain representation in local government. In particular, middle-income peasants (who generally turned out to be of middle caste as well) began to challenge the high-caste local gentry, beginning by winning seats on village *panchayats*, then gradually gaining control of the *panchayats* themselves, first at the village level and then at the district level.[28] By the late 1970s, they had taken over a number of the North Indian states from the gentry, and for a very brief moment in the person of Charan Singh, they controlled the national prime ministership itself.

Perhaps more importantly, their success showed still other groups the possibilities of political activism. In many areas, Harijans (former untouchables in the Hindu caste system) have organized themselves and become a formidable bloc at the ballot box. More recently, women have made some headway toward participating in local and regional politics as a group.

This process has been very uneven, it is true. While nongentry groups have enjoyed some success in various areas of India, in others, the rural scene has almost certainly become more oppressive for the lower strata, as traditionally dominant groups have reacted to any bid for participation with unrestrained hostility. Still, in large sections of the country, notably in the West and South, decentralization has allowed and encouraged new groups to become involved in politics and has made the system accountable to a far larger portion of the rural population than previously.

Application to Forestry

What is the relevance of this analysis to forestry? To answer this question, let us go back to the Nepal experience that was mentioned earlier. When the government decentralized control over village forests to the village level in 1978, it changed the nature of village woodlots in the public choice terms laid out in figure 6.2. The use of the woodlots remained individual or alternative (cutting by some reduced the availability for others[29]), but they changed with respect to exclusivity. Before the 1978 reforms, the woodlots were a common pool resource, protected from none and pillaged by all. But after the change to local control, they were policed by villagers against outside depredation, and in effect, they became a kind of private good. Villagers began to manage the woodlots once again as a common pool resource for their own use.

By prohibiting access to outsiders, in other words, the woodlots can be maintained as a successful common pool resource for insiders, that is, the villagers themselves. And the reason that this is at all possible is because village councils are accountable to those using the woodlots: villagers/users expect those in charge of the resource to protect it against outsiders and expect each other to exploit the resource carefully so that it can be maintained over time.

To be sure, there are some serious constraints at work here. One major constraint is that local users must perceive the resource as belonging to them as a group. The activists in the Chipko movement perceived the Garhwal trees as *their* trees to be protected against marauding outsiders; therefore, decentralized control would quite likely manage this resource well. In contrast, the Sundarbans forest in Bangladesh would probably be very badly mismanaged if it were turned over to local authorities because users (mainly people living adjacent to, but not in, the Sundarbans) have traditionally seen the forest as a frontier to be plundered and exploited rather than as a resource to be managed and conserved.[30]

On the other hand, there are a number of instances in which common pool resources have been very well managed by local bodies, both official and unofficial.[31] None of the more impressive cases of local resource management, however, were instant successes, just as on a larger scale, the Indian *panchayati raj* system took a couple of decades to make even the partial headway that it has achieved. But in a world where programs or strategies that have actually delivered very much to those outside the rural power structure are all too rare, these instances are no mean accomplishments.

One other public choice strategy that should be mentioned is privatization, which amounts to moving a resource into the private goods cell of figure 6.2. Despite its name, such privatization is not necessarily a politically conservative measure. The Indian state of West Bengal, for instance, which has long been dominated by the Communist Party of India (Marxist), has been quite successful in its social forestry project because the right to use trees planted on state land is guaranteed to the landless people entrusted with their care; the trees, in other words, though not the land on which they stand, are privatized.[32] This approach could well be applied elsewhere.

CONCLUSION

Political science, along with its allied discipline of public administration, has traditionally been neither a part of forestry training nor of much concern to forestry practitioners. However, political science, especially in the form of political economy, brings powerful tools of analysis to bear on forestry issues, particularly in helping diagnose what goes wrong in development efforts. Through advances in the adaptive development administration approach in the last decade or so, public administration as a field has made a significant contribution to the development enterprise, and much of this new knowledge can be applied in forestry as well as in other sectors.

Public choice theory combined with a decentralization strategy brings together the analytical qualities of political science and the applied orientation of public administration. This combination offers some long-term hope of ameliorating the lot of the rural poor and landless. Such an approach by no means guarantees complete success, and even when it does work, it will probably take a long time. But all things considered, in the realm of third world development that would not be doing half badly.

ENDNOTES

1. As might be expected, such a central definition has been the subject of great debate in the discipline. Suffice it to say that despite misgivings, almost everyone in political science would accept some version or other of Easton's definition.
2. The terminology is confusing here. In political science, the term "state" in the abstract usually means the decision-making institution at the highest level in a political system, for example, the Aquino government in Manila or the Bush Administration in Washington, but provincial units may also be called states. Therefore, in a discussion of this kind, which kind of state is meant will have to be inferred from context.
3. For more on the fires, see Bolgiano (1989) and Jeffery (1989); for the broader policy context, an excellent analysis is given in Freemuth (1989).
4. This was the Gujarat social forestry project, begun in the early 1970s and frequently hailed as one of the success stories of social forestry in India (see Eckholm 1979, FAO 1985b, and Blair and Olpadwala 1988: 6-11). While the material presented in this chapter is taken partly from the last source and partly from Blair (1986), and is derived specifically from Maharashtra, the experience was similar elsewhere in India, including Gujarat.
5. There was also considerable speculation that the real heart of much of the objection to social forestry was that forestry officers would not have the opportunities for graft and corruption that traditional forestry offered.
6. In some areas, it apparently was the government that decided to raise trees (mainly *Eucalyptus*) for paper, but the villagers who resisted (Shiva et al. 1982, 1987). Here too, then, the government found itself at least partly frustrated in attempting to impose its political will.
7. Of course, even trees grown for poles have "lops and tops" that can be (and are) used for fuelwood, to the extent that they are not used for fodder.
8. For instance, technical assistance in setting up schemes for urban marketing of the fuelwood could have been included in the projects, which quite possibly would have appealed to the growers.
9. The evidence is a bit murky here, for there is considerable indication that rural households use some dung and crop wastes by preference, that is, those who could easily afford to solely use wood nonetheless employ these "inferior" combustibles as well (Blair 1986, Natarajan 1985).
10. Still, the widespread use of kitchen gardens as a part of the female domain in the Indian countryside offers some scope for forestry extension efforts. The employment (thus far limited, but gradually expanding) of female social forestry officers holds out some promise for exploiting this potential.
11. This last option is not mere academic rhetoric. The list of genuine political democracies in Asia (if we are to define them as being systems with freedom of speech and assembly, with periodic and

honest elections) is a very short one indeed. In the summer of 1989 it would have included only India, Japan, (tenuously) the Philippines, and (very tenuously) Pakistan. India's long membership on that list (more than four decades, with a brief interruption in the mid-1970s) represents a substantial achievement and one that should not be taken lightly.

12. Here, too, there may be confusion of terminology, for like "state," the term "political economy" also has several meanings. In addition to the way it is used here, it is also employed by many conservative social scientists in the West to describe their critical analyses of what they see as government interference in the economy (that is, the imposition of political power and rules in what should be the openness of the market place). In addition, the term was often used in the 19th and early 20th centuries to describe what today we refer to simply as economics.
13. It can be argued that in most developing countries there is a judicial system to protect legal rights, such as tenant leases, but in practice, the defense of such rights is so costly and time consuming that only the rich can afford to go to court. One further point worth noting is that, because outbreaks occur relatively rarely, only a modest police establishment is required to deal with them. In those countries like the Philippines where rural violence is much more widespread, a correspondingly larger military apparatus is required by the state.
14. If a large portion of the funds leaks out altogether, thus preventing much project activity from occurring and precluding much project benefit from accruing to anyone, the regime's goals would still be accomplished, since in all likelihood the funds disappeared into the hands of the local rich.
15. The smaller cultivators invest more labor per hectare because, for the most part, they have no economically viable alternative activities to pursue; the opportunity cost of their labor is very close to zero, so they expend the unused time on extra weeding, gleaning, and the like.
16. This may be, for instance, what is currently unfolding in the Philippines, though the outcome there is far from clear at present. Certainly a case can be made that if the Marcos dictatorship had seriously pursued land reform and had made concerted efforts to ensure that its rural development programs materially benefited the poor, things would not be in their present precarious shape.
17. There is much excellent literature on this topic, which has been given a variety of labels. Korten and Uphoff (1981) speak of "bureaucratic reorientation," Rondinelli (1983) addresses "adjunctive and strategic planning," Chambers (1983) focuses on a "new professionalism" in development, while White (1987) writes about "social learning." Even the World Bank (1983) has devoted considerable attention to ADA in one of its recent World Development Reports.
18. The discussion here is taken from Blair and Olpadwala (1988:96-97). For the original assessment, see Hyman (1983).
19. There are many good accounts of the Chipko movement. See, for example, Jain (1984), Guha (1985), Shiva and Bandyopadhyay (1986), Bandyopadhyay and Shiva (1987).

20. With larger holdings, the farmers tend to have outside laborers do the field work or to lease the land out. In either case, the urge to experiment is much diminished, in that the experimenter is unlikely to see any of the ensuing gain. Except where noted, the evidence for this section in the text is largely personal observation or anecdotal, though the theme is one that resonates through much of the work of Robert Chambers (for example, 1983).
21. To take my own professional calling, for instance, how many university professors ever ask either their junior colleagues or their students for advice on teaching? We do not, as a rule, look for suggestions from either quarter.
22. One could say much the same for many of the privatization strategies currently being touted by development agencies like USAID (on privatization schemes in the forestry sector, see Laarman 1986). These approaches may well serve to increase overall production, but they offer little directly to the lower-income strata. Indeed, in the short run, privatization is probably harmful to the interests of the poor, for one of its main goals is to eliminate the redundant jobs that so often plague public sector operations and that cannot be cut for political reasons so long as the enterprises remain public ones.
23. See Mitchell (1988) for an account of the growth of public choice theory. There are many presentations of the theory itself. For two that relate to natural resource management, see Oakerson (1986) and Ostrom (1986).
24. The account in this paragraph is extrapolated (hopefully without too much violence to the original) from Arnold and Campbell (1986).
25. Commander (1986) suggests a similar strategy to protect forest resources from ongoing depredation in Bihar, India.
26. For a brief account of the Indian experience, see Blair and Olpadwala (1988:141-145). The central feature of *panchayati raj* was elected councils at village, block, and district levels, with the latter averaging perhaps 1.5 million in population in the 1960s. These councils were given some degree of control over government rural development activities in their areas (the precise degree of control varied considerably among the Indian states).
27. The Bangladeshi experience, being more recent, is not as well documented, but McCarthy (1987) can be taken as a representative analysis.
28. Districts in India today have roughly one to four million people.
29. If the woodlots were large enough, natural growth would regenerate wood to replace whatever had been cut, as in a swidden system, but population growth has long ago foreclosed that possibility.
30. Individuals are prohibited from living in the reserved forest area (though doubtless some do so). Instead, people living near the forest have traditionally, through both legal and illegal means, used the Sundarbans as a resource base. For a longer analysis of the matter, see Blair (1990, forthcoming).
31. See PCPRM (1986) for a set of case studies in common pool resource management, of which a number involve forest resources. Note that, in terms of figure 6.2, common pool resources can be either well- or ill-

managed. Village woodlots of either type would fit into this cell of the figure; the distinction between good and bad management lies in control of access to the resource by outsiders and insiders.

32. Poor rural households received 99-year leases for planting trees on small parcels of degraded state-owned land. See Shah (1987) for an account of this project.

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CHAPTER 7

The Economics of Agroforestry

D. Evan Mercer
with contributions by William F. Hyde

HIGHLIGHTS

— Agroforestry, agriculture, and resource economics literature is reviewed to develop a framework for understanding and analyzing the economic issues involved in agroforestry project planning and decision making.
— Economic theory is used to analyze the requirements for agroforestry systems and projects to satisfy two primary objectives: (1) an efficiency objective to optimize the use of rural resources to enhance the sustainable economic development of target communities and (2) a distributive objective to increase the well-being of the rural poor.
— The criteria for designing economically efficient agroforestry systems and projects are analyzed both from the individual farmer's or agroforester's perspective and from society's perspective. This method of analysis serves to determine optimal combinations of inputs and outputs in agroforestry system design.
— Meeting the distributive objectives of agroforestry is addressed through an analysis of how the distribution of benefits is affected by the choice of goods and services in agroforestry systems, the characteristics of the most likely adopters of agroforestry innovations, and the effect of differential adoption rates by different groups in a community on the distribution of wealth.
— Finally, larger policy issues are addressed that affect the success of agroforestry planning efforts. The effects of market failures and distortions of incentives for adopting and utilizing agroforestry are examined. These include property rights and land tenure regimes, macroeconomic development policies, and government policies affecting prices in land, labor, capital, and agricultural input markets.

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INTRODUCTION

Interest in agroforestry as a concept, land-use technology, and rural development tool is derived from its potential to solve a variety of land-use problems that afflict developing countries. Many definitions and objectives of agroforestry have been advanced. Most definitions center on trees grown as part of an agricultural enterprise that may also include more traditional annual crops. Objectives have ranged from maximizing total productivity, to creating jobs and income in rural areas, to safeguarding sustainability (Mercer 1985). The primary objective of agroforestry (and other social forestry initiatives), however, stated quite simply, is to optimize the use of rural resources (especially soil, forest, tree, and human resources) to enhance the sustainable economic development of target communities. This is an *efficiency objective*. Since the majority of target communities and individuals tend to be both rural and poor, helping the rural poor is a complementary objective of many agroforestry projects. This is a *distributive objective*. These two objectives provide the standard for judging the success of agroforestry projects, and they are the unifying theme for this discussion.

The purpose of this chapter is to review the agroforestry, agricultural, and resource economics literature to develop a framework for understanding and analyzing the economic issues involved in agroforestry project planning and decision making. To date, most of the agroforestry literature has been either descriptive or prescriptive. Typically, current agroforestry practices are described or prescribed to solve specific land-use problems. Economic references, by and large, deal with benefit-cost analyses and relative profitability of different systems and, in a few cases, with distributive and organizational issues. The technical aspects of benefit-cost analysis, budgeting, and linear programming as they apply to agroforestry have been reviewed adequately elsewhere (for example, Betters 1988, Etherington 1981, Etherington and Matthews 1983, Hoekstra 1983, 1984, 1985a, 1985b, Wojtkowski et al. 1988). The emphisis of this chapter is to discuss the insights that economics can provide for designing agroforestry systems, projects, and policies in order to meet the efficiency and distributive objectives cited above.

We first examine the efficiency objective. What are the criteria and techniques for achieving efficiency in the design of agroforestry systems and projects? What are the optimal combinations of inputs and outputs required to meet the efficiency criteria from the individual farmer's perspective and from society's perspective? Second, we examine the distributive objectives of agroforestry. What are the criteria for increasing the likelihood that agroforestry projects will benefit the targeted groups or communities? There are three main issues here: (1) How is the distribution of benefits affected by the choice of goods and services in the agroforestry systems? (2) Who are the most likely adopters of agroforestry innovations? (3) How does adoption affect the final distribution of wealth?

Even the most carefully designed projects, however, are often frustrated by local institutions governing property rights and resource tenure, by macroeconomic development strategies, and by government

policies affecting prices in land, labor, capital, and agricultural input markets. These institutions, strategies, and policies often produce market distortions and failures that underlie many of the land-use problems agroforestry intends to solve. Therefore, in the final section, we investigate both how these factors affect land use and agroforestry planning and what policy reforms are required to facilitate successful agroforestry and rural development.

Agroforestry is a young field, and the literature is not yet highly analytical. Economics, however, has a strong analytical framework. Therefore, this review relies on a wide range of economics literature and a general knowledge of agroforestry to identify the critical questions and hypotheses for examination within agroforestry, as well as the conditions under which agroforestry is particularly useful for economic development.

EFFICIENCY IN AGROFORESTRY SYSTEM AND PROJECT DESIGN

The efficiency objective implies using the resource available to a community to promote farmer welfare, community development, and economic growth. To achieve this, the social marginal benefits from the agroforestry activity (for example, increased wood and food production, decreased soil erosion, and afforestation) must exceed the social marginal costs (such as expenses for seedlings, education, extension, and public participation). In addition, the net benefits from agroforestry investments must equal or exceed the net benefits that would accrue from identical levels of investments in alternative development activities. Any agroforestry activity that does not satisfy these requirements cannot be justified on efficiency grounds.

Successful, locally initiated agroforestry activities meet these requirements, or they would not continue. Individual decision making and local markets assure this result. Therefore, market responses to agroforestry activities are largely indicative of the likelihood of adoption. Local farmers and communities, however, may not consider the many nonmarket, or external, benefits and costs associated with land use in their decision making. Therefore, projects initiated by government or international donor agencies require more formal efficiency analyses and more explicit consideration of these nonmarket values. We first examine the criteria for optimizing agroforestry production and design decisions from the point of view of the individual farmer. We then consider how optimal decisions from a social point of view may differ from the farmer's decisions by including external or nonmarket goods and resource services.

Optimizing Agroforestry Production and Design Decisions

Three bioeconomic relationships form the basis for optimizing agroforestry production and design decisions:[1]

1) *Input-output* addresses the question of whether to adopt an agroforestry activity and how much to produce.

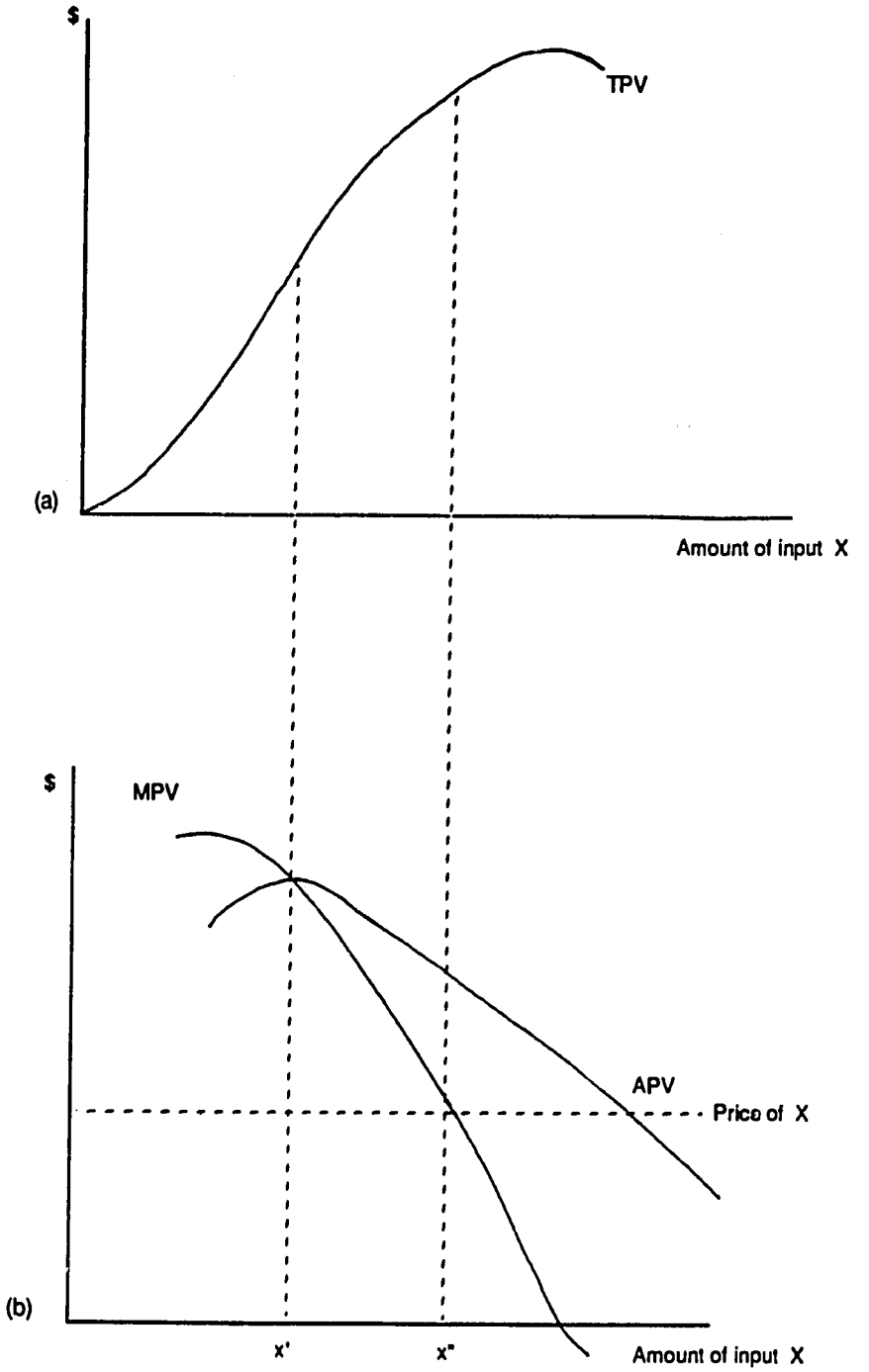

Figure 7.1: Optimal choices of inputs:
(a). Agroforestry total product value curve (TPV)
(b). Average product value curve (APV) and marginal product value curve (MPV)
x' = maximum rational level of input use
x" = minimum rational level of input use

2) *Input-input* considers the question of how to optimally combine two or more inputs (for example, water and fertilizer) in order to produce a certain level of output.

3) *Output-output* addresses the question of what is the best combination of two or more outputs with a given level of inputs. This third question is important for mixed agriculture and forestry operations, particularly for systems that intercrop trees and other annual crops.

Input-output decisions: How much to produce?

The basic tool economists use to examine input-output relationships is the production function, which shows the quantity of output as a function of the level of inputs. It is derived from knowledge of the biological response of plants to production inputs. The total product value (TPV) curve illustrated in figure 7.1a is derived by multiplying the production function by the price of the output. The average product value (APV) (TPV divided by amount of input) and marginal product value (MPV) (the value of the additional production from the last unit of input) are illustrated in figure 7.1b.

The decision facing the agroforester or farmer is to choose the amount of production inputs to maximize profit or net gain. This is achieved by increasing the use of inputs to the point where the value of the final unit of input just equals the value of the output attributed to that input (that is, where marginal cost, the price of x, equals marginal benefit, MPV). This occurs at input level x' in figure 7.1b. Before this point is reached, the additional benefits from using more inputs are greater than their costs. Beyond this point, the additional benefits of using another unit of input are less than their costs.

The optimal (and maximum) level of input use is represented by x' if no resource constraints exist. However, in most agroforestry situations, farmers operate under severe resource constraints. For example, there may be limited supplies of water, fertilizer, quality land, and seedlings. Even labor may be limited in some seasons. In these cases, point x'' becomes an important decision point. This point represents the level of input use that maximizes the net average value of production. If it pays to use a resource at all, no less than this amount should be used because the net average value of production increases until x'' is reached. For example, if farmers are experiencing severe resource constraints (e.g., labor, capital, water, fertilizer) for annual crop production, they may grow trees on part of their land. Because trees usually require only a small amount of the nonland constrained inputs, they may only slightly decrease the efficient level of annual crop production. The trees, together with the annual crops, increase the combined average output of the scarce nonland inputs to production. The optimal combination of scarce inputs and tree outputs will fall somewhere between x' and x'', depending on the individual farmer's particular resource constraints.

Input-Input decisions: Which input combination?

Figure 7.2 illustrates the decision criteria for determining the combination of inputs that maximize net revenue. Curves Q_1, Q_2, and Q_3 (iso-product curves), show all combinations of the inputs X and Y that produce a given level of output; output quantity or value increases from

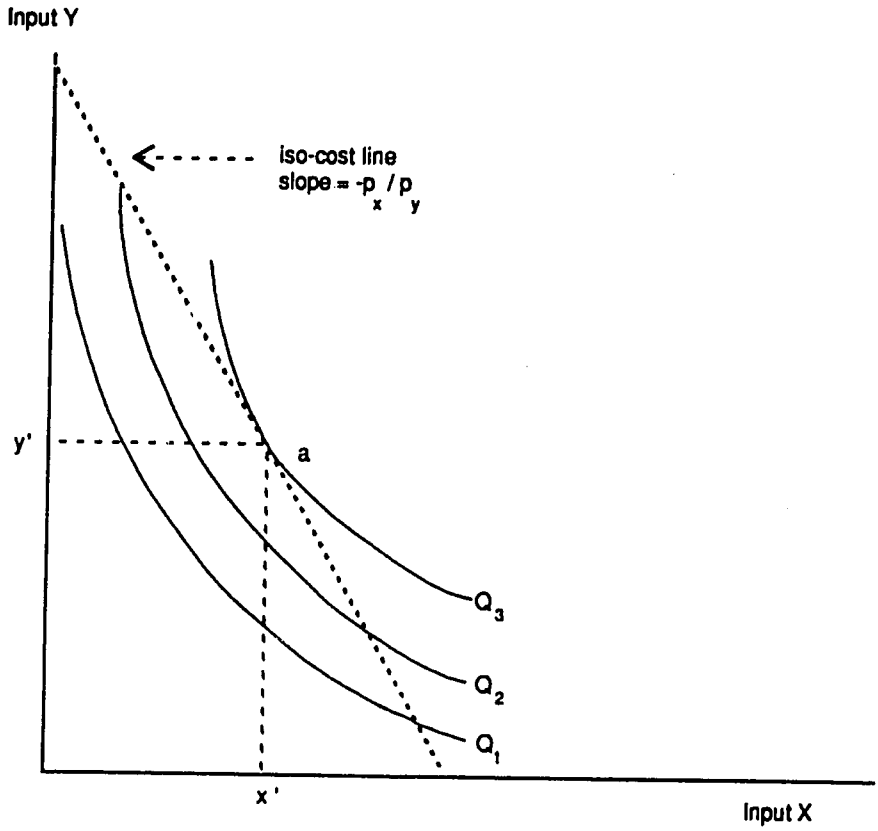

Figure 7.2: Optimal combination of two inputs, X and Y.

Q_1 to Q_2 to Q_3. The optimal combination of inputs depends on their prices, which determine the iso-cost lines in figure 7.2. Iso-cost lines represent all combinations of the two inputs that can be purchased for a given cost. Therefore, the iso-cost lines can be thought of as the farmer's budget constraint: the farmer can afford any combination of inputs on or below this line. The optimal combination of inputs occurs at point *a* where the iso-product and iso-cost curves are tangent. At this point, the farmer reaches the maximum possible iso-product curve, given the budget constraint, and uses x' of input X and y' of input Y to produce Q_3 of output.

Output-output decisions: Which output combination?

The general rule for efficiently allocating resources in any multiple output enterprise is to allocate the inputs so that the marginal product values are equal for all outputs. If the marginal product values are equal, gains could be obtained by shifting resources from the product with the lower marginal product value to the one with the higher. In other words, the resources or inputs should be shifted from one output to another so long as the gain from the increased production in the first is greater than the loss from decreased production in the second. For agroforestry systems, this means that it pays to continue adding trees to the farm as

long as the value of each additional tree is greater than the value of the output of the annual crop no longer produced on that spot of land.

Determining the optimal combination of outputs in an agroforestry system requires knowledge of how the tree and annual crops interact and information about the local valuation of the outputs. The production possibility frontier (PPF) is a function that shows the alternative efficient combinations of the annual crop and woody perennial crop that can be produced by a farmer with a given level of resource inputs.[2] The PPF, therefore, integrates the biological interactions of the system's components with the economic information available to the farmer. Figure 7.3 illustrates the PPFs for the three possible interactions between the two components: competitive, supplementary, and complementary. Two outputs are *competitive* when one output must be reduced to produce more of the other. Outputs are *supplementary* if increasing the production of one has no effect on the other. Outputs are *complementary* if increasing the production of one product also increases the production of the other.

The typical PPF for agroforestry systems exhibits a composite of these three relationships as illustrated in figure 7.4 (Filius 1982). The extremes of the PPF (areas *ab* and *de*) show the possibility that certain combinations of trees and annual crops are not competitive, but complementary. For example, adding trees to annual crop production may reduce weeding needs, increase available nitrogen through nitrogen fixation, provide a beneficial microclimate, or reduce erosion control costs. At the other extreme, growing annual crops during early stages of tree plantations (for example, *taungya* systems) may also result in decreased weeding costs for the plantation and increased tree production. However, as either more trees are added to annual crop production or more crops to tree plantations, competition for nutrients and light predominate to produce a region of competition such as region *bd* in figure 7.4. A supplementary relationship exists at points *b* and *d*.

Determining the optimal production combination on the PPF requires information about the social valuation of the outputs. (Market price measures the social valuation in nonsubsistence cases). Together, these data are used to construct the iso-revenue line in figure 7.4, which represents all combinations of outputs that produce the same income. The farmer's goal is to reach the highest possible iso-revenue line (that is, the highest income). This occurs when the PPF and iso-revenue lines are tangent, as at point *c* in figure 7.4. The slope of the iso-revenue lines represents the rate at which the two goods can be exchanged (the relative social valuation). Therefore, the optimal combination of annual and perennial crops in an agroforestry system will change as their relative values change.

For agroforestry to be a feasible alternative, the PPF must be concave to the origin, as in figure 7.4. Figure 7.5 shows a PPF that is convex to the origin and the corresponding iso-revenue line. In this case, the optimal solution is specialization in either annual crops or forestry, depending on the price ratio, but not production of both. Convex PPFs occur when the tree and annual crops are strictly competitive, as in intercropping or rotation, or when economies of scale exist in either annual crop or tree production. Specialization is also optimal with a concave PPF if one of the products is of such little value that the resulting iso-revenue line is either very steep or flat.

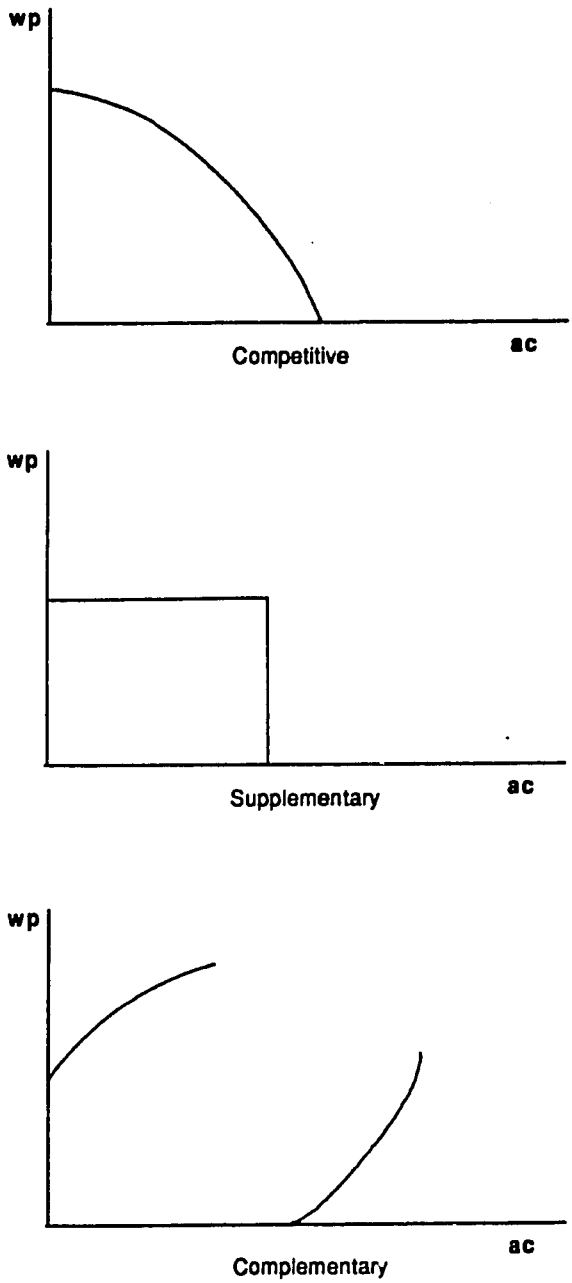

Figure 7.3: Production possibility relationships.
wp = woody perennial output
ac = annual crop output

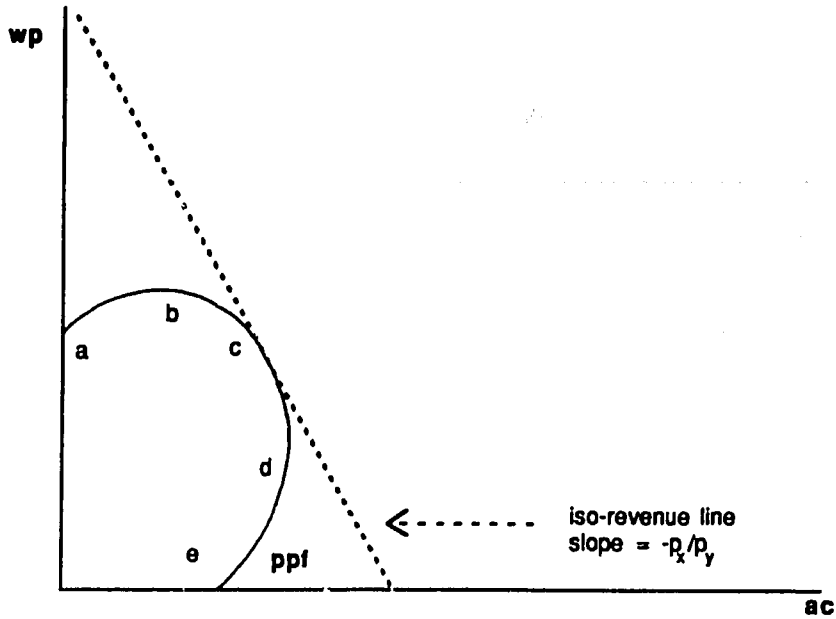

Figure 7.4: Concave production possibility frontier (PPF) resulting in agroforestry solution as optimal choice.
wp = woody perennial output
ac = annual crop output
c = optimal combination of wp and ac

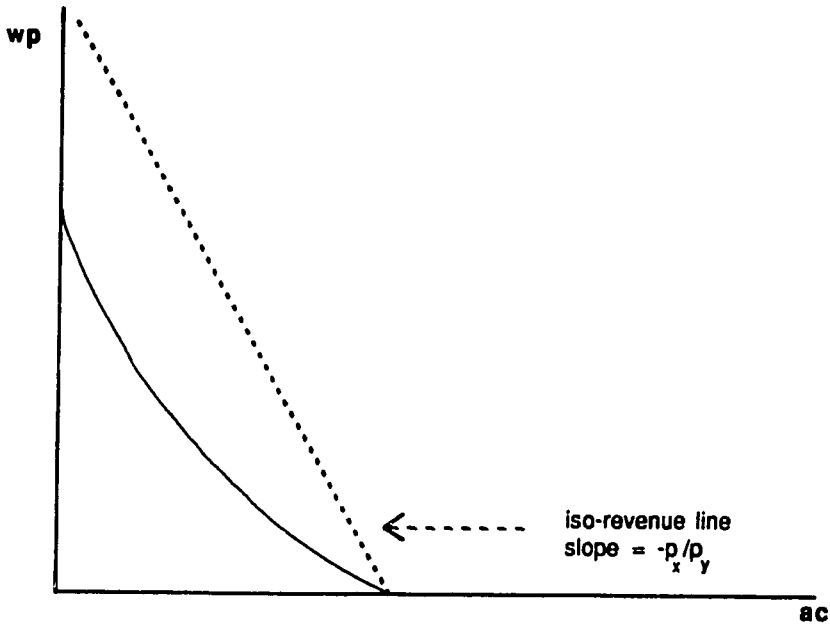

Figure 7.5: Convex PPF resulting in specialization in annual crop production.

Temporal considerations

In contrast to simple annual crop systems, the woody perennial component of agroforestry systems also requires analysis over a multiperiod time frame. Figure 7.6, from Etherington and Matthews (1983), provides a graphical approach for interpreting multiperiod production possibility frontiers. Here, an additional axis showing the time dimension is added to the standard PPF graph. The MCC′ M′ curve in figure 7.6 represents the PPF over the time period O to *T*. The PPF surface in figure 7.6 is drawn so that the yield of the annual crop declines over time (a common result in tropical soils that exhibit diminishing fertility with continuous cultivation), while the yield from the woody perennial output is *OD* at time O, the annual crop yield foregone is *BC*.[1] At time *T*, the woody perennial component has grown to *TD*′ along with an increased use of resources (for example, larger trees mean more crown closure and greater use of both land and sunlight) so that the annual crop production has been reduced to *TB*′.

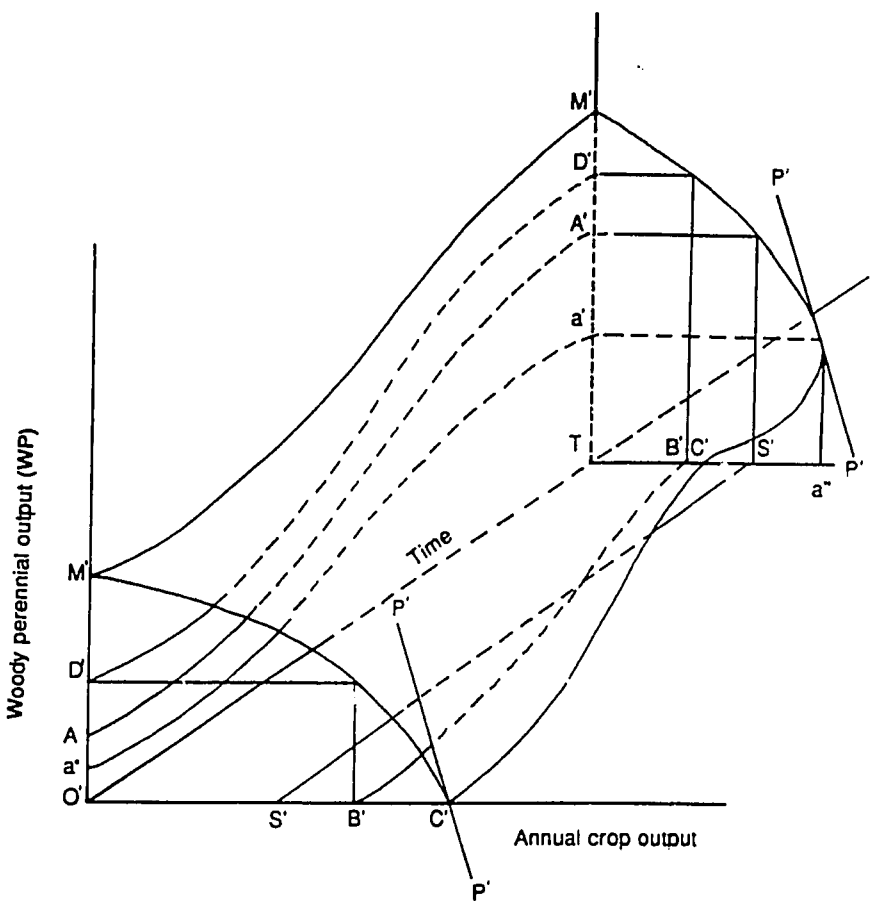

Figure 7.6: Multiperiod production possibility surface.
Source: Etherington and Matthews 1983.

To see how figure 7.6 can be used for analyzing agroforestry planning decisions, assume that the farmer's minimum subsistence needs require an annual crop production of at least *OS* in period O and *TS′* in period *T*. These subsistence requirements permit any woody perennial component between *Ta′* and *TA′* at time *T*. As before, optimal production levels depend on the relative prices. In this example, the relative prices are assumed to be constant over time, and the price of the annual crop is high relative to the woody perennial crop, resulting in a steeply sloped iso-revenue line (line *PP* in figure 7.6). With a shortsighted planning horizon, as may occur with insecure land tenure or ignorance of agroforestry possibilities, the farmer chooses to produce OC of the annual crop at time O and none of the woody perennial component. This result leads at time *T* to an annual crop production of *TC′* and no woody perennial production (producing at point C′).

This, however, is a nonoptimal long-run solution since the farmer could choose to produce, for example, *Oa* of the woody crop at time O, still meet subsistence annual crop needs at time O, and also produce *Ta′* of the tree crop and *Ta′′* of the annual crop at time *T*. The choice is between higher income now and higher income in the future, and the final optimal intertemporal decision depends on a variety of factors including the length of the time period, the discount rate,[4] and the security of land tenure and property rights.

Nonmarket values and agroforestry design

The discussion to this point has only considered agroforestry design and decision making from the farmer's perspective: given the prevailing social valuation or market prices, will the farmer utilize agroforestry? If so, which combination of trees and crops will maximize the value of production on the multiproduct farm? We have not considered the external and nonmarket benefits and costs of land use because they do not accrue directly to the individual farmer and therefore do not affect farmer decisions.[5] From society's viewpoint, however, these can be key factors in the decision to promote agroforestry projects and should be included in project design decisions.

As we showed above, the private farmer bases his production decision on the PPF and the relative values (such as market prices) of the products. From society's viewpoint, however, the market prices may not reflect nonmarket and external benefits and costs associated with production of the various outputs. For example, nonmarket benefits such as reduction of erosion and watershed deterioration provided by the trees in an agroforestry system are services that add to the social value of the woody component. Likewise, the social value of annual crop production is reduced by the external costs associated with their production (such as increased soil erosion or reservoir sedimentation).

Therefore, in determining optimal production levels from society's perspective, the values of the products must be adjusted to include associated nonmarket and external benefits and costs. These new values are referred to as shadow prices.[6] Figure 7.7 illustrates how a farmer's and society's optimal production decisions may vary. The private iso-revenue line reflects the farmer's relative valuation of the outputs based

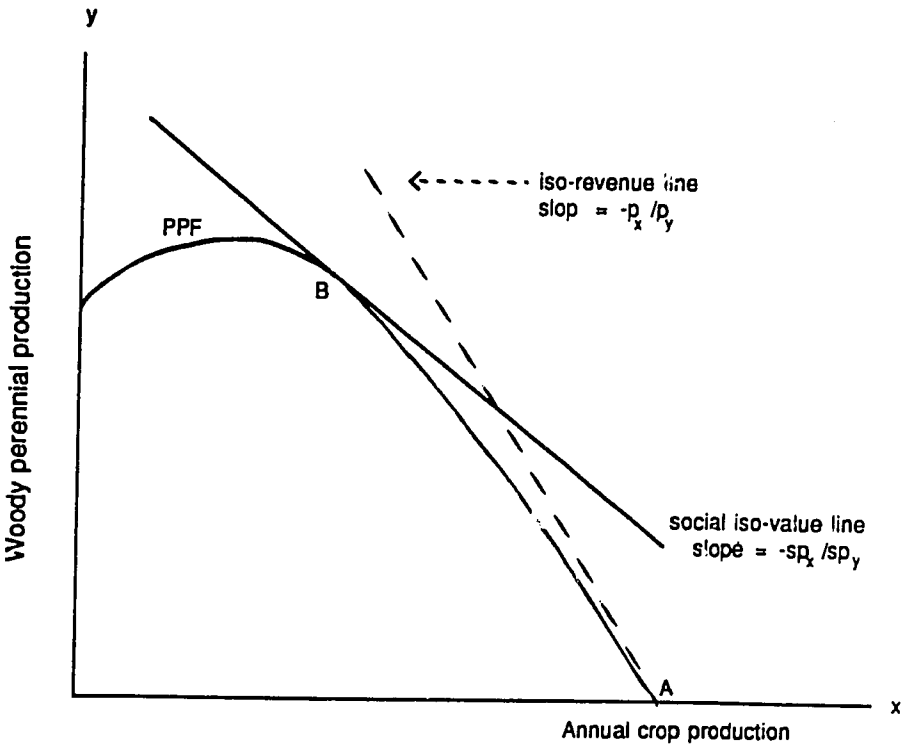

Figure 7.7: Social vs. private optimal production decisions.
p_x and p_y = market price of x and y respectively
sp_x and sp_y = shadow price of x and y respectively

on their market prices, p_x and p_y. In contrast, the social iso-value line reflects society's valuation of the outputs based on their shadow prices, sp_x and sp_y. In this case, society values the woody perennial production more highly than is reflected in the market price of the woody crop because of the positive environmental externalities associated with tree growing (that is, $sp_y > p_y$). The negative environmental externalities associated with annual crop production (for example, erosion) cause the shadow price of the annual crop to be lower than the prevailing market price (that is, $sp_x < p_x$). therefore, the social iso-value line is less steeply sloped than the private iso-revenue line.

Optimal production from the farmer's perspective occurs at point *A*, specialization in annual crop production. From the social perspective, however, optimal production occurs at point *B*, an agroforestry combination. Analysis of this kind may indicate the need for policies or programs (for example, subsidies or price incentives) to encourage the farmer to adopt the agroforestry system in order to maximize social benefits.

This section and these figures have discussed the general concepts concerning economically efficient applications of agroforestry. The more difficult task is applying these concepts in specific quantitative and empirical cases in order to determine which agroforestry systems work in

different locations and what input or output modifications might be sufficient to permit others to work. This is a rich area for inquiry. As yet, most agroforestry program planning and policy making has had to make do without such rigorous and quantitative analyses. Filling this gap in our knowledge will enable improvements in agroforestry programs and policies. This is the challenge.

DISTRIBUTIVE CONSIDERATIONS IN AGROFORESTRY PROJECT DESIGN

Many agroforestry projects are intended to promote some kind of distributive gain, for example, job creation in poor rural communities or income improvement for small farmers. Obviously, simply stating that a project is intended to provide distributive gains is insufficient. Each project must be evaluated on the basis of answers to three important questions (Hyde 1989):

1) Will the benefits of the project reach all the poor in a community or only certain groups of the poor (for example, the poorest of the poor)?
2) Is it acceptable for the relatively well-off to benefit from the project if the poor also benefit?
3) Is it acceptable if the well-off gain more than the poor?

These questions are important because rarely does the whole target group benefit from any project, and rarely are the poor the only gainers. In fact, although rural development projects are frequently designed to benefit the poor, the biggest gainers are often the aggressive and innovative larger landowners.

Who the target population is, whether this target population is truly deservng of distributive gains, and whether the target population will actually benefit from the proposed project must be determined. These empirical questions, however, are often simply assumed away. For example, in the United States many forest policies are at least partially justified on distributive grounds. Nevertheless, in the only wide-ranging assessment of the distributive impacts of forest policies known to us, Boyd and Hyde (1989) found that nine out of ten United States forest policies redistributed income from the poor toward relatively wealthier groups. Obviously, careful analyses are needed before casually accepting assertions regarding distributive gains from rural development projects.

What kind of distributive effects an agroforestry project will have is determined in large part by which particular goods and services are produced and which members of the local community adopt the agroforestry innovations. First, we discuss the choice of goods and services to be produced by an agroforestry project. This choice determines the distribution of gains among consumers. Then we review the literature on adoption and diffusion of agricultural innovations to derive insight on the distributions of gains to producers.

Choice of Goods and Services

Agroforestry projects encourage increased production of at least one or

more goods and services. Goods include wood (for a variety of purposes) and food. Services might include increased erosion control, decreased sedimentation of rivers, and reduced deforestation rates. The impact of increased production of goods may be significant for both urban and rural poor depending on the existence of markets for the goods. The distribution of gains among consumers will depend primarily on the relative share of the household budget that the goods represent[7] and on the relative price and income elasticities of demand for each income group (Hyde 1989, Ruttan 1977).

It is obvious that a program emphasizing production of goods representing small shares of the household budgets of the poor can only have limited distributive impact; achieving a significant distributive impact is more likely the greater the budget share. For example, the introduction of improved rice-growing technologies in Colombia resulted in increased rice production from 600 thousand metric tons (in 1966) to 1,570 thousand metric tons (in 1974). The result was lower prices and increased per capita consumption that allowed the lowest income quartile of household (for whom rice represented a substantial share of the household budget) to capture 28% of the consumer benefits while receiving only 4% of household income (Rutten 1977). In many cases, the share of the rural poor's expenditures for forest products is unclear; however, the conventional wisdom is that fuelwood, fodder, and forage make up a large proportion of their budget. In contrast, agroforestry projects emphasizing production of pulpwood are not likely to achieve distributive gains for poor rural consumers.

Price and income elasticities of demand are measures of how consumption of a good or service varies with changes in prices and income, respectively. The larger the price elasticity of demand, the greater the increase in consumption of the good for a given drop in price. Therefore, increased production of a good with a high price elasticity will produce greater distributive gains for the poor than a good with a low price elasticity of demand. A high income elasticity indicates that a given rise in income will result in a relatively larger increase in consumption of the good in question. Thus, a program emphasizing production of goods with both high prices and high income elasticities for consumers in lower income groups is likely to continue to produce distributive gains even as economic development occurs and the target population's income and wealth rise. Even if errors occur in assessing the target population or its initial income level, high income elasticities may still result in the project achieving its distributive objectives (Hyde 1989).

Adoption of Agroforestry Innovations

The distribution of benefits of an agroforestry project among producers obviously depends on who chooses to adopt the agroforestry innovation. Many agricultural projects intended to benefit the poorest and smallest farmers have the most obvious impact on the innovative, aggressive, larger farmers. The study of the adoption of agricultural innovations, attitudes toward risk, and methods of improving decision making in the face of uncertainties has received considerable attention from agricultural and development economists as a result of the infrequent success in achieving

high adoption rates in developing countries (Feder et al. 1985, Barry 1984, Ruttan 1977). Most of the work has focused on green revolution technologies. Nevertheless, in many cases, the results are directly applicable to agroforestry.

Rates of adoption often vary over time and across socioeconomic groups; some innovations are widely adopted, others, only infrequently. Low adoption rates typically have been attributed to capital and credit constraints, limited access to information, risk aversion, small farm size, insecure land tenure, insufficient human capital, inadequate and chaotic supply of inputs, and inadequate transportation infrastructure (Feder et al. 1985). Interested readers will find a review of the principal economic models used to predict adoption rates in the appendix to this chapter. The results from empirical studies of adoption behavior as they relate to agroforestry planning are briefly discussed in the next section.[8]

Empirical Studies of Adoption Behavior

There are no rigorous empirical studies known to us that specifically examine the adoption of agroforestry innovations. Numerous empirical studies, however, have examined the adoption of green revolution innovations in developing countries. Following an exhaustive review of empirical and theoretical studies on adoption behavior in these countries, Feder and colleagues (1985) concluded that risk and uncertainty, farm size, human capital, labor availability, credit, and land tenure are the key explanatory variables. The latter five are all partial measures of the farmer's wealth.

Risk and uncertainty

Farmers are subject to two types of risk associated with agroforestry innovations. *Subjective risks* derive from uncertainties associated with a lack of knowledge and familiarity with new technologies. *Objective risks*, in contrast, are associated with uncertainties concerning possible states of the world (such as weather, insect pests, timely availability of inputs). Theoretical studies indicate an inverse correlation between the degrees of risk aversion and the amounts of land allocated to innovations. However, probabilities of high adoption rates increase as information increases (for example, through extension efforts), reducing the perceived subjective risks. The likelihood of adoption is also related to the farmer's ability to decipher and analyze the available information. This means that the less educated, generally poorer farmers with small landholdings are unlikely to be the first to adopt new agroforestry practices.

Farm size

Ruttan (1977) reviewed the green revolution adoption literature and concluded that farm size was not a serious constraint to adoption nor an important cause of differential productivity growth. Also, the slower adoption rates of farmers of small landholdings typically disappeared within a few years. The majority of empirical and theoretical work suggests that farm size may act as a proxy for such factors as wealth, access to credit, capacity to bear risks, and access to scarce inputs and

knowledge. The relationship between farm size and adoption rates varies as the importance of the correlated factors varies in different regions and times. Both theoretical and empirical work suggest that innovations requiring large fixed implementation costs reduce and delay adoption by smallholders. Weil (1970), however, found that in some cases this is primarily a function of credit constraints.

Human capital

Schultz (1964) and Welch (1978) suggested that better-educated farmers tend to be earlier adopters and to use the innovations more efficiently throughout the adoption process. Several empirical studies have validated this (for example, Villaume 1977, Rosenzwieg 1978). Jamison and Lau (1982) found that only education above a threshold level of four years had an effect on adoption rates in Thailand and that adoption rates were positively correlated with age (representing experience) and extension efforts.

Credit

Capital, in the form of savings or credit, is required in order to finance many agricultural and agroforestry innovations. Therefore, differential access to capital is frequently cited as a major factor determining adoption rates. Several studies have confirmed this (Bhalla 1979, Khan 1975, Frankel 1971). However, others have argued that adoption of scale-neutral innovations are not necessarily inhibited by credit constraints. For example, Schutjer and Van der Veen (1977) concluded that the profitability of innovations often induces small farmers to find the cash required for adoption from their relatively meager resources.

Land tenancy versus ownership

Owning rather than leasing land may have differential effects on adoption behavior. In the next section, we discuss the impact of insecure property rights on agroforestry decisions, limiting the present discussion to the effects of owning versus renting land. Both theoretical and empirical work provide conflicting results on the effects of tenancy arrangements on technology adoption. A group of controversial theoretical works (for example, Bahduri 1973, Scandizzo 1979) concluded that, when interest earnings and price margins are high, a landlord who also provides credit will resist the adoption of innovations by the leasors. This observation, however, was refuted by Srinivasan (1979), de Janvry (1979), and Bardhan and Rudra (1979). Bell (1972) showed that tenants' adoption attitudes depend on the profitability and riskiness of the technology rather than on the lease arrangements. In Bell's model, innovations attractive to tenants are also attractive to less risk-averse landlords who are inclined to share the variable costs with the tenants.

Empirical work on the relationship between tenancy and the adoption of innovations reflects the unsettled debate in the theoretical literature. For example, Parthasarathy and Prasad (1978) concluded that tenants had a lower tendency to adopt innovations than landowners, while Vyas (1975) concluded that tenants were not only as innovative as landowners, but sometimes used more inputs per hectare than landowners. According to

Schutjer and Van der Veen (1977), differential tenancy effects may result from differential access to credit, markets for inputs and products, and technical information. Inappropriate consideration of these factors in different socioeconomic and cultural settings may account for the conflicts in land tenancy effects on adoption behavior. However, Ruttan (1977) concluded that landowners generally gained more than tenants and laborers from the adoption of high-yielding varieties.

Summary of adoption studies

Studies of adoption behavior suggest that the wealthier, more educated, and more aggressive members of any community are more likely to accept new ideas and adopt new technologies. Those with the least amount of land, labor, and financial risk capital (the poor) are unlikely to take the lead in adopting agroforestry innovations. Initially, therefore, distributive gains are most likely to flow to the wealthier farmers who are willing to bear the initial risks. Over time, however, their successes with the technology serve as incentives to the poorer farmers, so that adoption rates of wealthier and of poorer farmers eventually equilibriate. This process may be speeded up by reducing subjective risks through education, extension, and local demonstrations of the technologies and by improving access to credit and variable inputs.

Projects that produce outputs which are large budget items of poor households and which have large price and income elasticities of demand can still provide distributive gains to poorer farmers in the early years of the project before the land-use technologies are adopted and the full distributive impacts of the project are realized. Therefore, projects that initially distribute gains to those who are better off may still provide substantial secondary benefits to the poorer members of society. In the long run, they may provide substantial primary benefits. Nevertheless, the rate of technological diffusion as well as the household budget share and the income and price elasticities provide indications of the usefulness of any agroforestry activity for the rural poor.

DISTORTIONS OF AGROFORESTRY INCENTIVES

Our discussion to this point has assumed (implicitly) that capital, labor, land, and commodity markets function perfectly to provide farmers with information and incentives to make optimal land-use decisions. However, market failures and distortions are often underlying causes of many of the land-use problems for which agroforestry systems are the proposed solutions (Southgate 1988). We have previously suggested that adjustments may need to be made in agroforestry planning to take into account externalities and nonmarket benefits and costs of land use. We examine the effects of market failures and distortions on incentives for adopting and utilizing agroforestry. These can be divided into three categories:

1) *Property rights regimes*, including the problems that arise from insecure land tenure, common property, and open access lands

2) *Price distortions*, including distortions in capital, labor, and commodity markets

3) *Macroeconomic development policies and strategies* that promote industrialization at the expense of rural sectors or otherwise distort the agricultural sector

Property Rights Regimes

The local property rights regime, or land tenure system, is one of the most important factors for determining whether or not agroforestry and other conservation measures will be utilized by small farmers. Economic theory strongly predicts (and is supported by recent experience in developing countries) that, unless property rights are fully articulated and enforced, farmers' resource allocation will be inefficient and will produce social losses (Magrath 1989).[9] Rarely, however, do smallholders in developing countries possess nonattenuated (that is, secure and unlimited) private property rights (Southgate 1988). The three most familiar property regimes facing small farmers in developing countries are (1) attenuated private property (where ownership is either limited over time—temporally attenuated—or by use), (2) open-access land (which is controlled and managed by the community as a whole or by groups within the community). This section discusses the implications of these three property rights regimes on agroforestry.

Attenuated private property rights

In areas with insecure or attenuated private property rights, farmers are uncertain whether they will be able to claim the future benefits arising from their investments in the land. For example, agroforestry and other soil-conserving techniques (such as terracing) require some sacrifices in the short term in order to obtain significant gains in the long term. However, if farmers hold temporally attenuated property rights or precarious legal claims to their land, then they will be unwilling to trade costs now for benefits to which they may have no right in the future.

Furthermore, tenure that only recognizes use-rights (as in much of Latin America) also frequently results in suboptimal land management (Southgate 1988). For example, on public forestlands in many developing countries, continued use by squatters and adjacent farmers is often permitted, while permanent claims and opportunities for either alternative land uses or land exchange are forbidden. Without these opportunities, land managers or farmers have only limited incentives to make the long-term land improvements associated with agroforestry and most conservation practices.

Therefore, investments in resource-conserving practices such as agroforestry should be positively correlated with security of land tenure either temporally or by use. Increased uncertainty reduces investment incentives and encourages preference for current consumption over future consumption (Feder et al. 1988). Little incentive exists for managing currently standing trees, planting trees, or introducing other soil conservation practices. In this situation, projects promoting agroforestry cannot be expected to show great success.

Insecure land ownership also reduces long-term investments in the land by restricting access to credit. A secure legal title may facilitate a

farmer's access to cheaper, longer-term, and more extensive institutional credit (Feder et al. 1988). First, without a legal title the land cannot be mortgaged. This reduces access to credit, especially from formal lending institutions that require substantial collateral and that may not know the farmer personally. These farmers are usually forced to seek loans in informal credit markets where collateral is less important and lenders more often base their decisions on personal familiarity with the borrower. Informal credit, however, is usually more expensive and confined to smaller and shorter-term loans. Lenders also typically view farmers who lack clear title to their land as greater credit risks and therefore charge higher interest rates. For these reasons, farmers lacking secure land ownership find it more difficult (if not impossible) to gain access to low-cost, long-term credit.

In the most extensive empirical study to date of the effects of insecure land tenure, Feder and colleagues (1988) found that Thai farmers holding secure property rights receive significantly larger volumes of institutional credit (which is cheaper than alternative credit), utilize greater amounts of variable inputs per unit of land, introduce more conservation practices, and achieve significantly higher rates of production than farmers otherwise identical in all respects but lacking secure land ownership. The main source of the greater productivity was the greater access to cheaper and longer-term institutional credit. Benefit-cost analysis indicated that providing full legal title to the farmers' lands would bring a very high economic return, with the benefits far outweighing the relatively small costs. Other options (for example, forcing banks to provide credit to untitled farmers, or providing limited formal land tenure through nontransferable leases from the state, or usufruct certificates) were found to be either more costly or less effective in improving access to credit.

Open-access lands

Open-access regimes, in which the land is owned by no one but is available for use by anyone, inevitably causes depletion and land degradation (Magrath 1989, Southgate 1988). Gordon's (1954) seminal work showed that open-access resources are overutilized because the gains from conserving the resource (limiting harvest levels) are viewed as excess profits available to everyone. These profits entice others to exert even greater pressure on the resource. Therefore, incentives for any individual to adopt agroforestry or other conservation practices are nonexistent since any gains that result will be quickly expropriated by other resource users.[10]

This is Hardin's (1968) famous "tragedy of the commons."[11] It often occurs in developing countries, even where the property rights belong to the government, if the government has no adequate means to enforce these rights. Many of the third world's most serious land-use problems are the result of failures by governments either to enforce their rights to manage these properties or to cede them to private individuals or communities (Southgate 1988). Attempts by development agencies or governments to improve resource conservation (such as using agroforestry to plant trees in open-access pasture land) without accompanying changes in the land's open-access status are doomed to long-run failure.

Nevertheless, institutional changes sometimes do occur to act as a brake on land depletion and degradation (Hyde 1989). Development of the area may spur local communities or citizens to establish more permanent community or private rights to the future management and use of the land. Increasing forest values (perhaps aided by agroforestry extension and educational services) may cause local communities and citizens to assert and petition for secure rights to previously open-access forest resources. These newly established rights provide incentives for adopting sustainable management techniques such as agroforestry because they ensure the right to obtain the future gains that accrue from current management.

Common property

In contrast to open-access lands (which are properties of no one), the rights to common properties are held by well-defined groups (such as members of a particular village, tribe, or clan) that are able to exclude nongroup members from using the resource. The group reaps the benefits of management, investment, conservation, and protection of the resource. Traditional common property systems have been utilized successfully throughout history to manage resources on a sustained basis (Ciriacy-Wantrup and Bishop 1975, Runge 1981). The current problem is that many of these traditional systems are breaking down due to pressures from outside sources, population increases, or new demands on the resource. The result is often conversion to an open-access regime or appropriation by smaller, more responsive economic entities (for example, private individuals or businesses). In other cases, the central government claims the resource but frequently (as discussed above) does not have the means to enforce its claims so that, in effect, open-access prevails. (An example of this process and its reversal is discussed in Blair, this volume, under Public Choice Theory.)

Many analysts (Ault and Ruttman 1979, Cheung 1970, Demetz 1967, Hardin 1982, Johnson 1972, Stroup and Baden 1983) have argued for privatization of common property resources as the best or only solution to the problems of the breakdown of common property institutions. In many situations, this is probably accurate. However, even if it is technically and politically feasible, privatization faces several problems (Magrath 1989). Fragmentation of the resource may result in the loss of economies of scale and difficulties in protecting the property rights of relatively powerless small owners. Equity becomes a problem in dividing the resource when powerful elites are present in the community or when centralization of control ensues. Finally, all privatization schemes may be subject to divergences between private and social costs, and social losses may occur even if the individual private owners are former members of the group that controlled the commons. For example, common properties often provide a form of insurance for group members, and dividing it among the population removes its potential to serve as a polled insurance policy (Hyde 1989).

Furthermore, the breakdown of common property institutions and management systems is not an inevitable result of the development process. A variety of recent studies indicate that, while often difficult and

costly, community management of resources is feasible and can contribute to economic development (Bromely and Chapagain 1984, Griffen 1986, Marwell and Ames 1981, Runge 1981, 1985). With proper planning, agroforestry projects may be based on community management of the resource.[12] After an exhaustive review of the common property management literature, Magrath (1989) concluded that projects emphasizing community management are more likely to be successful the smaller and more clearly defined the boundaries of the common property resource, the smaller the group of users, the closer the resource to users' homes, the more vital the resource for survival, the more concentrated the benefits, the higher the costs of enforcing private property rights, and the lower the community's rate of time preference.

He also suggested the following necessary conditions for successful modern community management systems:

1. A recognition by the community that resource scarcity exists
2. Centralized investment planning and decentralized management
3. A system of exchange of information between users and managers
4. Strong, accountable, local leadership
5. Technical or extension services that provide a solid technical basis for management

Price Distortions

Distorted prices in labor and nonlabor agricultural input, capital, commodity, and foreign currency markets have been important causes for the reluctance of small farmers in developing countries to adopt conservation practices (Southgate 1988). In many situations, getting farmers to adopt agroforestry systems will remain difficult (if not impossible) in the face of these distorted price signals. In this section, we discuss how government policies influencing prices in labor, capital, commodity, and foreign currency markets may affect agroforestry decisions.[13]

Opportunity cost of labor

The opportunity cost of labor, which is the smallholder's primary factor endowment, is a key determinant in his decisions concerning agroforestry. Small farmers considering adopting agroforestry may face labor constraints for several reasons. First, seasonal variations in the opportunity cost of labor may be considerable. During planting and harvesting of their subsistence crops, the labor required for instituting an agroforestry system may carry a considerable opportunity cost. Second, off-farm employment opportunities often are important factors in allocating on-farm labor. For example, in Indonesia, the Philippines, and Thailand, as much as 40% of farm household income has been attributed to off-farm sources (Koppel and Zurick 1988).

Therefore, changes in government minimum wage laws or other policies affecting nonagricultural labor demand and supply may have significant consequences on the opportunity cost of labor and land management decisions. These may, however, work in opposite directions. For example, improvements in off-farm employment oportunities or wages could result in less time and effort devoted to land conservation measures, or it might

stimulate adoption of agroforestry systems that reduce the labor-intensity of farming. Careful analysis of local labor markets and wage policies are thus essential to successful agroforestry planning.

Price of capital

Restricted access to capital and credit for smallholders frequently acts as a disincentive to the adoption of long-term investments in land-conserving technologies such as agroforestry (Feder et al. 1988, Southgate 1988). In many cases, small farmers are denied access to formal lending institutions for a variety of reasons, and the only credit available to them is from noninstitutional sources where interest rates are higher and terms are shorter. We have already discussed how insecure land tenure restricts access to low-cost institutional credit. Here we examine government and international donor policies and programs that affect capital markets and access to credit.

In response to the perceived need for lower-cost credit, many developing countries impose heavy regulations dictating lower-than-market rates of interest. These usually apply only to formal institutional lenders because they are impossible to enforce on noninstitutional lenders. In addition, reforming rural credit markets and providing subsidized, cheap credit for small farmers has dominated much of the agricultural and rural development efforts by USAID, the World Bank, and other development agencies in recent years. Credit subsidization and controlled interest rates, however, have often undermined the viability of rural financial markets by exaggerating credit needs and the purchasing power of credit portfolios, by politicizing financial markets, and by concentrating credit in the hands of a relatively few large borrowers (Hayami and Ruttan 1985).

When interest rates are pegged at below market rates, formal credit institutions face excess demand for loans and must ration the available (often subsidized) credit. In these cases, they tend to favor large borrowers because they can reduce the ratio of loan service costs to loan volume, and they perceive them as lower credit risks. Small borrowers are then relegated to the higher-cost, shorter-term, noninstitutional credit, which decreases their incentives to undertake longer-term investments like agroforestry.

In Brazil, for example, government policies provide for lower real interest rates for agricultural credit than for nonagricultural credit. In some cases, real interest rates for official agricultural credit have even been negative (Binswanger 1989). As Binswanger noted, this difference in the price of credit is capitalized into the price of land. Since the credit is not equally available to farmers at all income levels, these credit subsidies make it even more difficult for poor people to buy land, the price of which has been artificially inflated due to distortions in the credit market. Furthermore, subsidized agricultural credit is often used to sustain current consumption, invest in consumer durables, and invest in land and lower productivity capital inputs (Hayami and Ruttan 1985).

Donor agencies often provide lending institutions with external funds earmarked for small farmers in order to alleviate rural credit shortages and encourage participation by small farmers in rural development efforts. However, without interest rate reform, these programs may not

succeed (Southgate 1988). All too often, the required documentation that accompanies loan applications for these funds reduces the program's impact since the documentation expenses may account for a significant part of the total costs to banks serving rural areas. [14] Furthermore, the real cost of credit to smallholders is often higher than stated because of significant transaction costs such as application fees, repeated trips to the lender, and mandatory deposits in accounts that pay below-market interest rates.

Commodity prices

In order to maintain inexpensively priced food and food products for urbanites, many third world governments use price controls and other policies to keep agricultural commodity prices artificially low (Brown 1978, Schultz 1978). As a result, farmers receive lower prices for their crops and livestocks. This effectively reduces the value of their farmland and discourages farmers from making long-term investments in land-conserving technologies such as agroforestry. Even in the rare case where governments institute agricultural price supports, smallholders rarely receive any of the benefits because either the government lacks the financial resources to effect the policy, or illiterate farmers are never informed of the price support program (Southgate 1988). Many governments also regulate the price of wood products (especially firewood and charcoal) in response to political pressures to maintain inexpensive supplies of fuelwood for urban areas. Unfortunately, this often reduces incentives for farmers in areas near urban centers to adopt agroforestry systems that produce fuelwood (or other wood products subject to price controls). Anderson (1986) described these effects for some African cities.

Exchange rates

Third world governments commonly set official exchange rates for domestic currency above the international market rate. The resulting overvalued domestic currency undervalues agricultural and wood products for export, which reduces the supply of these goods and diminishes the derived demand for agricultural land. As with commodity price control, the value of farmland is reduced, and farmers are less willing to make long-term investments in conservation practices such as agroforestry. If, as in many cases, export crops are the products of woody perennials (such as coffee, cocoa, and tropical fruits) that may form the basis for agroforestry systems, then overvalued exchange rates directly discourage adoption of these systems. In the Dominican Republic, for example, Veloz and colleagues (1985) found evidence that the government's exchange rate policies discouraged farmers from adopting agroforestry systems with major components of coffee and citrus for export.

Overvalued exchange rates that lower the prices farmers pay for imported agricultural inputs may also discourage agroforestry adoption. For example, if an overvalued currency makes agricultural chemicals cheaper for the farmer, it also reduces the cost of soil erosion to the farmer since he can substitute fertilizers for the lost soil fertility. Therefore, agroforestry options may become less attractive in the face of artificially inexpensive imported inputs.

Macroeconomic Development Policies

The market failures and distortions discussed above and the misallocation of resources that they entail have often been the direct result of developing countries' macroeconomic development strategies and policies. These have forced the agricultural sectors to bear the costs of promoting and protecting the industrial manufacturing sectors (Hayami and Ruttan 1985, Johnson 1973, Schultz 1978). The macroeconomic development policies that predominated during the 1960s and 1970s were based on the doctrine that industrialization is the mainspring for economic growth and that industry should be given top priority. Agricultural and rural development were undervalued (Schultz 1978) because (1) urbanites typically wield much greater political influence; (2) agriculture may carry a stigma from supplying products that served the economic interests of colonial powers; (3) agriculture is viewed as inherently backward; (4) farmers are perceived as nonresponsive to economic incentives; and (5) international prices and trade in agricultural products are presumed to have adverse effects on export prospects for traditional primary products such as sugar, tropical fruits, and wood.

Following the strategy of industrially led development, agricultural pricing policies have typically been used to extract economic surpluses from farmers (to be used to promote the industrial sector) rather than for the effective coordination of production decisions at the farm level and for intersector resource-allocation decisions (Hayami and Ruttan 1985). Decisions to adopt development strategies based on extracting surpluses from the agricultural sector were generated primarily by government demands for revenues and for forced savings to support industrial development, by inefficiency and corruption in monopsonist commodity organizations, and by misguided assumptions that the growing industrial base would be able to absorb the displaced labor that resulted from these policies. It is now apparent that, for developing countries in which the agricultural sector makes up a large share of the total employment, even very rapid growth in nonagricultural employment is insufficient to stabilize or reduce the size of the agricultural labor force (Hayami and Ruttan 1985).

Reduced agricultural incentives and continuing high rates of population growth, coupled with insufficient labor absorption by the industrial sectors, resulted in reduced land-labor ratios, agricultural labor productivity, wages, and incomes. The result of these policies was a continuing movement of peasants onto marginal lands, increased tropical deforestation, and extensive land degradation that has prompted the recent interest in agroforestry as a land management and rural development technology. If agroforestry (or any land management technology that emphasizes land conservation and increased rural employment) is to succeed, a necessary condition is to reverse the industrial and trade policies undertaken by many developing countries that have distorted factor prices in favor of large-scale, capital-intensive industrial enterprises.

In contrast to the above scenario, distortions in favor of agriculture can also create incentives to increase deforestation rates in frontier areas and accelerate forest-to-farmland conversion in already settled areas.

Binswanger (1989) documents these effects in Brazil, where tax laws make agriculture a tax shelter by virtually exempting agricultural income from taxation, and tax credit schemes for corporate ranches subsidize inefficient ranches established on cleared forest lands. Exempting agriculture from income taxation increases the demand for land. This occurs especially in frontier areas where urban investors and corporations compete for land to establish ranches, but it is also found in settled areas where wealthy individuals buy out small farmers for the tax advantages. Since the tax benefits are capitalized into land prices, small farmers are priced out of the market in established areas. Their only viable option is to squat on land at the frontier.

Furthermore, the land tax on agricultural holding in Brazil is levied in full on "unimproved" lands but is reduced by up to 90% on crop and pasture land. Forested land is considered "unimproved" and is fully taxed. Therefore, a farm containing forests is taxed at a higher rate than one containing only pasture or crop land; as a result, even lands that are marginal for annual crops or pasture on large farms are often deforested in order to reduce tax liabilities. Finally, since the rules for allocating public lands allow squatters to obtain title for up to three times the area they deforest, they are encouraged to rapidly deforest even larger areas than their agricultural operations would justify.

CONCLUSION

In this chapter, we have reviewed the literature on natural resources, agriculture, agroforestry, and development economics to develop a conceptual framework for designing agroforestry projects, programs, and policies in order to meet efficiency and distributive objectives. We first applied the microeconomic theory of multiple output firms to agroforestry decisions to determine the optimal combinations of inputs and outputs to meet the efficiency criteria. Effectively utilizing the insights from the theory, however, requires accurate estimations of the production possibility frontiers of a variety of agroforestry systems, but we were unable to find any work in this area. Nevertheless, even in the absence of empirical data, the theory indicates that for most of the likely production processes some integration of trees and crops will be desirable given appropriate relative product prices. There exists plentiful room for empirical economic research to guide policies and programs in this area.

Second, we examined the distributive objective (improving the situation of the rural poor). Our review indicates that emphasizing agroforestry systems that produce goods and services which represent large shares of the poor household's budget and which have high price and income elasticities should produce distributive gains for consumers. Again, there is almost no evidence that is both empirical and analytical. The entire distributive topic in agroforestry begs good research.

The distributive impact on producers depends on who chooses to adopt the agroforestry innovation. The adoption process is complicated and depends on a large number of factors including the availability of capital and credit and other production inputs, access to information, risk aversion, human capital, and land tenure conditions. The literature suggests that

in most cases the wealthier, more educated, and more aggressive members of the community are more likely to be early adopters. Over time, however, their successes serve as incentives for poorer, more risk-averse farmers so that eventually adoption rates equilibriate. Projects, programs, and policies emphasizing education, extension, and local demonstrations that reduce subjective risks may speed up this process and produce distributive gains earlier.

Third, we examined market failures and distortions that may affect agroforestry. Our review of the literature indicates that relative factor and product prices strongly influence the direction of the innovative and productive decisions of private farmers and public institutions. When prices are distorted, either through market imperfections or government interventions, resources are misallocated and social losses occur. If efficient allocations of resources away from land-degrading technologies (and presumably toward agroforestry) are to be achieved, the rigidities and distortions that result from government policies and that result in the maintenance of overvalued currencies, credit restrictions, and unfavorable factor and commodity prices must be removed. Binswanger's papers (1987 and 1989) provide the first research evidence specifically supporting these points for forestry and agroforestry.

In addition, unless individuals or community groups can be assured of secure and permanent property rights, agroforestry faces little prospect of success. In situations where insecure land tenure prevails, reform of property rights institutions should be a prerequisite to investments in any long-term activities, particularly any agorforestry promotion.

APPENDIX

Adoption Models

The two principal approaches used by economists to analyze adoption behavior are the expected utility model (EUM) and models based on safety-first decision rules. Detailed discussions and applications of economic models of decision making under uncertainty can be found in Anderson et al. (1977), Barry (1984), McKenna (1986), Roumasset (1976), and Roumasset et al. (1979); here a brief overview is given.

The EUM is based on the assumption that farmers maximize expected utility (expressed as a function of profit or income) subject to land availability, credit, and other resource constraints. Profit or income is expressed as a function of crop and technology choices, prices of inputs and outputs, and the annualized costs of the technologies. Expected utility, therefore, is a function of the choice of a technology mix, including traditional practices and the set of available innovations (for example, agroforestry combinations, high-yielding varieties, no tillage). Solving this optimization problem each period determines the farmer's choice of technology and the allocation of land and inputs among crops. At the end of each period, information of actual yields, revenues, and profits are used to update the parameters the farmer uses in making the decisions of the next period (Feder et al. 1985).

Mathematically, the objective function is expressed as:

$$\max_{j} EU(x) = \sum_{i} U(x_{ij})\, P(s_i) \qquad j = 1, 2, \ldots, n$$

where the set of decision choices result in outcomes x_{ij} associated with the jth decision and the ith state of the world. The x_{ij} are usually measured in monetary terms, and the utility function, $U(x_{ij})$, transforms this into utility values. $P(s_i)$ represents the individual's subjective probability density functions of the likelihood of the outcomes for each decision in the different possible states of the world (Robison et al. 1984).

Given the individual's resource constraints, utility function, and subjective probabilities of the occurrence of possible states of the world, the model can be solved to obtain optimal decisions. In this sense, the EUM analysis can be considered a positive (that is, descriptive) approach to analyzing risky choice. It is based on personal beliefs (subjective probabilities) about the occurrence of uncertain events and personal valuations (that is, utility) of the potential consequences.

Critics of the EUM approach have typically advocated basing decision models on practical and feasible decision rules (rules of thumb). They argue that, given farmers' imperfect knowledge of future events and limited abilities to use available information and make complicated calculations, their decisions are more appropriately characterized by "bounded rationality" (Simon 1986). Simple rules of thumb are used as decision criteria, and optimizing behavior is replaced by satisfying behavior.

The most common rule-of-thumb models, safety-first decision rules, assume that the decision maker's first priority is to satisfy a preference for security or safety. Only after this first priority is satisfied does he concentrate on maximizing profit (Robison et al. 1984, Young 1984). These models emphasize the farmer's security requirements by focusing on the lower tails of probability distributions at critical points. The three most common safety-first decision rules as described by Anderson (1979), Day and colleagues (1971), and Roumasset (1976) are presented below.

The first rule, the safety principle, involves minimizing the probability that some objective (such as profit or subsistence food production) falls below a specified disaster level. (This rule can be interpreted in expected utility terms if one assumes that the utility function is unity above the specified disaster level and zero below.) The second rule, the strict safety-first principle, involves maximizing the objective function (usually expected profit) subject to a constraint that sets an upper limit on the probability that profits will be less than or equal to a specified amount. The third rule, the safety-fixed principle, maximizes the minimum return or profit that can be obtained with a given level of certainty or probability. Most of the other rules in the literature can be shown to be special cases of these three.

For multiple goal planning (for example, production of subsistence levels of grain production, fuelwood, and fodder, and production of export crops for cash needs) lexicographic utility functions have been developed using sequential ordering of multiple goals. In this case, the goals are ordered so that the highest priority goal is accomplished before considering lower priority goals. Therefore, achieving higher priority goals acts as a constraint on achieving lower priority goals.

Applicability to Agroforestry

Both modeling approaches have problems of application to project analyses for predicting adoption behavior. The EUM analysis is demanding of professional skills and time, and the costs for most agroforestry situations will rarely be justified (Anderson 1979). It is more appropriate for scientific studies attempting to understand the behavior of risk-averse farmers operating in a risky world or for analyzing decisions about major project alternatives by governments (Dillon 1979).

Safety-first decision rule analysis suffers from the arbitrary way decision rules are selected and from difficulties in model calibration. However, the multiple goal models using lexicographic ordering appear to be appropriate for positive analyses of farmer decisions in agroforestry applications. Mathematical programming and capital-budgeting methods, which are often the techniques of choice for this analysis, however, are beyond the scope of this paper. Interested readers may consult Barry (1984), and Etherington and Matthews (1983) for discussions of these techniques.

ENDNOTES

1. This discussion draws heavily on Hildebrand's (1976) analysis of multiple cropping systems and on work by Filius (1982), Hoekstra (1983), and Raintree (1983) on agroforestry design decisions. For a more complete discussion of bioeconomic relationships in agricultural systems, see Bishop and Toussaint (1958), Bradford and Johnson (1953), or Debertin (1986). Willey (1979) extensively reviewed component interactions in intercropping systems.
2. Efficient combinations are those in which, given a fixed level of inputs, the output of one of the products cannot be increased by a reallocation of resources without decreasing the output of another.
3. Note that the maximum possible woody perennial and annual crop outputs at time 0 in monocultures are, respectively, OM and OC.
4. Hoekstra (1985b) discusses criteria for choosing discount rates to evaluate agroforestry systems.
5. By external and nonmarket benefits and costs of land use, we are referring to the downstream effects of soil erosion and watershed deterioration from destructive land use and the many costs that accrue to society from excessive rates of deforestation.
6. A variety of techniques exist for estimating the size and value of external and nonmarket costs and benefits and determining appropriate shadow prices. It is not within the scope of this paper to review them. The interested reader may consult Hufschmidt and colleagues (1983) and Johnson (1987).
7. Household budget here refers to all household consumption including nonmarket as well as market goods and services.
8. This discussion is based largely on the extensive review of adoption studies by Feder and colleagues (1985).
9. This condemnation only applies to open-access resources and not necessarily to the general class of common property resources. Group property rights may be fully articulated and enforced by cooperative group action to insure efficient common property management. See Magrath (1989) and Runge (1981) for examples.
10. Magrath (1989) provides an excellent review of the theory of open-access resource use and abuse.
11. "Commons," unfortunately, was poor choice of terms. What Hardin (1968) was actually referring to was open-access resources. Common property resources may or may not lead to a tragedy as we emphasize in the next section.
12. Most successful agroforestry and social forestry projects, however, have been based on private management and ownership of the resource.
13. This discussion draws heavily from Southgate's (1988) review of the economics of land degradation in developing countries.
14. Cuevas and Graham (1984) provided evidence for this in rural Honduras.

GLOSSARY

elasticity A measure of the percentage change in one variable that results from a 1% change in some other variable. If $y = f(x)$, then the elasticity of y with respect to x is equal to the derivative of y with respect to x (y/x) multiplied by x/y. Elasticity is most often used to describe how the quantity demanded or supplied of a good responds to a change in its price. This is the price elasticity of demand or supply. For example, if the price elasticity of demand is -2, a 1% rise in price causes the quantity demanded to fall by 2%.

externality An effect of one economic agent on another that is not taken into account by normal market behavior. Externalities reflect discrepancies between social and private benefits and costs. One economic agent (for example, a farmer) produces social costs (such as downstream sedimentation) that are not reflected in the private costs of production.

inter-sector resource allocation decisions Decisions (usually governmental) on how to allocate scarce resources between various sectors of a nation's economy.

iso The prefix "iso-" indicates combinations that produce equal results. For example, an iso-product curve (often referred to as an iso-quant) is a mapping that shows all combinations of inputs in a production process which produce the same quantity of product. Similarly, an iso-cost curve maps all those combinations of inputs that can be purchased for an equal cost.

lexicographic ordering (utility functions) The word "lexicographic" comes from the way words are ordered in a dictionary, alphabetically by the first letter, then the second letter, and so on. Therefore, lexicographic orderings, or utility functions, refer to rankings of bundles of commodities (or farm production goals in the case in the text) such that those that contain a specific commodity or goal (e.g., necessities) receive higher rankings (produce greater utility) than bundles that do not contain it.

probability density function A mathematical equation that represents the relative frequency of occurrence of particular values of a random variable. It is also often called the probability distribution of a random variable.

production possibility frontier The locus of all the alternative quantities of several outputs that can be produced with a fixed amount of inputs.

utility function A mathematical conceptualization of the way in which individuals rank alternative bundles of commodities.

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CHAPTER 8

The Uses of Anthropology in Agro/Social Forestry R and D: Approaches to Anthropological Forestry

Donald A. Messerschmidt

HIGHLIGHTS

- Applied anthropology, with its attention to sociocultural context and people issues and its theories, models, and methods, is a powerful tool for research and development worldwide.
- Its eclectic nature (borrowing tools and perspectives from other disciplines), its attention to holism (whole systems), and its complementary concern with case studies (highlighting both individual and community enterprise) gives anthropologists a remarkable breadth, depth, and sensitivity to local issues.
- Recent progress in the development of agro/social forestry in Asia is reviewed from the anthropological perspective. Several case studies demonstrate the full range of its potential in agroforestry research and development.

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INTRODUCTION

Applied anthropology has a centrally important and demonstrably powerful role to play in international development. The intent of this chapter is to describe that role, and to answer those who would ask *what good are anthropologists, anyway?* (Jansen 1989, McCorkle and Gilles 1987). As Pawlick (1989:3) has put it, quoting T.A. Heberlein, "The directors of too many natural resource management projects . . . 'view the social science component as unnecessary. The logic is that if we can just figure out the natural system, the social system will take care of itself. . . . The perception seems to be that social science is nice, but natural science is important.' "

This chapter responds from the perspective of anthropological forestry and agro/social forestry research and development. The first of three sections outlines how anthropology can assist natural resources research and development, giving particular attention to agroforestry. The second section introduces some of the higher-level theories, practical models (theoretical constructs or paradigms), and methods (strategies) that guide us. The third section presents brief case studies highlighting several approaches to anthropological forestry, the depth and breadth of the discipline, and its intellectual and practical potential.[1]

DEVELOPMENT ANTHROPOLOGY AND ANTHROPOLOGICAL FORESTRY

As practitioners of one of the most people-oriented professions, applied anthropologists work as administrators and researchers, advisers and consultants to bilateral and multilateral aid agencies, consulting firms, and nongovernmental organizations (NGOs) alike. We design, implement, evaluate, and conduct research on projects and programs in agriculture, irrigation, fisheries, forestry, range and livestock management, health and nutrition, eduction, community development, and more. We often work closely with bureaucrats and third world elites, but our concern for the "last"—the "largely unseen people in rural areas who are poor, weak, isolated, vulnerable and powerless" (Chambers 1983:viii), draws us toward the non-elites (poor farmers, tribal forest dwellers, rural villagers). We often are able to communicate their needs and wants, perceptions and aspirations, to the policy makers and project designers in urban centers.

Some of our intellectually closest colleagues are economists, rural sociologists, and political scientists. To a large degree, they have paved the way in development, so their skills and procedures have become part of the organizational culture of development (Burton et al. 1986). By comparison, when anthropology is applied to international development, more questions than answers are raised and more criticism than admiration. This is due, in part, to critical reviews of our theoretical concepts, methodologies, and findings and, in part, to our sometimes abrasive and critical style. Our sometimes negative image, however, probably says as much about the penchant of evaluators to focus on troublesome endeavors rather than on those that are relatively trouble-free and to highlight the lessons of failure over those of success.

Anthropologists are often severe self-critics, accusing themselves of being "unwilling to commit to a substantive focus" and of limiting themselves to criticism of other people's proposals for change, rather than providing their own solutions (Burton et al. 1986:261, echoing Cernea 1985 and Hoben 1982). More than one applied anthropologist prefers being called a developer rather than an agency anthropologist because the perception of colleagues from "hard" sciences (such as agronomy, botany, forestry, even economics) is that anthropology is a "soft" and highly generalizing science. They are wrong, of course. The editors of this volume can demonstrate that anthropology is a "harder" discipline than most of forestry (Burch, personal communication 1989). When judiciously applied and carefully analyzed, anthropological forestry is just as analytical and as capable of sound and effective results as any other applied technical discipline or development science. And arguably more so. Anthropologists have a great deal to be proud of and many exemplary successes to point to in agro/social forestry research and development.

Social forestry and agroforestry research and development are arenas that applied anthropology has only recently entered. Agroforestry is a natural conjunction of agriculture and forestry, but the name suggests an artifical distinction that only scientists make—rural farmers, to their credit, see that two as one piece or, perhaps, as two expressions of a single system. This perspective is perhaps better expressed as *farm and community forestry* (Foley and Barnard 1985), or as *farm forestry* or *farm and village forestry* (Taylor and Mehl 1988).

The anthropological study of agroforestry has its earliest roots in agricultural anthropology (DeWalt 1985, Raintree and Torres 1985, Rhoades 1984), and anthropological foresters have a great deal to learn from the experience of their agricultural anthropology colleagues. Considerable literature on anthropology in agroforestry has been generated from the International Council on Agroforestry Research (ICRAF), which has strong agricultural leanings (see Majisu and Labelle 1982 and the journals *Agroforestry Systems* and *Agroforestry Today*). The agroforestry addressed in this chapter leans more toward forestry than toward agriculture and is virtually synonymous with "social forestry" as defined and practiced today. Development anthropology (applied anthropology in the international context) has a great deal to offer this new subfield of agro/social forestry.[2]

The value of anthropological forestry and agro/social forestry is evident only to the degree that anthropologists are sensitive to the needs and aspirations of the rural poor *as well as* to fellow developers and scientists, students, and the agencies and organizations they serve. Years of experience have shown that in the development context anthropology's most powerful theories, models, methods, findings, and unique perspectives on the human condition must be joined with those of other development disciplines in truly interdisciplinary endeavors.

THEORIES, MODELS, AND METHODS

This discussion begins by defining concepts and terms with which anthropologists approach forestry and to which they inevitably apply the fundamental theories of their discipline.

Agro/Social Forestry

Agroforestry has been defined by Lundgren and Raintree as

> a collective name for land-use systems and technologies where woody perennials (trees, shrubs, palms, bamboos, etc.) are deliberately used on the same land management unit as agricultural crops and/or animals, either on the same form of spatial arrangement or temporal sequence. In agroforestry systems there are both ecological and economical interactions between the different components (1983:2).

Adding "social" to the term "agroforestry" stresses that people are actively taken into account in all activities dealing with agroforester land-use systems and technology; that is, individuals or groups are meaningfully involved in decisions that affect them. People's participation therefore occurs during conceptualization and identification of issues or problems (in research), decision making (in planning), resource mobilization and implementation (in action), benefit sharing (in results), and overall evaluation (in control). This social component may seem obvious—for after all, what is agroforestry *without* people? All too often, however, people, the primary users of trees and agroforest products and remarkable repositories of knowledge and belief about them, are ignored or forgotten by scientists, technicians, and developers. It is essential to remember, as the international forester Jack Westoby has said, that "forestry is not about trees, it is about people. And it is about trees only insofar as trees can serve the needs of the people" (1987:ix).

While all forestry may have social characteristics (a theme that is further developed in the introduction to this volume), not all forestry is social forestry if we mean the involvement of local people in fundamental decisions of management and utilization of tree and forest resources. Put another way, social forestry is a type of forestry, but not all forestry is social (just as, to use a medical analogy, all pediatry is a form of medicine, but not all medicine is pediatry). Distinguishing distinctly "social" forestry from other forms of forestry is one of the first steps in defining and understanding it (see figure 8.1).

Social forestry is not national forestry or reserve forestry, both of which, with rare exception, are managed or used with virtually no local input (Messerschmidt 1985). There are too many examples of indigenous peoples being forced out of preserve areas in which they have lived for generations. Neither is social forestry the same as conventional industrial forestry or territorial forestry,[3] both of which are typically designed to maximize biomass production for commercial output (Burch 1988). Specifically, conventional (industrial) forestry is the management of a single product on large tracts of forest, over a long rotation, by a highly centralized authority (Mahat 1987), and territorial forestry is the management by authorities of forest and forest land for the production of raw materials for industries, for energy conversion, or for commercial markets (Bendz 1989).

In contrast to these, social or community forestry requires primary users to manage forests and forest land for the direct benefit of rural communities (Bendz 1989).[4] Social forestry directly involves and benefits

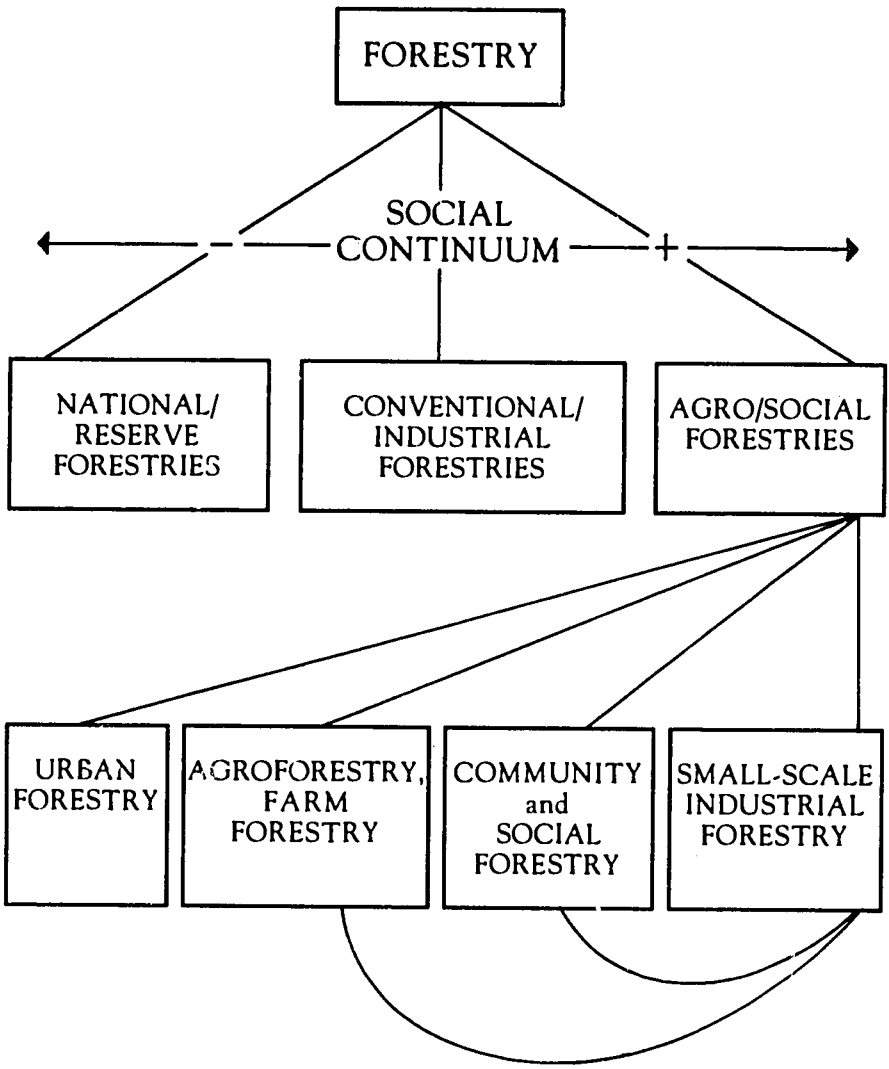

Figure 8.1: The forestry continuum, highlighting people's participation and local decision making.

local people, and it embodies, in turn, several subcategories of tree/forest management activity and utilization. Agroforestry, farm forestry, community forestry, and subsistence forestry are all examples or types of social forestry. (Some forms of urban forestry can also be added to the list.) Each implies strategies to manage and use single trees, small stands or groves, and shrubland for the direct benefit of people in social units, be they families, clans, tribes, households, neighborhoods, or other groups.

In social forestry, benefits (goods and services) ideally flow two ways:

1) *Sociocultural inputs*, such as indigenous knowledge and traditional organizational structure and practices, are incorporated in development projects to ensure people-sensitive resource management and utilization.

2) *Socioeconomic outputs*, such as increased production of and earnings from both timber and nontimber products, go back to the local people. The growing literature on this topic reveals a vast array of these inputs and outputs, to and from forest ecosystems. See Laporte and Kelleher (1989), Clausi and Bopp (1989).

The great danger in a brief discussion like this is a too heavy reliance on dichotomies to make a point. While they are convenient markets and provide clear-cut, black and white distinctions, continuums and gray areas are the reality that must be confronted in creative, innovative, and sensible ways.

One troublesome dichotomy frequently encountered in the development literature sets people's participation against management by government authorities or technocrats. This aligns social forestry against various national, reserve, or industrial forestries. Idealists applaud the former and criticize the latter. In fact, while social forestry does presume some form of local or user participation, in practice, what constitutes participation is too varied to be easily categorized.

Another sometimes troublesome distinction is that between forests and trees. In this chapter, they are interchangeable and interlinked. Like farmers and forest dwellers, social foresters deal with both trees and forests, slipping back and forth between them (conceptually and practically) with ease. Farmers rely on forests, for example, to provide watershed protection, pasture, and hunting and to be the abode of deities. They rely on the trees of the forest or farmstead as sources of fuel, fodder, building materials, charcoal, tool handles, live fences, shade, flowers, leaves, nuts, fruits, medicinal substances, and other valuable by-products.

To avoid trouble with such dichotomies, it is best to consider all forestry on a continuum, with national, reserve, and industrial forestries on one end and the various farm, village, or community forestries on the other (see figure 8.1). Agro/social forestry implies an interrelationship of mutual support between practice and theory, and it incorporates three broad categories of people's involvement, decision making, and performance: (1) communal or public action (community forestry, village forestry, user-group forestry, urban forestry); (2) individual initiative (private forestry, private tree growing); and (3) group or private small-scale industry (production forestry). *Anthropological forestry* is simply the application of anthropology to any of these social forestries.[5]

Applied anthropology plays potentially important roles all across the continuum, particularly in research and extension following examples in agricultural anthropology and agroforestry (Raintree and Torres 1985, Raintree and Hoskins 1988, Rhoades 1984). But the training of professional foresters to appreciate anthropological methods and models offers some of the greatest opportunities and challenges (Burch 1987, 1988, Parker et al. 1989, Messerschmidt 1989; see also case study 3 below). This implies working with the rural poor and with the central elites who bear the greatest responsibilities for developing sustainable resources in their own national and regional settings. Relatively few social scientists work in forestry, however, and so few teach in forestry training

institutions that they are like pine needles in a sal forest. As a result, we find many third world foresters, rather than social scientists, at the leading edge in social forestry. In the past, and unfortunately still today, many anthropologists and other social scientists tend to work alone and publish in obscure journals far from the eyes of either the applied technicians or the general public.

This is changing as many modern foresters discover social forestry. They are learning about its sociological implications, its anthropological applications, and the interdependence of forests, trees, and people in larger systems. These foresters, by beginning to use social science concepts, insights, and methods and by increasing their sensitivity to people issues, are fast becoming world leaders in development-oriented social forestry (Messerschmidt 1989).[6]

Anthropological Theory

As advocates, brokers, and collaborators (Whisson 1985), applied anthropologists are expected by management to deal directly with project issues by giving advice, solving problems, designing plans and implementation strategies, monitoring and evaluating results, and making recommendations for policy (Partridge 1984, Green 1986, Wulff and Fiske 1987). Applied anthropologists do not typically approach development as an exercise in theory building or theory testing. Theoretical discourse is not expected, and therefore, much anthropological writing on development, found mostly in project reports, is virtually devoid of theoretical exposition. (An example to the contrary is Murray's explicit discussion of the theoretical power behind his design of an agroforestry project in Haiti, which is the basis for case study 2 below.)

Nonetheless, higher-level theory inevitably exists as the "hidden hand" behind all anthropological application (Curtis 1985). Basic theories include evolutionism, historical particularism, functionalism, structuralism, and cultural materialism. These theories, as well as second-level analytical constructs, or models, and their attendant methods, help form anthropologist's biases, interpretations, and definitions about the world, especially about the most central concept: culture. Several theories and models that form the nucleus of today's thinking in applied anthropology have great relevance for agricultural, forestry, and agroforestry research and development.

This is not the place to expound at length on higher-level anthropological theory, but because it is important for the reader to realize the scope of thought on which applied anthropology is based, the chief schools are briefly described below (with great injustice to their conceptual richness and histories).[7]

Cultural evolutionism.—Popular in the 19th and early 20th centuries, cultural evolutionism holds that civilization has developed in regulated fashion through various generalized stages of social and cultural progress, typically putting Euro-American lifestyles at or near the top. Discourse on (and subsequent disappointment with) cultural evolution and the social Darwinism it spawned is found in the writings of Lewis Henry Morgan.

A lingering Euro-American evolutionary bias is still evident today in top-down approaches to development. Theories about the role of class struggle in achieving social progress are also rooted in evolutionism. Karl Marx's dialectical materialism, developed in reaction to social Darwinism, is the most well-known of these.

Neo-evolutionism.—Refinement of early evolutionary theory took several forms. Leslie White, for example, stressed an evolution determined by the capture and utilization of energy. Another version was proposed by Julian Steward, who described the interaction of natural resources and conditions (soil, water, temperature) with cultural factors (technology and economy) in what he called cultural ecology.

Historical particularism.—In the early 20th century, historical particularism arose to challenge early evolutionary doctrine. Its leader was Franz Boas. Historical particularists argued that each culture or society is unique and that the gross generalizations (and the rampant ethnocentrism) of cultural evolutionism are nonsense, thus giving rise to cultural relativism, which states that there are no higher or lower forms of culture. Particularism is expressed today in the aggressive empirical approach of most ethnographic fieldwork.

Functionalism.—This major nonevolutionary theory, which arose out of early 20th century British anthropology, seeks to describe the consistent actions and patterns (that is, the recurrent functions) of a society's institutions and customs, all of which are interrelated in a consistent whole, as espoused and developed by Bronislaw Malinowski.

Structural functionalism.—Related to functionalism, but more narrowly conceived, this theory stresses the contribution of biological and psychological aspects of functioning social systems. It is based on the work of A.R. Radcliffe-Brown.

Structuralism.—Most closely associated with the contemporary French anthropologist Claude Levi-Strauss, structuralism aims at explaining the origin of cultural similarities and differences and, in particular, the underlying psychological uniformities that exist in social thought and action (such as behavior).

Cultural materialism.—This modern form of evolutionary theory provides a further elaboration of the work of Marx, White, and Steward. Its principal proponent is Marvin Harris, who holds that similarities and differences in cultural expression are found by studying the material constraints or environmental conditions with which a society copes.

There is typically little or no time for applied anthropologists to step back and objectively analyze their work, to theorize about its meaning for the profession, or wax philosophical on its implications for rural people. Higher theories and implicit anthropological insights based upon them are infrequently articulated in the development literature. When they are discussed, they appear transposed as practical strategies or are translated

into implicit models for action. More often, they are simply ignored. In development, therefore, higher-level theory tends to take a back seat; more practical models and methods tend to drive the development enterprise where time and the inevitable report are of the essence. This apparent theoretical lacuna has, unfortunately, fueled the seemingly endless debate between practitioners of basic, theory-oriented anthropology and applied, goal-oriented anthropology. This leads to one of two conclusions. One is that development theory and the development *of* theory have not kept pace with our experience nor with our results. The other states, to the contrary, that abstract theorizing is itself a form of applied anthropology to the extent that it provides a general set of principles to which action programs must conform if they are to achieve success (see Harris 1987).

Anthropological Constructs or Models

Given the need to analyze and interpret human decision making and social actions at various levels, even down to the solitary farmer choosing whether to apply organic compost or chemical fertilizer, or to raise indigenous or exotic trees, anthropologists have developed a number of useful constructs, or models, to guide fieldwork. They include holism, cognition, and social change.

Two great strengths of anthropology are its eclecticism and its adaptability—that is, its propensity to incorporate useful ideas and analogies from other sciences and restructure them to fit anthropological needs and experiences. Anyone familiar with the models described here (and there are others) will note that some are commonly used by related disciplines (such as biology, ecology, psychology, sociology, and history).

Holistic models

Holism is a conceptual-methodological approach that treats people and their environment as a whole. Perhaps its broadest expression is found in Lovelock's (1987) notion of "Gaia," the idea that the whole earth is a living thing, and in Bateson's (1972) "ecology of mind." A somewhat more manageable view of holism that permeates virtually all of anthropological thinking considers the natural and social world as a system, perhaps best expounded in the notion of ecosystem discussed below.

A holistic premise is that problems cannot be adequately understood unless they are integrated into a complex of interacting causes and effects (Vayda 1983). However, anthropological holism implies such breadth of vision that, if approached uncritically, it becomes overwhelming in its attention to connections and detail. To cope with the whole, we tend to limit out view to specific domains of natural, social, cultural, economic, religious, and/or political interaction, interdependency, and causation (see case study 1 below).

To apply holism to agro/social forestry, anthropologists focus or narrow the perspective in order to examine interactions between people, land, trees, and forest. Such interactions could be the relationships and feedback mechanisms that arise as farmers collect tree litter for animal bedding and field compost, tree fodder, fuelwood, tree by-products, non-timber goods and services, nutritional supplements, and medicines.

Similarly, anthropologists study broad linkages, such as those between traditional user groups and modern social forestry policies, and how people organize themselves across social boundaries to manage, protect, utilize, and sustain forests and other natural resources.

Foresters (as laboratory and research station scientists, technicians, and extension workers) stand to gain immensely from the activities of agro/social forestry research and training. So also do the teachers and students of forestry. Utimately, however, it is the farmers to whom the generation and utilization of this knowledge must be directed; it is to their benefit that anthropologists and foresters alike study and learn about forest-tree-people interactions (see figure 8.2).

The *ecosystem* approach to holism as found in anthropology is based most directly on general systems theory in biology and ecology and has great applicability to forestry and agroforestry research and development. In anthropology, it falls under the subdisciplines of ecological anthropology and cultural ecology, both of which emphasize human adaptation and energy flow in ecosystems (Moran 1984, Bennett 1976, Netting 1968, Vadya 1969).

Adaptation studies look at how humans perceive, react, and respond to their combined biophysical and sociocultural surroundings in the process of creating or modifying culture (Bennett 1976, Moran 1982). They also examine sociocultural change and the impact of humans on ecosystems (Moran 1986). Energy-flow studies look at the cycling of energy and natural resource matter through the environmental settings of specific human groups (Moran 1984). They also examine the critical interdependencies among and between organisms and the physical features that form a community (Lamb 1987, Geertz 1974).

The development of the ecosystem concept reflects several recent trends within the profession of anthropology. One trend is rising concern over the inadequacies of early 20th-century biases toward environmental determinism and overdependence on the concept of culture (Rambo 1983). Another trend (dating to the 1960s) is a general redirection toward the adoption of biological concepts and analogies (Moran 1984). Yet another trend is the swing toward a more interdisciplinary approach to research. Measurement and statistical analysis are especially useful in studying the flow of energy through the trophic levels of ecosystems in which human beings are an integral part (Moran 1984, Rappaport 1967).

Cognition

Cognitive anthropology is virtually as old as anthropology itself, and deals with the study of language and the meaning of symbols (words) in their socioenvironmental contexts. It concludes the important study of indigenous knowledge systems. Two approaches to cognitive anthropology that have particular relevance to forestry are ethnobotany and ethnoecology.

Within forestry, the intensity of anthropological concern with context can be likened to the biologist's and geneticist's penchant for provenance. For biologists, provenance trials are essential, standard experiments used to discover geographic variation patterns in the genetic makeup and adaptation of tree seeds. This biogeographical knowledge helps foresters

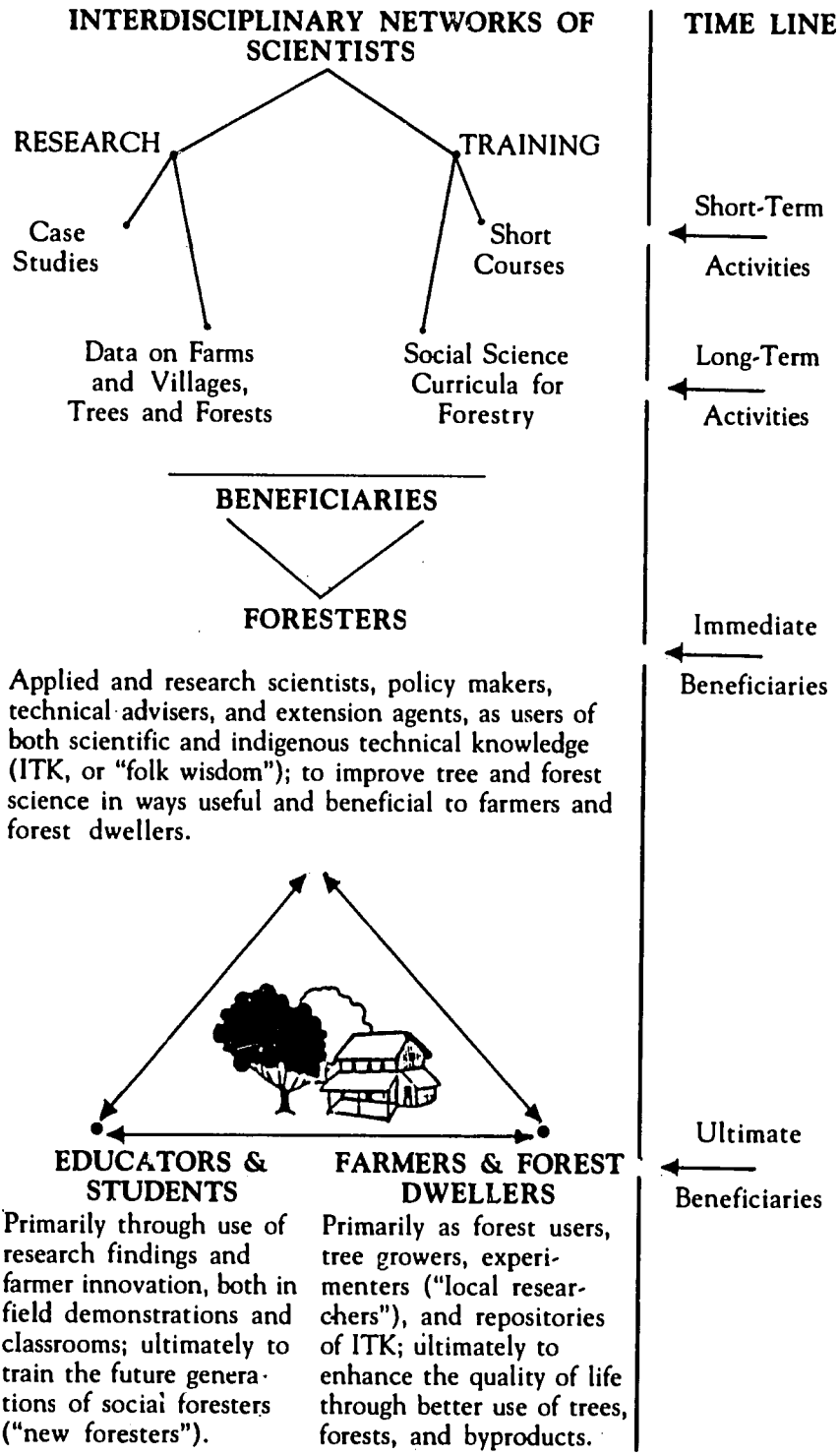

Figure 8.2: Agro/social forestry research and training.

establish rules to guide the selection and use of tree seeds and seedlings in specific soil and climatological regimes (Wenger 1984). Similarly, social scientists seek the conditions and rules by which people act, react, and make decisions. Social forestry studies are a kind of "social provenance" research seeking social, cultural, and economic patterns and conditions that affect people's choices and use of species under specific socioenvironmental regimes. There is no stronger argument for encouraging agroforestry trials on farms, in farmers' fields, under agrarian conditions (Chambers et al. 1989, ICRAF 1988, Lightfoot 1987).

For our purposes, the importance of cognitive studies is more than words and their meanings—it is the contextual knowledge that local people bring to topics like trees, forests, or farm forestry. This is critical stuff for anthropologists, who place so much stake in the concept of culture.[8] We can only have access to this knowledge, however, through words, their meanings, their communication, and their utilization; observation is not enough. To bring this down to earth for development, anthropologists study indigenous or traditional systems of knowledge, communication, innovation, practice, management, and utilization of natural resources (see Compton 1989, McCorkle et al. 1988). That is, we seek to find out what people perceive, believe, know, and ultimately say and do about the soils, water, plants, animals, trees, and forests in their environment. Given women's traditional role in harvesting the forest in many societies, their knowledge is especially important (Hoskins 1986, Pandey 1988).

The study of cognition involves not only knowledge, but also understanding and application. In its application, it implies dialogue for collaboration and active participation of local peoples, including putting traditional knowledge and resource management systems to work for development. Culture is knowledge, and development agents and their clients express and exchange knowledge through language. Client culture is sometimes most easily accessed through local language, the formalization of which improves agent-client communications, respect, empathy, and credibility (Warren and Meehan 1980). Or, more simply put, in seeking to improve development and increase its human benefits, we need to cultivate "a great appreciation of the wisdom—and the potential power—of the villagers we would teach and guide" (Keesing 1980:6; see also Nair 1979).

The first major publication stressing the immense value (and power) of indigenous knowledge for development was the book *Indigenous Knowledge Systems and Development* (Brokensha et al. 1980). In the decade since its appearance, significant advances in methodology and practice have been made (see discussions and bibliographies in Chambers 1983, McCorkle et al. 1988, Warren et al. 1989, the journal *Agriculture and Human Values*, and the *ILEIA Newsletter*).[9] Rapidly increasing interest has resulted in several recent international conferences on the topic, bringing social scientists, conservationists, biophysical scientists, and development agents together. Anthropologists play a vital role in this movement:

> Indigenous knowledge systems (IKS) permeate all that we do and think and believe. Some indigenous knowledge is fact as Western scientists know and define fact. Some of it is belief as philosophers and theologians define belief. And a lot of it is folk wisdom . . .

> common sense. Indigenous knowledge systems are learned ways of knowing and looking at the world. They have evolved from years of experience and trial-and-error problem solving by groups of people working to meet the challenges they face in their local environments, drawing upon the resources they have at hand. . . . (IKS) is a broad topic which cuts across many disciplines and professions. . . . [IKS is] an integrative concept which keeps the focus on the individual or group as it functions in the local setting . . . [and it] facilitates bringing together the social scientist and the [bio]physical scientist on collaborative work within a task environment. (McClure 1989:1-2)
>
> Indigenous knowledge can play a key role in the design of sustainable agricultural systems, increasing the likelihood that rural populations will accept, develop, and maintain innovations and interventions. It [is] . . . the sum of experience and knowledge of a given ethnic group that forms the basis for decision-making in the face of familiar and unfamiliar problems and challenges. Farmers of agrarian, as well as industrialized, societies have sophisticated ways of looking at the world. They have names for many different kinds of plants, ways to diagnose and treat human and animal diseases, and methods to crop fertile and infertile soils. This knowledge has accrued over many centuries, and is a critical and substantial aspect of the culture and technology of any society. Yet it has often been overlooked by Western scientific research and development. (Warren and Cashman 1988:3)

Ethnobotany and *ethnoecology* are two closely related subfields of cognitive anthropology that look at indigenous knowledge by analyzing folk taxonomies and traditional systems of understanding and dealing with complex ecosystems like tropical forests. A few of the many examples of the methodologies and findings from these rich areas of inquiry and understanding and their significance for forestry and agro/social forestry research and development are found in studies of native firewood categories by Metzger and Williams (1966), traditional knowledge of trees and their food crops by Brokensha and Riley (1980), and indigenous knowledge and utilization of tropical forest regimes by Posey (1988), Posey et al. (1984), and Posey and Balee (1989).

The relevance of all this to agroforestry is well documented (Cashman 1989, Colfer et al. 1988, Kartawinata et al. 1984, Mitchie 1986). There are obvious close links between the cognitive and holism constructs (above) and those of social and developmental change (below).

Social change

Social change theory provides another set of models and methods with which anthropologists approach research and development of agroforestry. Social change analysts apply their perspectives to project development, program design, policy recommendations, and often, analyses of the bureaucratic or administrative cultures within which development occurs. Concepts of holism and system often underlie their work. Some concentrate on models of cultural adaptation, diffusion, and innovation (see Rogers 1983). Some strive vigorously to debunk common myths, misconceptions, and ignorance about interrelationships between people, culture, and nature.[10]

The *innovation model* of social change is one of the most important for development, but the least understood. It is especially useful in development forestry and agroforestry where researchers, technicians, and advisers frequently attempt to entice farmers to adopt exotic, fast-growing species. It also has great relevance in attempts to understand both enthusiasm and reluctance to adopt them.

Innovation as a major theoretical construct in anthropology was developed by H.G. Barnett, who defined it as "any thought, behavior, or thing that is new because it is qualitatively different from existing forms" (1953:7) but that is founded upon preexisting or indigenous forms. Innovation is the result of "creative transformation emerging from advanced technology *combined* with the empirical methods of the peasants" (Friere 1973, cited in Bajracharya 1984:330, original emphasis). Research anthropologists seek evidence of innovation in sociocultural change, and development anthropologists who implement projects use the innovation process to ensure that local people's knowledge, methods, perspectives, experience, and needs are adequately incorporated. In contrast to intervention, which is often used to promote inappropriate development of indigenous systems, innovation implies a process that involves local knowledge and perspective, blends outside technologies and resources with local ones, proceeds through a process of dialogue and understanding, recognizes and builds upon local custom and need. Innovation demands that we take the time to use all available opportunities to listen to and learn from local people, then follow up by engaging, encouraging, enabling, and empowering them to participate in the dialogue and throughout the effort to effect beneficial change (Messerschmidt 1990b).

Multifarious methods

One of the main concerns of anthropological forestry is to learn how peasant farmers and forest tribals perceive and adapt to their surroundings, including how they classify, manage, and utilize trees, tree by-products, and other natural resources. To understand tree-people-farm-forest ecosytems, anthropologists utilize a variety of strategies and perspectives, dipping into their kit bag of methodological tools to select what works best with particular project circumstances, issues, and problems.

A sampling of the literature reveals many methods: household economic and demographic surveys, time allocation studies, social-psychological profiles, rapid rural appraisal, ecosystem and agroecosystem mapping and analysis, ethnoscience and ethnosemantic analysis, diagnostic research, various sampling techniques, multivariate analysis, historical analysis, structured, semi-structured, and unstructured interviews, various group dynamics approaches, participant-observation, life histories, community studies, expert systems analysis, and farming systems analysis.

There are many methodologies from which to choose. The enterprise is rich with opportunity and often made all the "harder" by the use of sophisticated computer technologies and programs to analyze the data and present the findings. In the anthropological forestry literature, econometric and bioeconomic methodologies are applied to many types of studies: farmer interest and involvement in forestry projects (Colfer 1981b, Dove 1987, Dove et al. 1988), marketing timber and nontimber forest products

(Jessup and Peluso 1986, Murray 1984), Socioeconomic factors affecting traditional forest use and management (Campbell et al. 1987), the socioeconomic attributes of trees (Raintree 1988), and agroforestry cropping systems (Raintree 1983).

Development anthropologists are also attracted to various techniques of quick diagnosis, or rapid rural appraisal (RRA). Rapid rural appraisal is very useful for introducing and sensitizing researchers and development workers of all disciplines to the holistic, systemic nature of human adaptations in agriculture, agroforestry, and other development sectors. Rapid appraisal methodologies from agriculture include the *sondeo* (Hildebrand 1981), the art of informal agricultural surveys (Rhoades 1985), and agroecosystems analysis (Conway 1986). The technique has also been used effectively for studying village nutrition, irrigation, and watershed management. Recent RRA experiences across Asia have demonstrated its strengths as a general, topical, and participatory research tool (Khon Kaen University 1987, Lovelace et al. 1988, Messerschmidt 1987, Sajise et al. 1990).

The techniques of RRA have been criticized as "quick-and-dirty" as opposed to other "long-and-dirty" methodologies (Chambers 1987). But the quick approach of RRA is useful for determining the fundamental issues or rural development in a cost-effective manner, for narrowing the range of researchable questions, and for identifying issues or problems for more in-depth study or action. In such cases, it serves as an excellent tool to lead researchers directly into more systematic, continuous, or longitudinal appraisals.[11] ICRAF's diagnosis and design (D&D) methodology, described by ecological anthropologist John Raintree (1986), is an example of a more extensive approach. (See the appendix to this chapter for a synopsis of D&D methods and procedures.)

The more traditional social-structural studies in anthropology are also applicable to the study of agroforestry and forest resource management. They look at the sociocultural environments of forestry by examining kinship systems, leadership patterns, user-group organizations, and the rules and regulations by which local people manage and utilize resources. Examples are the study by Vayda and colleagues (1985) of situational adjustments to changing forest environments, Cernea's (1985) study of "alternative units of social organization sustaining afforestation strategies," Bennett's (1963) analysis of social patterns of forest exploitation, and my own studies of traditional systems of forest management organization (Messerschmidt 1986, 1987, and 1990a).

And finally, although more of a goal than a methodology, the results of the anthropological forestry enterprise should be workable recommendations for better, more sensitive, appropriate, and realistic forestry-agroforestry-natural resources *policy*. Agro/social forestry research is especially important to forestry policy because of its in-depth understanding of the sociological conditions under which agroforestry specialists, technical foresters, and resource managers serve in the field. Examples of its relevance to policy making in the Himalaya can be found in Fisher and Gilmour 1990, Fisher et al. 1989, Gilmour 1989, Ives and Messerli 1989, and Thompson et al. 1986.

TRANSFER TECHNIQUES: CASE STUDIES IN ANTHROPOLOGICAL FORESTRY

The following three case studies are synopses of recent, and in one case ongoing, forestry research and development projects involving anthropologists on mostly interdisciplinary teams. Case studies are powerful expository tools in anthropology. They demonstrate the relevance of anthropological theory of international development, the use of practical models and paradigms, the variety of methodologies available, the relevance of project design and policy, and, not least, the impact and implications of anthropological work on the quality of life among the world's poor. Although these three case studies come from three different geographic areas (Indonesia, Haiti, and Nepal)—indeed, because they do—they clearly illustrate how universally applicable the anthropological perspective is. (See also the appendix to this chapter for an example from Africa.)

CASE STUDY 1—TRANSMIGRATION, FOREST FARMING, AND FOREST CONVERSION IN BORNEO

Project: U.S./Indonesia/UNESCO Man and Biosphere Project: Interactions Between People and Forests in East Kalimantan.
Source: A.P. Vayda. 1983. Progressive contextualization: methods for research in human ecology. *Human Ecology* 11(3): 265-281.

> Theoretically or practically significant research results concerning transitory as well as persistent phenomena can be obtained by human ecologists while avoiding commitment to long-term, expensive projects, rigid frameworks, traditional disciplinary goals, and unwarranted assumptions about the stability and purposiveness of units or systems. (Vayda 1983:265)

In 1979, UNESCO's Man and the Biosphere program contracted anthropologist Andrew Vayda to direct a three-year study of transmigration, forest farming, and forest conversion in East Kalimantan, on the island of Borneo, Indonesia. Vayda and his colleagues sought to design research relevant to the Indonesian government's policy of transmigration. The study focused on people-forest interactions, using systems analyses from a human ecology perspective.

A major factor in forest conversion in East Kalimantan is the practice of shifting cultivation (also called slash-and-burn or swidden agriculture) by people sometimes assumed to be rootless, landless, and struggling in unfamiliar ecological conditions. To try to determine if either the tribal Dayaks or the migrant Bugis farmers were operating under these desperate circumstances, the researchers chose a site known for the practice of shifting cultivation where they could document its effects on the distribution, structure, and composition of the primary forest ecosystem.

The research team consisted of anthropologists, botanists, silviculturalists, and administrators. Their methods reflected the input of each discipline, both qualitative and quantitative, including the anthropological

strategies of conducting informal interviews, making participant-observations, and collecting life histories. This information was combined with data from household surveys and studies on time allocation and land use. Some of their methods were similar to those of RRA, which allowed the investigators to

> start by noting such activities as tree cutting or forest clearing by migrant farmers and Dayak tribesmen . . . ; they could then, in contextualizing the activities, proceed to relate them to factors as various as the operations of one or another of the hundred or so timber concessionaries in East Kalimantan, the demand for aloe wood (*gaharu*) and other forest products in such distant places as Hong Kong, and . . . previous migrations [to] frontier areas where there still was forest to be cleared and land to be farmed. (Vayda 1983:272)

They applied a research design that they called progressive contextualization (PC), which is a holistic concept translated into a research strategy applicable to the study of complex human activities. Using this method, significant human activities and people-environment interactions are studied within progressively wider or narrower contexts.

To test the PC methodology, Vayda and colleagues focused on a specific activity—timber cutting—then traced the causes and effects of the activity outward into the broader context. While they remained committed to holism, they avoided a priori definitions about the boundaries of the enterprise. Thus, starting with the relatively narrow topic of timber cutting, they progressed in step-wise fashion, systematically putting their data in context, gradually increasing their understanding of the complex interaction between culture and nature and (not least) government policy. What they learned tended to refute certain government assumptions and expectations.

Findings

1) Timber cutting, previously attributed to poor shifting cultivators, was actually being done by or on behalf of wealthier, enterprising rural and urban residents more interested in profits from land speculation and selling timber than in farming.

2) The farming practices of some transmigrant Dayak shifting cultivators resettled by the government were more extensive than they had been in their traditional homeland and more damaging to the forest.

3) Contrary to assumptions of East Kalimantan development planners, the Dayak people still living in their homeland were not uniformly nomadic and destructive of the forest. Their mobility varied by time and by village group, and they reused previously farmed sites left fallow long enough for forest regeneration.

4) The Bugis' patterns of migration and settlement along new roads were well organized. But to the extent that commercial crop production was encouraged by good profits, their practice of forest clearing for settlements caused noticeable environmental damage.

5) Wood cutting by small teams in one study area demonstrated how appropriate technology may be applied to forest use and management by bringing economic benefits to rural people, using existing organizational

and technological abilities, and causing much less damage than more highly mechanized operations used by timber concessions.

Implications

The powerful, but limited, methodology of progressive contextualization focuses and maintains attention on issues of concern to policy makers. This contrasts with the usually diffuse, hence less useful, results of the larger and longer holistic ethnographies that try to present the whole picture of a community or society to which many traditional anthropologists are still committed.

Further reading

Colfer 1981a, Kartawinata and Vayda 1984, Vayda et al. 1985.

CASE STUDY 2—CASH-ORIENTED AGROFORESTRY IN HAITI

Project: USAID/Haiti Agroforestry Outreach Project
Source: G.F. Murray. 1987. The domestication of wood in Haiti: a case study in applied evolution. In: *Anthropological praxis: translating knowledge into action*. (R.M. Wulff and S.J. Fiske, eds.). Boulder, Colorado: Westview Press. pp. 223-240.

> One reforestation program after another has come in with the finger-wagging message that the tree should be seen as a sacred soil-conserving, rain-drawing object which the peasant should plant but never cut.
>
> Tree-cutting is viewed not as a legitimate economic behavior, but as a type of economic misbehavior. (Murray 1984:154)
>
> Trees will reemerge when and only when human beings start planting them aggressively as a harvestable crop, not when human consciousness is raised regarding their ecological importance. (Muray 1987:237)

In 1981, three anthropologists were hired to implement Haiti's Agroforestry Outreach Project (AOP): Fred Conway was employed by USAID/Haiti to direct the overall effort, Gerald Murray headed up USAID's subcontract with the Pan American Development Fund (PADF), and Glenn Smucker assisted Murray, later taking his place in directing the PADF effort. The AOP's purpose was to reduce soil erosion and increase production of charcoal for fuel and poles for building materials through a massive tree-planting scheme. The goal was to have 5,000 peasants plant 3 million trees.

USAID invited Murray of examine two questions of importance to their program: Was Haitian peasant land tenure compatible with tree planting? What were the determinants of success and failure in reforestation and soil conservation projects? The answers to these questions became the basis for this innovative project.

Many projects failed, Murray concluded, not because peasants were unwilling to cooperate, but because institutional, organizational, and

motivational components of the projects were flawed. He argued that removing certain institutional barriers and using anthropological insights could release a flow of resources resulting in peasants planting millions of trees on their own land (Murray 1984). He designed strategies to circumvent these problems in the AOP.

Institutional strategy

Instead of channeling USAID funds through the national government, the AOP was funded through private voluntary organizations, thus avoiding the Ministry of Agriculture, which as Murray describes it, produced more jobs than seedlings. Experienced agroforesters were hired to manage the outreach activities, and local peasants were appointed as village organizers. In the field, the project was conducted entirely in Creole, the peasant language, instead of French, the language of Hitian elites.

Technical strategy

The AOP foresters chose tree species that were resistant to drought and that were fast-growing, nitrogen fixing, coppicing, charcoal producing, and marketable as construction material. *Leucaena leucocephala* (ipil ipil), *Cassia siamea*, *Azadirachta indica* (neem), *Casuarina equisetifolia*, and *Eucalyptus camaldulensis* were planted in the humid lowlands; pines, especially *Pinus occidentalis*, in the highlands. They also perfected a nursery system for producing microseedlings, which reduced time and energy in transporting them to farms. Good agroforestry techniques were used, intermixing trees and crops on individual farms instead of a reforestation model that relied on woodlots or large tracts of land for massive planting by groups or communities. The latter requires land tenure and economic arrangements not found in Haiti (Murray 1987).

Motivational benefit-flow strategy

Cultural evolution, coupled with an ethnographic understanding of peasant rationality and the power of innovation, profoundly shaped the project. Market pressures have long been considered the force behind Haiti's environmental problems: by encouraging tree cutting, the market accelerated deforestation and erosion. Murray insightfully turned this notion on its head: in the AOP, the market became the driving force for good. It is the peasants who must plant trees faster than they can be cut down, and this can be achieved if tree planting can be demonstrated to contribute to the flow of desperately needed cash into their homes.

Murray's thinking was guided by an analogy between the origins of agriculture and the cash value of tree planting. It is very shortsighted and erroneous to think of the global tree problem only as a conservation or ecological problem. Ancient hunters and gatherers solved their food crisis not by conservationism, but by shifting to crop domestication. Similarly, domesticating tree production for use as cash crops was the key in Haiti. "Peasants already cut and sell natural stands of wood. They already plant and sell traditional food crops. . . . Join[ing] these two unconnected streams of Haitian peasant behavior . . . is the core purpose of the Agroforestry Outreach Project" (Murray 1987:237-238).

Thus the project was based on a notion of cash-generating agroforestry, an ethnographic appreciation for Haitian cultural history, and the peasants' reputation as inveterate and aggressive cash-croppers. Nevertheless, the peasants needed convincing that benefits would come quickly, that trees would not interfere with crop production, and that they alone were sole owners of the trees. Once peasants understood that these were designed features of the project, they planted trees far in excess of expectations. "For the first time in their lives, they were hearing a concrete proposal to make the wood tree itself one more marketable crop in their inventory" (Murray 1987:228).

Findings

1) Within two years (1981-1983), the project had reached its four-year target of planting 3 million seedlings, and by the end of the fourth year, 75,000 peasants had enthusiastically planted 20 million trees.

2) Peasants well understood the potential market value of trees. But rather than cut and sell immediately, many preferred to keep them as a form of security or insurance against possible future crop failure (Chambers and Leach 1987).

3) Success of the cash-cropping strategy encouraged Haitian PVOs to reconsider their ineffective ecology and conservation models based on ethereal visions of the functions of trees and become more responsive to the economic interests of the peasants.

4) USAID's style also changed. By the mid-1980s, 60% of mission funding was channeled through PVOs because they had proven to be a safe mechanism through which to manage projects.

Implications

1) The project's nursery system was a technical breakthrough that reduced to a fraction the costs of fossil fuel and human energy required to transport and plant trees.

2) The project's agroforestry strategies were most appropriate for Haitian land tenure, economy, culture, and society. Prior ethnographic knowledge of Haitian cropping patterns helped the AOP establish with the peasants various systems of border planting and intercropping to make tree planting feasible even for cultivators with small holdings. Agroforestry replaced reforestation as the tree-growing system.

3) Successful agroforestry projects, even under the most difficult institutional, technical, and motivational circumstances and under the most trying political, economic, and environmental conditions, can succeed if based on sound ethnographic theory and practice and if implemented by interdisciplinary teams that understand local realities such as land tenure and incentive structures. These realities, including control of assets, outputs, and shared benefits, must be addressed in appropriate ways. The AOP project theme—wood as a marketable crop—stemmed from ethnographic knowledge of the cash-oriented foundations of Haitian peasant horticulture and knowledge of current conditions in the internal marketing system.

Further reading

Conway 1984, Murray 1984, 1986, USAID/S&T 1981.

CASE STUDY 3—SOCIAL FACTORS IN COMMUNAL AND COMMUNITY FOREST MANAGEMENT IN NEPAL

Project: Institute of Forestry Project, Nepal—USAID, Yale University School of Forestry and Environmental Studies, and International Resources Group, Ltd.
Source: Ongoing field studies by faculty researchers at the Institute of Forestry, Pokhara, Nepal. Unpublished.

> Involvement of people in protection of forest is good. However, equality in benefit sharing is crucial, so a sustainable forestry system should be managed for all ethnic [and caste] groups, especially for the untouchable [occupational] castes. (Subedi 1989)

Research by foresters and social scientists from Nepal's Institute of Forestry (IOF) uses rapid appraisal techniques, participant-observation, and key informant interviews to determine the use and condition of land and natural resources and the history, social structure, and rules of local forest user groups. This is the beginning of a longitudinal research, training, and extension exercise by IOF faculty. Research is conducted in demonstration villages selected by the IOF's interdisciplinary Social Forestry Systems Study Group. Project assistance is complemented by grants from the Nepal-Australia Forestry Project and the Ford Foundation.

One study compares two villages in the middle Himalayan hill zone. Lahchowk is a predominantly high-caste (Brahmin and Chhetri) village, located on flat tablelands suitable for growing irrigated rice. Rhiban is a predominantly ethnic (Gurung) village located on a nearby steep mountainside where rice farming on lower terraces is combined with forest pastoralism and migrant wage labor. Both villages include households of each of the other groups, and both have significant numbers of Kamis, low-caste blacksmiths, who depend for their livelihood on day labor in the fields of others and on making and mending farm tools. The forest is a critical resource for every household's fuel, livestock fodder, and tool hafts.

Findings

1) Lahchowk forests have been divided historically into four units, each controlled and managed by a few influential leaders exclusively for the use of their immediate kin, the members of four Brahmin and Chhetri subcastes (*thar* in Nepali): the Poudels, Thanuris, Adhikaris, or Rana-Bhatts. Only Poudels, for example, can enter the Poudel *ban* (forest), and all but Thakuris are excluded from the Thakuri *ban*. These Brahmin and Chhetri *thars* claim prior and exclusive rights to their forests based on historic grants, some of which date back several hundred years. Members of other groups, including the Kamis, are prohibited entry to each of these forests; for the Kamis, this means that their only other recourse is to use the equally restricted government forest (*sarkari ban*) in the mountains high above the village.

The Lahchowk model is a kind of "communal" forest management system that reinforces restrictive attitudes of the discrete kin groups over

access to scarce resources. Their attitude is summed up in the saying *mero ho, bhanne chalan*—literally, " 'it's mine,' we say is the custom." Everyone else, with rare exception, is excluded, including the Kamis whose occupational services are nonetheless essential to all.

Given a chronic fuelwood and fodder shortage in Lahchowk, disenfranchised villagers have adopted several strategies. Individual farmers plant trees extensively on private lands, along trials and lanes, and along the borders of fields. "Living fences" and stalled livestock, fed from farmyard fodder trees, are a common sight. This works best, of course, when individual farmers own sufficient land. The Lahchowk Kamis, however, are virtually landless, so they have been forced to adopt more devious means. They ascend many hours up the mountain to use the *sarkari ban* or sneak at night, at great risk, into the clan forests.

2) In contrast to Lahchowk, the Rhiban forests are considered one unit, managed by representatives of all village groups. Access to forest resources is open equaly to all residents, regardless of kin ties or caste/ethnic status, according to minimal rules set down by the *ban samiti* (forest committee).

Rhibans pattern of organization, resource management, and rules of access are more in tune with Nepal's national commitment to "community forestry." Rhiban villagers speak of *hamro ban*—"our (collective) forest," which is managed by one committee to serve the needs of all households, including the Kamis. Shortages are still serious, however, and their response as a community has been to use government help to reforest large tracts of steep, eroded hillside.

Implications

1) Social forestry programs at the IOF include training in research methods that are sensitive to local conditions and needs, resource systems, histories, and organizational structures. The study group is interdisciplinary, combining the biophysical with the social. This is important given Nepal's national emphasis of community forest management and the issues that face resource managers (both villagers and foresters).

2) Contrary to assumptions about basic similarities in community forestry management systems across Nepal and about the need for similar policies and practices, there are distinct differences in perception, management, and use of forests by local users. This study reveals two distinct patterns or models of forest use and social organization. On the one hand, the *communal* forestry at Lahchowk implies exclusion of some groups within the community through restrictive rules of management, access, and utilization. On the other hand, the *community* forestry at Rhiban implies representative management and open access. Appreciation for the differences between these two types of management (and, undoubtedly, there are others in Nepal) provides valuable knowledge for resource managers, trainers, and students (the future foresters of Nepal) at the IOF.

3) The social forestry demonstration villages provide the IOF with two unique and enviable opportunities. First, because they represent rather typical village environments (mixed topography, natural resources, social systems, and economies), they are ideal sites for longitudinal research.

The disciplines and professions represented in this form of agro/social forestry will gain immensely from the synergism generated by the interdisciplinary accumulation and analysis of spatial and temporal data. Second, as field laboratory sites, they provide access to real forest management situations, thus providing a unique training opportunity not found in many other forestry schools.

Further reading

Adhikari 1990, Rayachhetry et al. 1989, Subedi 1989.

APPENDIX: DIAGNOSIS AND DESIGN IN AGROFORESTRY

Source: John B. Raintree, 1986. *An introduction to agroforestry diagnosis and design*. Nairobi: International Council for Research in Agroforestry.

> Increasingly, researchers in developing countries are trying to reach out to farmers through on-farm experimentation. . . . [T]he "partnership" is still somewhat one-sided. Even in the best-intentioned programmes the language in which this activity is couched reveals a lingering "center bias." Scientists "go out" to the farmers and "bring back" information to help them decide how best to make their technologies more relevant to their clients needs. . . . What is needed . . . is a communication channel in which information about technology and research needs and priorities flows with equal ease in both directions. (Raintree 1986:21)

After years of experimentation, including a five-year trial in several African and Asian countries, ICRAF's team of anthropologists, economists, and agricultural and forestry researchers—together with participating men and women farmers—have created a methodology for the diagnosis of land management problems and the design of agroforestry solutions. Besides its speed and flexibility, a key feature is its iterative learning approach: unlike some rapid assessment procedures, D&D is continuous and systematic. It is specifically designed for researchers, extension agents, and fieldworkers. It makes maximum use of the combined knowledge of both technicians and farmers for use in planning and implementing projects.

Key concepts of the D&D approach are

Land-use system: the interrelationship between land resources, technology, and land user (farmer)
End product: functional specifications that identify the needs of a system and, in a general way, how they can be satisfied
Candidate technologies: prototypes capable of meeting these specifications
Technology specifications: choice of technologies for the system

The D&D approach reveals existing knowledge, practices, and needs; it exposes gaps and problems; and it suggests appropriate research and extension programs to deal with them. It is an iterative, trial-and-error process that does not rely on first approximations.

Basic stages of D&D

Prediagnostic stage.—This stage defines the land-use system by examining its functions, organization, and objectives. Once a site is selected, its distinctive combination of resources, technology, and land-use objectives, its production objectives and strategies, and the arrangement of its components are observed, compared, analyzed, and described.

Diagnostic stage.—Researchers conduct interviews and direct field observations in order to determine how well the system works and what

problems and constraints exist in meeting system objectives (production shortfalls, sustainability, intervention points).

Design and evaluation stage.—Researchers design and evaluate alternatives to improve system performance.

Planning stage.—Researchers design and plan implementation strategies to determine what research, development, and extension needs exist and how to develop and disseminate the innovations.

Implementation stage.—Researchers must determine what feedback should be provided from on-station research, on-farm trials, and special studies. Then they rediagnose and redesign in light of the new information.

The D&D manual includes a "case study example of the D&D learning process" by John Raintree and Diane Rocheleau, derived from trials conducted in association with the Kathema Agroforestry Project in the subhumid/semiarid midlands of Machakos District, Kenya. The Kathema research was conducted in two phases. The first was on-farm, the second at the watershed and community level, with complementary on-station research. The following example from the on-farm phase demonstrates the D&D approach over a period of four years, 1981-1984 (based on Vonk 1983).

The basic question confronting the D&D team was technical. What is the best agroforestry method for establishing trees to arrest soil erosion under the harsh conditions of prevailing drought? Researchers opted for alley cropping, and over time, four technical solutions were attempted. One farmer's unanticipated innovation brought success.

Example of the D&D approach

Trial 1: Direct seeding in plough furrows.—*Leucaena leucocephala* seeds were sown in association with maize. It was thought this would involve the least change in farmer's normal cropping patterns and behavior. During the short rains of 1981, farmers dropped ungerminated seeds directly into the ploughed furrows. The result was failure. Drought killed most of the newly germinated seedlings, and the rest were too weak to survive the next dry season.

Trial 2: Direct seeding in pre-fertilized plough furrows.—Manure and triple superphosphate fertilizer were added to the soil prior to planting. This method was tried during the long rains of 1982, but also failed. Although the sprouted seedlings appeared more vigorous, their survival past the rainy season was poor.

Trial 3: Seedlings in planting holes, with fertilizer.—Planting holes were dug during the dry season and treated with manure and phosphate. When the short rains arrived, seedlings in polyethylene bags were brought from a nursery and placed in the holes between the alleys where the crops were to be grown. Results were mixed. The seedlings' high survival and growth rates were offset by unacceptably high labor demands. Digging

holes in the hard, dry ground required up to 14 minutes each (the equivalent of 192 person-days/ha), consuming valuable time and energy that few farmers could afford.

Trial 4: Seedlings, planting holes, and fertilizer, with a difference.—A successful scheme originated when a participating farmer neglected to follow directions for digging holes during the 1983 trials. Instead of preparing full-sized holes during the dry season as instructed, he merely scooped out a shallow hole in the hard, dry ground, then waited for the rains to soften the soil before more easily completing the digging and fertilizing. His results were excellent. Survival and growth rates were high, and labor costs low. Although actual time and labor data were not recorded (since it was done without the prior knowledge of the researcher), his two-step method took, at most, only 4 minutes per hole (no more than 54 person-days/ha).

Implications

Trial 4 reduced the labor required for planting hole preparation by 60% to 70%. Further reductions are desirable, but for farmers who wish to adopt alley cropping, this method's labor is nearly in the acceptable range, provided the work is spread out over several planting seasons.

The Kathema on-farm trials illustrate that each progressive design improvement should be correctly regarded as a scientific hypothesis for testing. Discovery of errors advances knowledge so that appropriate corrections can be made in subsequent stages.

Diagnosis and design can be applied to farms, larger watersheds and communities, and ultimately to regional and national levels. These higher-level analyses also allow for consideration of the potential for marketing and processing agroforestry cash crops.

Further reading

Lundgren and Raintree 1983, Raintree 1983, Raintree and Torres 1985, Ssekabembe 1984, Vonk 1983.

AUTHOR'S NOTE

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ENDNOTES

1. This chapter also serves as a literature review, noting that the bibliography is more suggestive than exhaustive and that much of the literature is "fugitive," that is, found in technical reports, conference proceedings, and in project assessments, proposals, and evaluations, often inaccessible and unknown outside of project files and donor and host agency libraries. One of the few repositories of literature on development anthropology is at AADP (the Applied Anthropology Documentation Project), part of the Special Collections and Archives at the King Library, University of Kentucky, Lexington, KY 40506, USA. AADP's director, Dr. John van Willigen, has collected thousands of documents, many from outside the mainstream of professional publication. Because the acquisition of fugitive literature depends on the help of the practitioners, international development anthropologists are especially encouraged to contribute and participate. Abstracts of recent acquisitions are periodically published in *Practicing Anthropology* (of the Society for Applied Anthropology).
2. For recent examples of anthropology and allied social sciences applied to natural resource development and research, see Brokensha et al. (1980), Cernea (1985), Fortmann and Bruce (1988), Little and Horowitz (1987), and NAS/BOSTID (1986). For examples specific to agro/social forestry, see Foley and Barnard (1985), Fujisaka et al. (1986), Gregerson et al. (1989), Poffenberger (1990), and Rhoades (1984).

   Studies in applied anthropology for development, and specifically in anthropological forestry, are found in many sources. Some examples are (listed alphabetically): *Agricultural Administration*, *Agroforestry Systems*, *Agroforestry Today*, *Human Ecology*, *Journal of Developing Areas*, *Journal of Forestry*, *Journal of World Forest Resource*, *Mountain Research and Development*, *Social Forestry for Rural Development*, *World Development*, and *Unasylva*.

   See also the newsletters, working papers, monographs, and occasional papers of the Academy for Educational Development (Washington, DC); Aga Khan Rural Support Programme (Gilgit, Pakistan); Center for Indigenous Knowledge in Agriculture and Rural Development (Iowa State University); The Ford Foundation (New York); the Forestry/Fuelwood Research and Development (F/FRED) Project (Bangkok); the East-West Center's Environment and Policy Institute and the Resource Systems Institute (Honolulu); ILEIA

Newsletter (Information Center for Low External-Input Agriculture; Leusden, the Netherlands); the Institute for Development Anthropology (Binghamton, NY); the Institute of Development Studies (Sussex, UK); the International Centre for Integrated Mountain Development (Kathmandu); International Council for Research in Agroforestry (Nairobi); the International Institute for Environment and Development (London); the Nepal-Australia Forestry Project (Kathmandu); the Social Forestry and Agricultural Administration networks of the Overseas Development Institute (London) and the Forestry Department of the UN Food and Agriculture Organization (Rome and regional offices); particularly, the Forests, Trees and People Program (ETPP); the Winrock International Institute for Agricultural Development (Morrilton, Arkansas); and Yale University's Tropical Resources Institute (New Haven, Connecticut). Note that the Yale School of Forestry and Environmental Studies, in association with USAID/S&T and Winrock International, has recently published a social forestry bibliography and selected readings; see Laporte and Kelleher 1989, Clausi and Bopp 1989; also Majisu and Labelle 1982.

These sources are more suggestive than exhaustive in *all* categories.

3. The term traditional forestry is sometimes used to refer to conventional industrial forestry; this should not be confused with *traditional systems* of forest management and utilization that social foresters study among indigenous tribal and peasant peoples.
4. Kumar and Kohli (1988) claim that social forestry is a purely Indian concept, developed under the cultural and environmental conditions in India. Their definition is further confined to poor people, poor lands, and multipurpose tree species.
5. FAO/RAPA defines community forestry much as I have defined social forestry in this chapter:

   Community forestry centres on the idea of people's participation—getting local populations to plan and execute their own projects on a self-help basis. Although opinions vary as to what should be included under the term, it generally covers all activities which intimately involve local people in forestry; growing trees on farms; processing forest products at household, artisanal or small industry level; establishing local woodlots, etc. Community forestry activities involve individuals, households or local communities which take prime responsibility for planning, implementation and management. Outputs include small timber and poles for buildings and fences, fuelwood, leaves for fodder and organic fertilizer, and fruits and other edible forest products. (1988:4)
6. For example, advisers to the well-regarded Nepal-Australia Forestry Project (NAFP) admit to having found their way there almost by serendipity (Griffin 1988). It was almost two decades after the NAFP was begun, after having gained an enviable reputation as a model community forestry project, before a social scientist was hired on the team. Their choice was an anthropologist who, in two short years, had a significant impact on the directions of community forestry thinking and

doing in Nepal. See Fisher (1989), Fisher and Gilmour (1990), Fisher et al. (1989), Gilmour et al. (1987). In the interim, NAFP expatriates and nationals have practiced and reported extensively on some exemplary social forestry with remarkable sensitivity to people issues. See Gilmour (1989) and Mahat et al. (1986-87).

7. This is a necessarily thin and selective treatment of anthropological theory. The literature on the subject is vast and often pedantic. I am indebted in this account to the writings of Marvin Harris (1968, 1987). For the application of theory to international development, see comments in Moris (1981) and Scott-Stevens (1987).
8. While there are possibly as many definitions of culture as there are anthropologists, one useful definition stressing its cognitive aspects is "the acquired knowledge that people share and use to interpret experience and generate behavior" (adapted from Spradley and McCurdy 1980).
9. The Center for Indigenous Knowledge for Agriculture and Rural Development (CIKARD) at Iowa State University, the Academy for Educational Development (AED) of Washington, DC, and the Commission on Ecology of the International Union for Conservation of Nature (IUCN) in Gland, Switzerland, are among several organizations actively promoting indigenous knowledge in development and conservation.
10. On myths about forest swiddens (shifting cultivation) and related agroforestry land-use systems, see Dove (1983, 1986), and Peluso (1989). On myths about women in agroforestry, see Acharya and Bennett (1982), Fortmann (1986), and Hoskins (1986).
11. Discussions of RRA methodology and comprehensive bibliographies are found in Bruce (1989), Chambers (1983) Khan Kaen University (1987), and Molnar (1989).

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Epilogue

J. Kathy Parker
William R. Burch, Jr.

As biophysical or social scientists, each of us carries a set of feelings and assumptions, even biases, about the way the world works, or at least how we think it should work. In our efforts to address the complex issues of rural poverty and natural resource degradation, these feelings, assumptions, and biases both help and hurt us. They can help by guiding us to find what we are looking for; they can hurt by blinding us to what may really be there or by establishing limits beyond which we are not willing to go in search of alternative solutions. We must be aware of what our feelings and assumptions are and recognize how they affect our way of looking at and understanding our world.

Any number of feelings and assumptions affect the way we do business, but some of the strongest ones relevant to the integration of the social sciences in forestry/agroforestry may be characterized as "disciplinary tribalism," mistaken diagnosis, and the law of negativity.

Disciplinary tribalism refers to the limits that our training and professional socialization set for us. We see the world through the eyes of an agroforester, or a social ecologist, or a plant breeder, or a political scientist, and rarely is our myopia corrected. The symptoms include use of jargon from our own field but lack of understanding of the jargon of other disciplines; frequent lack of synchronization of input from the social sciences with that of other sciences in research designs; lack of effort to investigate unconventional sources of knowledge; and the view that local people only receive knowledge from outside experts and do not provide the experts with knowledge.

While this myopia is chronic, it is not uncorrectable. Changes are beginning to occur: many foresters acknowledge the need for social scientists, and many social scientists have moved from being critics of foresters and their work to being active participants in the process of planning and implementing agroforestry activities for human benefit.

Mistaken diagnosis often occurs because more attention is paid to the symptoms of a problem than to the actual causes. For example, development experts view tropical deforestation as a problem requiring major intervention by international donor agencies. Those who define deforestation as the result of poor technology or irrational land-use practices by low-resource agriculturalists typically propose interventions in the form of technologies such as those that produce more biomass per

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hectare with faster-growing nultipurpose trees. However, those who understand deforestation to be a symptom of larger underlying social causes propose strategies for resolving what is happening by incorporating social and economic components along with the more technical elements. In other words, they propose social solutions (such as laws for land and tree tenure) for social problems (such as increasing population pressures, scarce resources, maldistribution of resources, and the desire of impoverished people for land and stability). These social solutions must be integrated with technical solutions to respect the complexity of the many and diverse rural contexts in which forestry is a development strategy.

Mistaken diagnosis also confronts us when we live with erroneous assumptions about who the vast majority of resource managers really are. We talk in forestry "tongues" to other foresters who can understand us, but we must begin to speak to the men and women farmers who are managing soil, water, and tree resources across most of the world. These resource managers do not necessarily speak the same language, let alone the language of foresters. Nor do they worry about having scientifically correct solutions for success. Nor do they always want maximum productivity when the cost is increased risk to their households, typically already in unstable situations. Yet they manage most of the resource base, and we must understand them better in order to find better ways to work with them.

The *law of negativity* seems to guide many science professionals in the development community, who generally find what they are looking for. The law of negativity finds the constraints to success more obvious than the opportunities, or it assumes that the opportunities will take care of themselves if the constraints are removed. This outlook must be modified before current and future contributions of the social sciences to rural development forestry will be incorporated.

To repeat what was said in the introductory chapter, when systematic social knowledge is applied to agroforestry activities, it is to aid basic problem solution. That is, social knowledge is not included because it seems right, or it is part of current rhetoric, or the donor groups force us to include it, or local politics compel us to make the gesture; rather, social knowledge is included because

It is effective—the job gets done.
It is efficient—economic, social and ecosystem costs are minimized.
It promotes equity—benefits and burdens are balanced among target populations.
It ensures sustainability—the people will continue the innovative processes long after we have left.
It increases flexibility—new information to the system can be incorporated and acted upon.

We thus use social science knowledge because it is *essential* to project success. Any other reasons are simply empty political gestures.

We hope this book will move us in the appropriate direction by providing the reader with a better understanding that all enduring social systems (from the smallest rural village to the grandest metropolitan

center) create, distribute, waste, and conserve resources on the basis of cultural values (anthropology), social norms (sociology/social ecology), material wealth (economics), and social power (political science). When agroforesters ask about soil types, slope, and crop and tree species in their planning activities, they arrive at a full understanding only by knowing what people care about (values), how they order themselves (norms), and how capital and power are distributed. Agroforesters need to know what values various groups hold and what values emerge from the adoption of innovations (anthropology), and how equitable the benefits and burdens of the project are (sociology), how efficient the project is (economics), and how effective the implementation is (political science).

We have here stressed the need to rediscover and reinvigorate traditional Asian forestry practices. We have outlined some of the complex issues to which integrated biophysical and socioeconomic sciences can be applied. We have indicated that agroforestry strategies are merely part of an ever-shifting family of forest strategies. We have stressed that there are already ample sources of social knowledge for immediate application to agroforestry activities. Finally, we have illustrated useful facets of the four social science disciplines this book examines in some depth. The message we want to convey is that social science is useful, not because it seems fashionable among some donor groups, but because it helps solve problems.

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