AGRICULTURAL POLICY ANALYSIS PROJECT, PHASE II

Under contract to the Agency for International Development, Bureau for Science and Technology, Office of Agriculture
Project Office Hampden Square, 4800 Montgomery Lane, Suite 500, Bethesda, MD 20814 • Telephone: (301) 913-0500
Telex: 312636 • Fax: (301) 652-7530 • Fax: (301) 652-7791

COSTA RICA NATURAL RESOURCE POLICY INVENTORY USAID/ROCAP RENARM PROJECT

VOLUME I

EXECUTIVE SUMMARY

OCTOBER 1990

TECHNICAL REPORT NO. 112

Conducted under contract with Abt Associates Inc. and the Agricultural Policy Analysis Project, Phase II (APAP II) in collaboration with the Tropical Science Center (San José, Costa Rica)

Main Authors: **Theresa Bradley**
Thomas Divney
Marcelino Losilla Penon
Dennis McCaffrey
Francisco Rodriguez Vega
Joseph Tosi

Prime Contractor: **Abt Associates Inc.,** 55 Wheeler Street, Cambridge, MA 02138 • (617) 492-7100

Subcontractors: **Harvard Institute for International Development,** Harvard University, One Eliot Street, Cambridge, MA 02138 • (617) 495-2164
Food Research Institute, Stanford University, Stanford, CA 94305-6084 • (415) 723-3941
North Carolina State University, Department of Economics and Business, Box 7645, Raleigh, NC 27695-7645 • (919) 737-7187
Abel, Daft & Earley, 1410 King Street, Alexandria, VA 22314 • (703) 739-9090
International Science and Technology Institute, 1129 20th Street, NW, Suite 800, Washington, D.C. 20036 • (202) 785-0831
International Food Policy Research Institute, 1776 Massachusetts Avenue, NW, Washington, D.C. 20036 • (202) 862-5600

TABLE OF CONTENTS

VOLUME ONE: EXECUTIVE SUMMARY

ACKNOWLEDGEMENTS ix

ABSTRACT x

ACRONYMS xi

1. INTRODUCTION 1
   Contents of the Report 1

2. KEY MACRO ISSUES 2

   2.1 Macroeconomic Issues 2

   2.2 Population Growth and Demands on Natural Resources 6

   2.3 Private Property Rights 6

   2.4 National Strategies for Development 7

3. SUSTAINABLE AGRICULTURE 9

   3.1 Improper Soil, Water and Land Use Management Practices 9
      3.1.1 Issue Description 9
      3.1.2 Policy and Institutional Framework 9
      3.1.3 Issue Analysis 10

   3.2 Misuse of Agrochemicals 12
      3.2.1 Issue Description 12
      3.2.2 Policy and Institutional Framework 12
      3.2.3 Issue Analysis 13

   3.3 Agricultural Technology Research and Extension Services 13
      3.3.1 Issue Description 13
      3.3.2 Policy and Institutional Framework 14
      3.3.3 Issue Analysis 14

   3.4 Policy Gaps, Policy Alternatives and A Research Agenda 16

4. MANAGEMENT OF WATER RESOURCES 18

   4.1 Water Pollution 18
      4.1.1 Issue Description 18
      4.1.2 Policy and Institutional Framework 18
      4.1.3 Issue Analysis 19

   4.2 Competition for Water Resources 20
      4.2.1 Issue Description 20
      4.2.2 Policy and Institutional Framework 21
      4.2.3 Issue Analysis 22

4.3 Watershed Deterioration 23
4.3.1 Issue Description 23
4.3.2 Policy and Institutional Framework 24
4.3.3 Issue Analysis 24

4.4 Policy Gaps, Policy Alternatives and A Research Agenda 26

5. PRODUCTION FROM FORESTS 28

5.1 Deforestation 28
5.1.1 Issue Description 28
5.1.2 Policy Framework 28
5.1.3 Institutional Framework 29
5.1.4 Issue Analysis 30

5.2 Reforestation 31
5.2.1 Issue Description 31
5.2.2 Policy and Institutional Framework 32
5.2.3 Issue Analysis 33

5.3 Ineffective Forest Management 35
5.3.1 Issue Description 35
5.3.2 Policy and Institutional Framework 36
5.3.3 Issue Analysis 37

5.4 Inefficient Production from Forest Resources 40
5.4.1 Issue Description 40
5.4.2 Policy and Institutional Framework 40
5.4.3 Issue Analysis 41

5.5 Policy Gaps, Policy Alternatives and A Research Agenda 42

6. MANAGEMENT OF WILDLANDS 44

6.1 Inadequate Conservation of Biodiversity and Consolidation of Wildlands 44
6.1.1 Issue Description 44
6.1.2 Policy and Institutional Framework 44
6.1.3 Issue Analysis 46

6.2 Inappropriate Land Uses in Buffer Zones 47
6.2.1 Issue Description 47
6.2.2 Policy and Institutional Framework 48
6.2.3 Issue Analysis 48

6.3 Inadequate Long Term Planning for Ecotourism Activities 49
6.3.1 Issue Description 49
6.3.2 Policy and Institutional Framework 49
6.3.3 Issue Analysis 50

6.4 Policy Gaps, Policy Alternatives and A Research Agenda 51

7. MANAGEMENT OF COASTAL AND MARINE RESOURCES 55

7.1 Lack of Coastal Zone Management 55
7.1.1 Issue Description 55
7.1.2 Policy and Institutional Framework 55
7.1.3 Issue Analysis 56

7.2 Unsustainable Fishery Yields 58
7.2.1 Issue Description 58
7.2.2 Policy and Institutional Framework 58
7.2.3 Issue Analysis 59

7.3 Policy Gaps, Policy Alternatives and A Research Agenda 60

8. CONCLUSION 63

VOLUME TWO: THE INVENTORY

PREFACE ix
Purpose of the Report ix
Background Context of the Policy Inventories x
Contents of the Report xi
Summary xi

ACKNOWLEDGEMENTS xiii

ABSTRACT xvi

ACRONYMS xv

LIST OF CHARTS AND MAPS xx

CHAPTER ONE: INTRODUCTION 1

1.1 Scope and Orientation of the Analysis 1
1.1.1 Natural Resource Themes 1
Sustainable Agriculture. 1
Production from Forests. 1
Management of Water Resources. 1
Management of Wildlands. 1
Management of Coastal and Marine Resources. 2

1.1.2 Criteria for Selecting Policies 2

1.2 An Overview of Costa Rica's Environment 3
1.2.1 Physical Diversity 3
1.2.2 Climatic Diversity 5
1.2.3 Ecological and Biological Diversity 5
1.2.4 The Natural Resources 6
Soils 6
Land Use and Land Capability 7
Soil Erosion 8
Water 9
Forests 10
Coasts 11

CHAPTER TWO: THE MACRO POLICY ENVIRONMENT 13

2.1 Introduction 13

2.2 Human Ecological Factors 13

2.3 Macroeconomic Factors 15
2.3.1 Historical Perspective 15
Sustained Import Substitution. 16
Economic Instability and the Move Toward a Planned Economy,1973-79. 17
Economic Crisis and Fiscal Retrenchment, 1980-90. 18

2.3.2 Economic Policies and Patterns of Land Use.
Finacial Incentives 20
Property Rights 21

2.4 Political and Institutional Factors and Their Consequences for Long Run Natural Resource Management Policies 22

2.5 Cultural Factors 24

CHAPTER THREE: SUSTAINABLE AGRICULTURE 25

3.1 Improper Soil, Water and Land Use Management Practices 25
3.1.1 Issue Description 25
3.1.2 Policy Framework 26
3.1.3 Institutional Framework 27
3.1.4 Issue Analysis 28
3.1.5 Policy Gaps, Alternatives and a Policy Research Agenda 31

3.2 Misuse of Agrochemicals 32
3.2.1 Issue Description 32
3.2.2 Policy Framework 33
3.2.3 Institutional Framework 33
3.2.4 Issue Analysis 34
3.2.5 Policy Gaps, Alternatives and a Policy Research Agenda 35

3.3 Agricultural Technology Research and Extension Services 36
3.3.1 Issue Description 36
3.3.2 Policy Framework 37
3.3.3 Institutional Framework 37
3.3.4 Issue Analysis 38
3.3.5 Policy Gaps, Alternatives and a Policy Research Agenda 39

CHAPTER FOUR: MANAGEMENT OF WATER RESOURCES 41

4.1 Water Pollution 41
4.1.1 Issue Description 41
4.1.2 Policy and Institutional Framework 42
4.1.3 Issue Analysis 43
4.1.4 Policy Gaps and Alternatives 45

4.2 Competition for Water Resources 46
4.2.1 Issue Description 46
4.2.2 Policy and Institutional Framework 47
4.2.3 Issue Analysis 48
4.2.4 Policy Gaps and Alternatives 50

4.3 Watershed Deterioration 51
4.3.1 Issue Description 51
4.3.2 Policy and Institutional Framework 53
4.3.3 Issue Analysis 56
4.3.4 Policy Gaps and Alternatives 59

4.4 Policy Research Agenda and Policy Alternatives 60
4.4.1 Water Laws Reforms 60
4.4.2 National Water Plan 61
4.4.3 Watershed Management Secretariat (STC) 61
4.4.4 Water Monitoring Program 61
4.4.5 Water Management Strategies and Concepts 61
4.4.6 National Constitutional Reforms 62

CHAPTER FIVE: PRODUCTION FROM FORESTS 64

5.1 Deforestation 64
5.1.1 Issue Description 64
5.1.2 Policy Framework 64
5.1.3 Institutional Framework 65
5.1.4 Issue Analysis 67
5.1.5 Policy Gaps, Alternatives and a Policy Research Agenda 69

5.2 Reforestation 70
5.2.1 Issue Description 70
5.2.2 Policy Framework 70
5.2.3 Institutional Framework 73
5.2.4 Issue Analysis 75
5.2.5 Policy Gaps, Alternatives and a Policy Research Agenda 79

5.3 Ineffective Forest Management 80
5.3.1 Issue Description 80
5.3.2 Policy Framework 81
5.3.3 Institutional Framework 83
5.3.4 Issue Analysis 84
5.3.5 Policy Gaps, Alternatives and a Policy Research Agenda 87

5.4 Inefficient Production from Forest Resources 88
5.4.1 Issue Description 88
5.4.2 Policy Framework 90
5.4.3 Institutional Framework 92
5.4.4 Issue Analysis 92
5.4.5 Policy Gaps, Alternatives and a Policy Research Agenda 94

CHAPTER SIX: MANAGEMENT OF WILDLANDS 96

6.1 Inadequate Conservation of Biodiversity and Consolidation of Wildlands 96
6.1.1 Issue Description 96
6.1.2 Policy Framework 101
6.1.3 Institutional Framework 102
6.1.4 Issue Analysis 103
6.1.5 Policy Gaps, Alternatives and a Policy Research Agenda . . . 105

6.2 Inappropriate Land Uses in Buffer Zones 106
6.2.1 Issue Description 106
6.2.2 Policy Framework 107
6.2.3 Institutional Framework 108
6.2.4 Issue Analysis 108
6.2.5 Policy Gaps, Alternatives and a Policy Research Agenda . . . 109

6.3 Inadequate Long Term Planning for Ecotourism Activities 111
6.3.1 Issue Description 111
6.3.2 Policy Framework 112
6.3.3 Institutional Framework 114
6.3.4 Issue Analysis 114
6.3.5 Policy Gaps, Alternatives and a Policy Research Agenda . . . 116

CHAPTER SEVEN: MANAGEMENT OF COASTAL AND MARINE RESOURCES 118

7.1 Lack of Coastal Zone Management 118
7.1.1 Issue Description 118
7.1.2 Policy Framework 118
7.1.3 Institutional Framework 119
7.1.4 Issue Analysis 120
7.1.5 Policy Gaps, Alternatives and a Policy Research Agenda . . . 123

7.2 Unsustainable Fishery Yields 125
7.2.1 Issue Description 125
7.2.2 Policy Framework 125
7.2.3 Institutional Framework 128
7.2.4 Issue Analysis 129
7.2.5 Policy Gaps, Alternatives and a Policy Research Agenda . . . 131

CONCLUSION 132

APPENDIX A: LIST OF CONTACTS A-1

APPENDIX B: REFERENCES B-1

APPENDIX C: TEAM MEMBERS C-1

VOLUME III: TECHNICAL APPENDICES

TECHNICAL APPENDIX A: PUBLIC POLICIES A-1

TECHNICAL APPENDIX B: PUBLIC INSTITUTIONS B-1

TECHNICAL APPENDIX C: NON-GOVERNMENTAL ORGANIZATIONS C-1

ACKNOWLEDGEMENTS

The Tropical Science Center (Centro Cientifico Tropical), which provided logistic and technical support in Costa Rica, is gratefully acknowledged. The team would like to thank the many people and institutions who provided information, frank opinions and helpful comments. We would also like to acknowledge the supportof the USAID/Costa Rica mission and USAID/ROCAP. In particular, Ann Lewandowski and Peter Kranstover made numerous valuable comments and suggestions. Editing by Bill Levine and Paula Hirschoff, and preliminary discussions with Ruben Nunez at Abt Associates in Washington D.C. are gratefully acknowledged.

ABSTRACT

Under The Regional Environmental and Natural Resource Management Project (RENARM), the U.S. Agency for International Development/Regional Office for Central Amercian Programs (USAID/ROCAP) funded country case studies of policies affecting the management of natural resources in Central America. This report presents the results of the Costa Rica Inventory.

Volume I is a summary of the results and conclusions of the Costa Rica Natural Resource Policy Inventory. Volume II is organized into seven chapters. Chapter 1 provides the scope and orientation of the inventory by dividing the analysis into five natural resource themes: sustainable agriculture, management of water resources, production from forests, management of wildlands, and management of coastal and marine resources and setting the criteria for selecting policies analyzed in the inventory. Costa Rica's soils, water, forest and coastal resources are also described. Chapter 2 analyzes how Costa Rica's natural resource policy framework has been and is shaped by macro policies and human ecological, institutional and cultural factors. Chapters 3 through 7 correspond to the five natural resource themes described in Chapter 1. In each chapter, two to four policy issues are identified. An issue is a problem in natural resources management that could be ameliorated by policy change. For each issue, the inventory presents the issue description, policy framework, institutional framework, issue analysis of what does and does not work, and policy gaps, alternative and a research agenda. In total, the inventory identified 15 policy issues and analyzed over 100 policies.

Volume III contains three technical appendices. Appendix A presents seventeen policy inventory tables that support the policy discussions of Chapters 3 through 7. Over forty public policies and laws are grouped into these seventeen major policy categories. Each table describes the major policies framing a policy category, its corresponding institutions, and evaluates its impact on the environment and natural resources and the economy. Appendix B briefly describes the characteristics and objectives of over twenty public sector institutions involved in Costa Rica's natural resource policy issues. Appendix C lists over 100 international, national, regional and local Non-Governmental Organizations (NGOs) active with natural resource agendas in Costa Rica.

10

ACRONYMS

ANAI	New Alchemists Society (Asociacion de las Nuevos Alquimistas)
AyA	Costa Rican Institute for Water and Sewer Systems (Instituto Costarricense de Acueductos y Alcantarillados)
CAAR	Rural Aquaducts Administration Committee (Comite de Administracion de Acueductos Rurales)
CAC	Cantonal (County) Agricultural Center (Centro Agricola Cantonal)
CAF	Forestry Bond Certificate (Certificado de Abono Forestal)
CAT	Tax Bond Certificate (Certificado de Abono Tributario)
CATIE	Tropical Agronomy Teaching and Research Center (Centro Agronomico Tropical de Investigacion y Ensenanza)
CIMAR	Center for Research in Marine Science and Limnology (Centro de Investigacion en Ciencias del Mar y Limnologia)
CINDE/ CAAP	Costa Rican Coalition of Development Incentives/ Private Agriculture Enterprises Coalition (Coalicion Costarricense de Iniciativas de Desarrollo/ Consejo Agropecuario Agroindustrial Privado)
CNFL	National Light and Power Company (Compania Nacional de Fureza y Luz)
CNP	National Market Stabilization Board (Consejo Nacional de Produccion)
CODESA	Costa Rican Development Corporation (Corporacion Costarricense de Desarrollo)
CONAI	National Commission for Indigenous Affairs (Comision Nacional de Asuntos Indigenas)
DGF	National Forest Service (Direccion General Forestal)
DGMH	Bureau of Geology, Mines and Hydrocarbons (Direccion de Geologia, Minas e Hidrocarburos)
DSA	Environmental Sanitation Division (Direccion de Saneamiento Ambiental)

ECODES	Strategy for the Conservation and Sustainable Development of Costa Rica (Estrategia de Conservacion para el Desarrollo Sostenible de Costa Rica)
EIA	Environmental Impact Assessment (Evaluacion del Impacto Ambiental)
EPA	Environmental Protection Agency
ESPH	Public Service Company of Heredia (Empresa de Servicios Publicos de Heredia)
FAO	Food and Agriculture Organization of the United Nations
FDF	Forestry Development Fund (Fondo de Desarrollo Forestal)
FODEA	Law for the Promotion of Agriculture and Livestock Development (Ley de Fomento del Desarrollo Agropecuario)
GEC	Executive Watershed Group (Grupo Ejecutivo de Cuencas)
GTZ	German International Technical Cooperation Agency
ICAITI	Central American Institute for Industry Research and Technolgoy (Instituto Centroamericano de Investigacion y Tecnologia Industrial)
ICE	Costa Rican Electricity Institute (Instituto Costarricense de Electricidad)
ICT	Costa Rican Tourism Institute (Instituto Costarricense de Turismo)
IDA	Agrarian Development Institute (Instituto de Desarrollo Agrario)
IDB	Interamerican Development Bank (Banco Interamericano de Desarrollo)
IFAM	Municipal Advisory and Development Institute (Instituto de Fomento y Asesoria Municipal)
INBio	National Institute for Biodiversity (Instituto Nacional de Biodiversity)
INCIENSA	Costa Rican Institute for Training and Research in Nutrition and Health (Instituto Costarricense de Investigacion y Ensenanza en Nutricion y Salud)

INVU	National Institute for Housing and Urbanization (Instituto Nacional de Vivienda y Urbanismo)
IPM	Integrated Pest Management (Manejo Integrado de Plagas)
ITCR	Costa Rican Institute of Technology (Instituto Tecnologico de Costa Rica)
IUCN	International Union for the Conservation of Nature and Natural Resources
JAPDEVA	Atlantic Port Administration and Economic Development Council (Junta de Administracion Portuaria y de Desarrollo Economico de la Vertiente Atlantica)
JASEC	Cartago Electric Services Administration Board (Junta Administradora de Servicios Electricos de Cartago)
MAG	Ministry of Agriculture and Livestock (Ministerio de Agricultura y Ganaderia)
MIDEPLAN	Ministry of National Planning and Economic Policy (Ministerio de Planificacion Nacional y Politica Economica)
MIRENEM	Ministry of Natural Resources, Energy and Mines (Ministerio de Recursos Naturales, Energia y Minas)
MOPT	Ministry of Public Works and Transportation (Ministerio de Obras Publicas y Transportes)
MTZ	Marine and Terrestrial Zone Zona Maritima-Terrestre
NGO	Non-Governmental Organization
OPS	Panamerican Health Organization (Organizacion Panamericana de la Salud)
OTS	Organization for Tropical Studies (Organizacion para Estudios Tropicales)
PRMC	Regional Watershed Management Project (Proyecto Regional de Manejo de Cuencas)
PRONASA	National Environmental Health Program (Programa Nacional de Sanemiento Ambiental)
ROCAP	Regional Office for Central Amercian Programs
SENACSA	National Soil and Water Conservation Service (Servicio Nacional de Conservacion de Suelos y Aguas)

14

SENARA	National Service for Ground Water, Irrigation and Drainage (Servicio Nacional de Aguas Subterraneas, Riego y Avenemiento)
SEPSA	Executive Secretariate of Agriculture and Renewable Natural Resources Sector Planning (Secretaria Ejecutiva de Planificacion Sectorial de Desarrollo Agropecuario y de Recursos Naturales Renovables)
SERH	Executive Secretariat for Water Resources (Secretaria Ejecutiva de Recursos Hidricos)
SNE	National Electricity Service (Servicio Nacional de Electricidad)
SPN	National Parks Service (Servicio de Parques Nacionales)
STC	Technical Secretariat for Watersheds (Secretaria Tecnica de Cuencas)
SU	Users Societies (Sociedades de Usuarios)
TFAP	Tropical Forestry Action Plan (Plan de Accion Forestal Tropical)
TSC	Tropical Science Center (Centro Cientifico Tropical)
UCR	University of Costa Rica (Universidad de Costa Rica)
UNA	National University (Universidad Nacional)
UNED	State Correspondence University (Universidad Estatal a Distancia)
UNESCO	United Nations Educational Scientific and Cultural Organization
USAID	U.S. Agency for International Development

15

1. INTRODUCTION

Under The Regional Environmental and Natural Resource Management Project (RENARM), the U.S. Agency for International Development/Regional Office for Central Amercian Programs (USAID/ROCAP) funded country case studies of policies affecting the management of natural resources in Central America. This report presents the results of the Costa Rica Inventory. There are four main steps to conduct a Natural Resource Policy Inventory:

a) identifying critical policies and laws from both the public and private sectors at the regional, macroeconomic, and local levels which affect natural resources (including those pertaining to the economy, commerce, agriculture, forestry, energy and industry);

b) identifying institutions and agencies (both government and non-government) that create and implement such policies;

c) conducting a qualitative assessment of the impacts of each policy on economic growth and the natural resource base in both the short and long run; and

d) analyzing the interactions of these policies, discussing significant gaps in the current policy set and determining principal policy alternatives for a research agenda.

This policy inventory organizes policy issues under the themes of sustainable agriculture, management of water resources, production from forests, management of wildlands, and management of coastal and marine resources. An issue is a problem in natural resources management that could be ameliorated by policy change. Fifteen policy issues were identified and over 100 policies were analyzed in the inventory.

Contents of the Report. Volume I is a summary of the results and conclusions of the Costa Rica Natural Resource Policy Inventory. It is non-technical and geared for a wide audience. Illustrative examples are used to support the inventory's main conclusions.

Volume II is organized into seven chapters. Chapter 1 provides the scope and orientation of the inventory by dividing the analysis into five natural resource themes: sustainable agriculture, management of water resources, production from forests, management of wildlands, and management of coastal and marine resources and setting the criteria for selecting policies analyzed in the inventory. Costa Rica's soils, water, forest and coastal resources are also described. Chapter 2 analyzes how Costa Rica's natural resource policy framework has been and is shaped by macro policies and human ecological, institutional and cultural factors. Chapters 3 through 7 correspond to the five natural resource themes described in Chapter 1. In each chapter, two to four policy issues are identified. For each issue, the inventory presents the issue description, policy framework, institutional framework, issue analysis of what does and does not work, and policy gaps, alternative and a research agenda.

Volume III contains three technical appendices. Appendix A presents seventeen policy inventory tables that support the policy discussions of

Chapters 3 through 7. Over forty public policies and laws are grouped into these seventeen major policy categories. Each table describes the major policies framing a policy category, its corresponding institutions, and evaluates its impact on the environment and natural resources and the economy. Appendix B briefly describes the characteristics and objectives of over twenty public sector institutions involved in Costa Rica's natural resource policy issues. Appendix C lists over 100 international, national, regional and local Non-Governmental Organizations (NGOs) active with natural resource agendas in Costa Rica.

2. KEY MACRO ISSUES

Volume II, Chapter 2 analyzes how Costa Rica's natural resource policy framework has been and is shaped by macro policies and human ecological, institutional and cultural factors. This section highlights four of these issues: (1) macroeconomic policies concerning international trade, government revenue and expenditure, and credit and price subsidies have indirectly affected the management and use of natural resources in Costa Rica (2) the incompatibility between Costa Rica's 2.67 percent human population growth rate and the scientifically supported notion that 25 percent of Costa Rica's territory should be protected in some form from human activity; (3) the legal framework granting private property rights has contributed to the uncontrolled settlement and deforestation of Costa Rica's frontier and significantly constrains the ability of government institutions to enforce laws and policies on privately owned lands; and (4) there is a tradition in Costa Rican culture to need national strategies for every aspect of economic activity, despite the fact that in some cases the private sector has demonstrated the ability to operate with long-run foresight.

2.1 Macroeconomic Policies

For conceptual purposes, the economic history of Costa Rica over the past 30 years can be divided into three broad phases, each characterized by a distinctive strategy of national economic development, and each introducing a new set of problems for Costa Rica's natural resource management: (1) 1960-73, a period characterized by a policy of sustained import substitution; (2) 1973-79, a period noted for continuation of the import substitution model, but in the context of dramatically increased government intervention in the economy in the form of price controls, subsidies, and an expanded state industrial conglomerate; (3) 1980-90, a period of economic crisis, structural adjustment, and fiscal retrenchment.

During the 1960s and 1970s, successive administrations pursued a general policy of sustained import substitution. The price of both industrialization and improvement in the standard of living was increased foreign debt. This period was characterized by modernization of traditional agriculture, largely through increased agrochemical inputs and the introduction of improved varieties. In 1963 only 17 percent of Costa Rican farms used fertilizers; by 1973, 50 percent did so. Problems of agrochemical runoff and pesticide contamination largely date from this time. The period also witnessed a sustained effort to increase beef production, not so much by raising

productivity per unit of land, as by bringing more land into production and converting forest to pasture. Between 1950 and 1963 the total area dedicated to agriculture increased by 47 percent. Very little of this increase was in cropland; most was in new pastures. The expansion of pasture was particularly notable during the early 1970s, when ranchers enjoyed high prices and credit subsidies. Although the massive conversion of forest to pasture was associated with a temporal increase in domestic production as measured in the national income accounts, this development brought about a long-term decline in the total productivity of the altered ecosystems. According to the National Forest Service (DGF), only 5.3 percent of Costa Rica's national territory is considered suitable for sustained pasture management. Nonetheless, by 1984 fully 49 percent of the country had been converted to pasture.

As noted above, the expansion of cattle production displaced a substantial portion of the rural population, causing migration to both forested areas and to the cities where the push to industrialize created new job opportunities. Urbanization exacerbated local problems of solid waste disposal. Industrialization without the benefit of environmental regulation also contributed to water pollution, particularly in the rivers of the Central Valley and the Gulf of Nicoya near the city of Puntarenas.

Over the long term, import substitution programs were accompanied by a gradual increase in the size and scope of government activities. From 1950 to 1980 the government grew faster than any other sector of the economy. In 1950 government expenditures accounted for 5.38 percent of the gross national product; by 1980 they had risen to 15.19 percent of GNP. This period was characterized by the expansion of regulatory agencies and state enterprises and growing government intervention in the economy through price controls (on gasoline and basic foodstuffs) and subsidies (for industry, cattle, and basic grains).

The dramatic expansion of Costa Rica's system of national parks and reserves also dates from this period. Part of a much broader move to establish regulatory control over activities formerly beyond the purview of public officials, was a move to bring large tracts of public reserve land nominally owned by government under regulatory control. Many lands that were declared reserves were areas of active colonization. Because regulatory agencies typically lacked sufficient funds to purchase nationalized lands from their occupants or to adequately patrol the newly created reserves, those management problems remained unresolved.

The changing circumstances of the 1970s contributed to progressively more serious problems with the import substitution model. Public expenditures continued to rise throughout the decade. Furthermore, new developments in the international economy, particularly the disintegration of the Central American Common Market and the oil crises of 1973 and 1979, were associated with sharply deteriorating terms of trade and increasingly serious domestic financial problems.

The trends in natural resource use and degradation continued in the 1970s. Encouraged by generous credit subsidies through the national banking

-18-

system, settlers and ranchers continued to convert forest to pasture throughout the decade. By this time, virtually all of the land thought to be suitable for sustained pastoral use was already in pasture. Thus, most of the pasture expansion of this period was on less desirable land which led to diminishing returns on investment and the inability of ranchers to pay their debts. During this period, problems of air and water pollution and solid waste disposal increased as a result of continued unplanned urban growth and unregulated industrialization.

The 1980s were characterized by a seemingly intractable government fiscal crisis and a continuous cycle of negotiations between the government of Costa Rica and multilateral lenders over the terms of the foreign debt. Each new round of debt negotiations brought renewed pressures to: (1) introduce a combination of cost cutting and revenue generating measures designed to bring government expenditures in line with revenue; and (2) increase hard currency export earnings by devaluing the colon and introducing programs to promote non-traditional exports. During the Monge and Arias administrations there was also a hesitant, gradual, and incomplete shift away from the state-building philosophy of the 1970s.

At present, the principal indicators of employment and production are reasonably robust. Nonetheless, long-term economic performance is still hampered by persistent problems of an intractable public deficit and a chronically negative balance of payments. The new Government is presently pursuing an energetic program of structural adjustment and fiscal reform, which includes a significant reduction of the public deficit through a combination of cost cutting and revenue generating measures.

In terms of natural resource management, the most conspicuous feature of the present situation is the chronic fiscal crisis of the central government. For the past 10 years, all the mainline government agencies charged with protecting natural resources and safeguarding public health have faced stringent budgetary constraints which has caused critical problems such as shortages of vehicles and gasoline required for fieldwork, a general freeze on the size of staff, and an inability to attract the most talented professionals. For the National Parks Service (SPN) and the Forest Service (DGF), the budgetary constraints come on the heels of the expansion of the system of parks and reserves which began in the 1970s and continued through the 1980s. These agencies are now charged with managing huge tracts of land, but lack the wherewithal to do so effectively. Much the same may be said for those institutions responsible for safeguarding public health. The rapid urbanization and industrialization of recent decades have created regulatory problems of increased scope and complexity for these institutions.

Shifts in public policy aside, multiple incentives that favor unsustainable use of the country's renewable natural resources are embedded in Costa Rica's economic and legal structure. Most will be discussed in the chapters on specific resource management issues. However, specific financial incentives in the form of taxes, credits, and subsidies that influence general patterns of land use is pertinent to all of the narrower issues discussed in this report. Therefore, it is included in this section as part of the survey

of contextual factors that condition a broad range of resource management decisions.

Property taxes in Costa Rica are low and have declined in real terms over time as the result of the fall of the colon and the tendency of the Ministry of Hacienda to reassess property values at infrequent intervals. The significance of a low property tax is that it offers little disincentive to inefficient patterns of land use such as cattle ranching. Were taxes on pastures to be raised, large areas of marginally productive land would most likely be abandoned to secondary forest.

For more than 30 years the cattle industry was favored by the national banking system. Compared to other agricultural activities, cattle ranchers received large amounts of credit at lower interest rates with a long payback period. The desire to capture loans at negative real rates of interest resulted in the extension of pasture to many areas that were not ecologically suitable for that use. In effect, the national banking system subsidized the conversion of forest to pasture over a 30-year period. In recent years, the amount of credit available to cattle ranchers has been reduced and subsidies have generally been curtailed. Despite the fact that credit for cattle has been reduced and the terms of loans are much less favorable than they once were, loans for cattle are the only means of capitalizing a farm for the many farmers who lack title to their land. Costa Rican banks quite reasonably do not give mortgage loans to those who lack title to their farm. However, they allow farmers to mortgage movable assets, such as cattle. For those who lack title, this system has created an incentive to convert forest to pasture which persists to the present, although it is less of a problem now.

There has been little coordination between the lending policies of the national banking system and the regulatory agencies charged with protecting wildlands. Until 1988, National Bank of Costa Rica (BNCR) granted loans for cattle to the occupants of government forest reserves. In effect, the national banking system subsidized the conversion of forest to pasture inside protected areas. Cattlemen whose pastures are inside government reserves were eligible for the 1987 Promotion of Agriculture and Livestock Development (FODEA) program and appear to be eligible for FODEA credits as well.

The national banking system tends to offer credit for agricultural development without sufficient consideration of land use potential. As a result, agriculture and pastoral use have long been financed on sites not suitable for that purpose. In addition to government banks, numerous non-governmental organizations channel credit to small producers who similarly give little or no attention to land use potential.

Costa Rica's history demonstrates the critical need to evaluate the effect macroeconomic policies have on the use and management of the country's natural resources to ensure sustainable development. Structural adjustment and other macroeconomic policy reform discussions should evaluate how the specific policies under consideration place demands on the renewable natural resource base and whether these demands are sustainable in the long run.

2.2 Population Growth and Demands on Natural Resources

Often policy analysis of specific natural resource issues ignores the population dimension. However, this issue is critical in Costa Rica. Given the scientifically supported notion that 25 percent of Costa Rica's territory should be protected in some form from human activity, Costa Rica's 2.67 percent population growth rate is too high with respect to maintaining the long-run availability and quality of the renewable natural resources that support the population.

Until recent decades, Costa Rica has always been characterized by a comparatively small population and an open agricultural frontier. Throughout much of the nation's history, the availability of frontier lands for homesteading served as the principal solution to many of the country's social and economic problems. However, in the last 25 years, that frontier has gradually closed. All the land is now claimed by private owners or the national government. Moreover, regardless of ownership, the unoccupied lands are not suitable for sustained agricultural or pastural use. Nonetheless, migration continues. In fact, the rate of internal migration is higher now than at any point in Costa Rica's history.

The inventory demonstrated that adverse consequences of uncontrolled population growth are already impinging on Costa Rica's economy and natural resource base. For example, the inventory highlighted problems such as expanding urbanization in areas with rich soils suitable for agriculture and intensive cattle raising; human settlement in areas that are not considered suitable for sustained agricultural or pastoral use, and increasing competition for water resources.

Thus, natural resource policy discussions and reforms should consider demographic factors, such as mechanisms to reduce the population growth rate and to ensure the optimal distribution of the human population for long-run sustainable development.

2.3 Private Property Rights

Costa Rica's body of land law which promoted the colonization of public domain lands recognized the occupation and use of public domain lands as acts which convey certain property rights upon the occupants and established a legal mechanism by which homesteaders could petition for recognition of their claims. Although these land laws have been amended in important ways in recent years, the general legal principles remain pertinent.

The notion that the use and "improvement" of land conveys property rights to the user has important implications for natural resources. First, according to both rural tradition and Costa Rican land law, forestland was historically regarded as "idle" and clearing forest was regarded as an "improvement." Currently, it is illegal to homestead on public lands and to clear forest without a permit. Nonetheless, both practices remain quite common, and clearing forest remains a means to establish claims within public reserves.

The legal framework granting private property also significantly constrains the ability of government to enforce laws and policies on privately owned land. The constitutional right to private property often overrides public environmental welfare laws, such as the General Law of Health, The Forestry Law, and the Water Laws. The exception is when the state uses its powers to expropriate land. Moreover, it is difficult to enforce regulations on activities, such as timber harvesting, land clearing close to waterways, drilling wells, and agrochemical use, within private lands.

Policy reform discussions should address this issue directly.

2.4 National Strategies for Development

Clearly, Costa Rica needs broad long-run plans to ensure its sustainable development. The National Strategy for Conservation and Sustainable Development (ECODES), published early in 1990, highlights development choices in 19 sectors that Costa Rica needs to address. ECODES, the result of an intensive three-year effort that involved nearly 200 Costa Rican professionals, demonstrates Costa Rica's ability to formulate sound long-term planning for development. The Forestry Action Plan (TFAP) was also multi-sector effort and initiated by the Ministry of Natural Resources, Energy and Mines (MIRENEM). At this point in time, little has been done to implement many of the strategies, proposed projects, or suggested policies. National strategies affect the management and use of the country's natural resources only to the extent that they are implemented.

The inventory also identified several key areas where the private sector promotes long-run sustainable activities without national government interference. Examples abound in the areas of forestry, agriculture, water resources and wildlands.

- Private reforestation companies have developed reforestation projects not dependent on government fiscal incentives.

- No formal policies have been adopted on the integration of forest and industry, but the private sector has taken some action. Portico, S.A., probably the best example of these efforts, has an active campaign of purchasing or leasing forestland in the northeastern part of the country.

- Some municipalities and Rural Aquaducts Administration Committees have formed watershed and natural resource groups. These groups are taking protective actions in their water supply watersheds, such as reforestation in recharge zones, and denunciations of deforestation and agrochemical, quarrying, or livestock pollution of watersheds.

- Several NGOs and local community organizations promote sustainable agricultural and forestry practices at the grassroots level. They represent logical supporting entities for protection and economic production activities by the private sector in buffer zones.

22

- Thus far, ecotourism development has occurred largely through private sector initiative and in the absence of a national policy framework for ecotourism and despite disincentives for NGO involvement. Specifically, the incentives which do exist for ecotourism are not available across the whole private sector. As an example, businesses receive tax reduction incentives for developing a tourism site. But an NGO that establishes, protects and manages a reserve which generates tourism, does not qualify for these incentives.

- Private sector involvement in conservation is extensive. Examples include the Tropical Science Center (TSC), which manages the Monteverde Cloud Forest Reserve and has overseen its expansion and protection, and the Organization for Tropical Studies (OTS), which manages a biological and ecological research station at La Selva. Both support ecotourism and scientific research.

There are clear cases where the private sector has demonstrated the ability to take an active and positive role. However, the inventory also highlights cases, such as coastal zone management, which lack but require implementing a national strategy to protect the natural resources from exploitation and degradation. Thus, one overriding policy issue is to determine the extent of public sector involvement needed to ensure that the country follows a sustainable path of development.

The remainder of this executive summary is devoted to specific natural resource policy issues under the five natural resource themes of sustainable agriculture, management of water resources, production from forests, management of wildlands and management of coastal and marine resources. For each natural resource theme, two to four policy issues are described. A policy and institutional framework, along with an analysis of what works and what does not work is presented for each policy issue. A discussion of policy gaps, policy alternatives and a research agenda concludes each natural resource theme section.

3. SUSTAINABLE AGRICULTURE

3.1 Improper Soil, Water, and Land Management Practices

3.1.1 Issue Description

Soil, water and land management practices and sustainable agricultural practices have not been a "tradition" in Costa Rica's agricultural technology. Instead, the emphasis during the last 20 years has been on unsustainable development practices supported by credit, physical capital, and subsidies for agrochemicals and other imported inputs.

3.1.2 Policy and Institutional Framework

Land Management. Within the last few years, several documents and projects, including the Tropical Forestry Action Plan (TFAP), the Conservation Strategy for the Sustainable Development of Costa Rica (ECODES) and Neotropica's "Desarrollo Socioeconomico y el Ambiente Natural de Costa Rica" have defined strategies, issues, and policy on environmental protection and development processes and activities at the national and sectorial levels. These strategies mainly relate to zoning and land use, institutional coordination, and approval of the proposed Environmental Code.

One major policy issue in Costa Rica is to define and use a standard land use classification system. The 1987 Forestry Decree officially recognized the TSC land classification system. However, not all institutions have abided by the Forestry Decree, and various land classification systems are currently in use in Costa Rica. A recently appointed commission is in charge of deciding on a land classification system that provides a framework for soil and water management practices and projects. This commission is formed by the National University (UNA), the University of Costa Rica (UCR), TSC, the Agrarian Development Institute (IDA), the National Forest Service (DGF), the National Soil and Water Conservation Service (SENACSA) and the Executive Secretariate of Agriculture and Renewable Natural Resources Sector Planning (SEPSA).

Soil and Water Management. In 1985 SENACSA was created within the Ministry of Agriculture and Livestock (MAG) to promote soil and water conservation. Since 1985, SENACSA has expanded its activities by working with technicians from IDA in settlement areas and establishing demonstration farms and plots to train SENACSA personnel and verify soil and water conservation practices for particular agroecological zones in Costa Rica. Recently, SENACSA proposed a new Soil Conservation Law as an effort to reform and update the legislation.

SEPSA is composed of representative from MAG, the Ministry of National Planning and Economic Policy (MIDEPLAN), the Ministry of the Presidency, the National Council for Production, IDA, and representatives from the agriculture and livestock sector. Under its mandate to implement policies formulated by MAG, SEPSA prepares the Annual Sector Operation Plan, the Institutional Operation Plan and the National Plan for Agriculture, Livestock

and Renewable Resources, undertakes studies at the national level, and proposes agriculture, livestock and renewable natural resources policies.

The National Irrigation, Underground Water and Drainage Service (SENARA) is an autonomous institution with primary responsibility to develop and implement irrigation and agricultural drainage projects. SENARA is also responsible for underground water resources, especially in an agricultural and rural community development context. Its major efforts consist of the Arenal-Tempisque irrigation project in Guanacaste, which should irrigate 70,000 hectares by the year 2000; the Itiquis irrigation project near Cartago; and various drainage projects in the atlantic coastal region and in the southwestern part of the country.

3.1.3 Issue Analysis

What Works. TSC offers short courses on the practical use of its land classification system at the field level to the technical personnel of various institutions, including the Costa Rican Electricity Institute (ICE) and IDA. The DGF continues to require use of the TSC land classification system to determine land use capacity for lands to be reforested under the incentive system, or for those forested lands to be considered for harvesting.

A reference manual of methodologies and technical criteria in soil and water conservation has been written by SENACSA. SENACSA also has established a data bank on natural resources. In 1988, SENACSA provided technical assistance to 135 farmers in soil and water conservation practices, erosion control, drainage, flooding, recuperation of gullies, and maintenance and management of vegetation covering. Activities were conducted on 366 hectares of land in Orotina, San Carlos, Cartago, and the Golfito.

Regional and local soil conservation projects and activities, such as those at Puriscal, Hojancha, and Osa Peninsula, promote long-term soil conservation practices and farming systems. Positive soil management examples related to dairy production are also found in the northern part of Cartago Province where soil conservation practices started by the former Interamerican Institute for Agriculture Cooperation (STICA) are still in place.

SENARA has been successful in the construction of irrigation and drainage infrastructure and the delivery of irrigation water. Its efforts have increased productivity and limited crop failures from inconsistent precipitation during the rainy season in sugar cane and rice production.

The German International Technical Cooperation Agency (GTZ), CARE, and the New Alchemists Association (ANAI) have been developing projects with communities and Centros Agricolas Cantonales (CACs) that include instruction in specific soil and water conservation practices.

What Does Not Work. As of the mid-1980s, Costa Rica had 10 land use capability classification systems in use by 22 institutions, of which only five methodologies were taught in the universities.

25

Even though the TSC land classification system was declared the official system by the Forestry Emergency Decree, recent forestry, agroforestry, and agricultural development projects have not considered its zoning or land use recommendations. For instance, IDA does not consider zoning and land use when defining the size of the plots and the characteristics of the settlement. Likewise, SEPSA continues to use a modified U.S. Department of Agriculture classification system to determine the land use capacity of the Costa Rican territory. Moreover, the new Forestry Law states that the designation of an official system for determining the forestry capacity of lands will be at the discretion of DGF.

Soil management is not a credit-financed activity mandated by the Law for the Promotion of Agriculture and Livestock Development (FODEA), and IDA settlements do not receive technical assistance tailored to their ecological characteristics. Recent IDA settlements assign settlers a five-hectare plot on wet tropical soils that generally have been deforested. Without technical assistance on soil management or crop choice, these actions are creating a minifundio-type of development, which together with credit and subsidies, does not encourage ecologically sustainable soil and water management practices.

Too few professionals are trained in soil classification and analysis. Traditional emphasis in soils investigations has been on soil-crop relations and chemical analysis. There is no active soil inventory/classification program in Costa Rica and few university instructors are trained or have experience in this area. There are no laws requiring soil inventory for Environmental Impact Assessments or other activities.

A shortcoming in SENARA's efforts is the lack of technical assistance when the emphasis is on nontraditional export crops. SENARA's extension agents have little experience in irrigated agriculture, and probably less in nontraditional crops. Additionally, these techniques are very input-intensive, requiring large and frequent applications of pesticides and fertilizer, which are not affordable for small farmers who benefit from the irrigation projects.

Part of SENARA's problem in transferring the appropriate technology has been the emphasis on the engineering and maintenance portions of their projects. Until 1987, SENARA's general manager was a civil engineer, with no prior agricultural experience. As of early 1989, only five full-time agronomists were assigned to extension work in the Arenal Tempisque district, with over 25,000 hectares and 180 farmers to serve.

Institutions at the field level lack the coordination needed to solve specific soil and water management problems. Because soil capability and land use recommendations are not consistent across institutions such as SENARA, SENACSA and MAG, a farmer can receive conflicting information on how to plan the development and protection of his land. Moreover, institutional coordination with the communities and with community organizations to enforce environmental protection or resource management is not mandatory, and effective incentives are not directed to community groups in charge of resource management.

-26

3.2 Misuse of Agrochemicals

3.2.1 Issue Description

The issue of misuse of agrochemicals covers worker safety, contamination of soil and water, and off-site contamination. Much of the misuse of pesticides and other agrochemicals in Costa Rica stems from carelessness and ignorance.

Contamination problems occur both on- and off-site. For example, copper buildup in the soils from fungus control products used for more than a decade on banana plantations along the Southern Pacific Coast are now affecting production to the extent that these plantations cannot be converted to other agricultural uses. Aerial spraying and the proximity of houses, rivers, and roads to the sites where agrochemicals are applied by hand also adversely affect the human population.

3.2.2 Policy and Institutional Framework

The major public institutions connected with regulating agrochemical uses are the Ministries of Health, Agriculture, Labor and Education. The Pesticide Registration Department and the Agronomist Association Advisory Group in the Vegetable Sanitation Department of the Ministry of Agriculture are in charge of the registration of all chemicals used in pest or disease control. The National Insurance Company (INS) also has responsibilities for worker protection, education, and labor-related accidents.

Pesticide importer groups participate in controlling agrochemical distribution and provide general information on use and application through the Chamber of Pesticide Importers.

Many institutions are involved in pesticide research, development, and residue analyses: the Faculty of Agronomy Advisory Group and the Centro de Investigacion de Contaminacion Ambiental (CICA) of the University of Costa Rica; the Pesticide Research and Development Group of the National University; Costa Rican Institute for Training and Research in Health and Nutrition (INCIENSA); Tropical Agronomy Teaching and Research Center (CATIE); GTZ and the University of Florida.

Registration of pesticides is required, and the policy is to follow U.S. Environmental Protection Agency (EPA) standards. The Ministry of Agriculture also offers Integrated Pest Management programs.

The Environmental Code and the ECODES strategy are two broad based environmental policies, currently under consideration by the Government, which have provisions on pesticide regulation. The Environmental Code, which has been presented to the Legislative Assembly for consideration, integrates the decrees and laws of various institutions in order to present a comprehensive framework for all environmental protection activities. The ECODES strategy proposes to create a data base on environmental contamination and to study environmental problems created by agrochemicals in aquifers and potable water systems, as well as chemical residues in agricultural products and water.

3.2.3 Issue Analysis

What Works. Costa Rica has extensive marketing infrastructure for the distribution of agrochemicals, including 300 sales outlets for agrochemicals throughout the country and inspectors in each of the eight regions who visit the outlets monthly to ensure that all products are registered.

Recently, the Ministry of Agriculture and GTZ agreed to develop an educational program for farmers on the safe use of pesticides, which will be executed at the farm level and in rural schools. MAG and the University of Florida have also agreed to define a pesticide management control system, which includes a component to transfer technology to the farm level.

Over the last eight years, the Pesticides, Development, Health and the Environment Program of the National University has monitored pesticide imports and uses and environmental and human health problems, including the adverse economic consequences of pesticide misuse.

What Does Not Work. Production inputs are introduced at the farm level without considering long-term environmental or socio-economic effects, such as contamination and other health dangers. Recent analyses show that 80 percent of farmers in the Central Valley use pesticides as their exclusive means of pest control.

MAG is promoting Integrated Pest Management (IPM) only for sugar cane, sorghum and potatoes. Applying IPM to crops, such as tomatoes, corn, rice, beans and sorghum, is difficult in Costa Rica. For example, there are 39 different fungi that attack both black and red beans.

The use of agrochemicals at the farm level is not well controlled. Contraband in agrochemicals comes mainly from Panama. Extension education service to train farmers in the field on the application of chemicals and required protective gear is ineffective. Farmers often overuse or misuse agrochemicals, obtain restricted pesticides without the required professional receipts from the Agronomists Association, apply agrochemicals freely despite legal restrictions, and fail to take the required precautions to protect workers and the environment.

3.3 Inadequate Agricultural Technology Research and Extension Services

3.3.1 Issue Description

A technology transfer system requires specific support services and activities, such as extension agencies, field offices, community groups, and research mechanisms, as well as land tenure, credit, and marketing incentives. Choices of agricultural technology and management techniques have not been based on soil production potential. Agricultural production has become a credit-dependent activity. As pesticides and fertilizers increasingly contaminate the environment and destroy soil and water resources, the economic feasibility of agriculture depends more on credit. This is particularly true for nontraditional crop production on tropical soils which require land

clearing, irrigation, and high amounts of more dangerous pesticides and fertilizers.

3.3.2 Policy and Institutional Framework

MIRENEM and the ECODES and TFAP strategy papers promote the consolidation of the natural resource technology transfer system in order to avoid duplication of effort and competition for scarce resources among institutions. Part of MAG's legal mandate is to promote agricultural development based on research and extension according to socioeconomic objectives and the needs of the agricultural and livestock producers.

The most important aspect of technology transfer and training is the participation of institutions created at the community level such as the Centros Agricolas Cantonales (CACs). These centers are conceived as operational structures and links in a technology transfer network, which is supported by universities and internationally funded technical assistance. They can integrate services and incentives and more efficiently transfer funds, contracting technical assistance and coordinating resource management activities in the community.1

At the regional level, Central America has a network of institutions undertaking scientific research in sustainable agriculture such as CATIE, the Central American Institute for Research and Technology (ICAITI) and the Organization for Tropical Studies (OTS). Universities and research-oriented externally funded groups, such as TSC and CATIE, are involved in sustainable agriculture and resource management activities. These universities and research centers, through interinstitutional agreements and projects, develop and transfer research findings to ministries and technicians in charge of technical assistance activities.

Private enterprise and producer groups, which are also part of the technology transfer and training system, carry out important functions. These organizations are well developed and influential in Costa Rica. The Costa Rican Coalition of Development Incentives/Livestock and Agroindustrial Private Coalition (CINDE/CAAP) integrates several export market-oriented organizations and chambers that represent interests of specific unions or production groups. CINDE/CAAP provides technical assistance, training, and marketing information to the coalition associates.

Finally, some institutions, such as the State Correspondence University (UNED) and the Improvement of Science Teaching Center, administer education programs for schools, teachers, and other groups.

3.3.3 Issue Analysis

What Works. International research centers, such as CATIE and North Carolina State University, have conducted investigations on acid soil management techniques specifically designed for the humid tropics. Private enterprise research and technology transfer systems, focused on specific economic activities such as coffee, sugar cane, cacao, and milk production,

have been instrumental in making Costa Rica one of the most efficient producers of these traditional crops.

Agreements among MAG, the Chamber of Pesticides Importers, the University of Florida, and GTZ related to pesticide use and education contain technical transference components for the local community and the farm level.

SENACSA's effort in soil conservation is providing experience in applying technology at the watershed level for Rio Banano in Limon and Rio Quebradas in San Isidro. SENACSA also publishes technical pamphlets and bulletins and offers courses, demonstrations, and training in soil and water management.

ANAI, CATIE, and the International Union for the Conservation of Nature and Natural Resources (IUCN) in Talamanca are providing information on non-traditional uses of the forest that permit sustainable management of buffer zones. Community participation and tree nurseries are important channels for the transfer of agroforestry systems technology.

Non-Governmental Organizations (NGOs), community organizations, and foundations also provide an operational structure that allows technical assistance, incentives, and credit to reach the farmer. NGO efforts in Hojancha, ANAI in Talamanca, and BOSCOSA in the Osa Peninsula are some examples.

UNED and the Neotropica and Parks Foundations develop and provide environmental education activities and materials for elementary and high school teachers to use in rural schools.

What Does Not Work. Not all research and development and technology transfer activities related to sustainable agriculture are part of the Agricultural Extension System under MAG. For example, MAG is promoting IPM for only three crops: sugar cane, sorghum and potatoes. Although CATIE is investigating IPM issues for four traditional vegetable crops (tomatoes, chili, cabbage, and corn), it is difficult to apply this technology to the field in Costa Rica. For example, there are 39 different fungi that attack both black and red beans.

Research conducted by regional or international institutions such as CATIE and OTS do not reach technicians and farmers at the field level, and formal university training is not directed to solving soil and water management problems. Until recently, little research conducted by regional and international institutions like CATIE and OTS was driven by farmers' problems in soil and water management, nor were the results of the research made available to farmers. This situation appears to be improving, however.

There are no provisions to provide trained technicians in soil management, agroforestry, or non-traditional production alternatives. Moreover, technology transfer activities and informal education at the field level often lack human and logistical resources due to poor institutional coordination and isolated field efforts.

3.4 Policy Gaps, Alternatives, and a Policy Research Agenda

Both MIRENEM and MAG have a mandate to protect and preserve renewable natural resources, but institutional responsibilities are not clearly defined at the field level. As a result, there is no national policy to develop a technology transfer system that integrates the efforts of organizations such as TSC, OTS, and CATIE and focuses on community and field level project needs. International donors also have not promoted a specific natural resource management technology transfer system even though numerous institutions and NGOs are involved in sustainable agriculture and natural resource management. Consequently, many NGOs are doing active at the field level without guidelines needed to provide technical assistance to participating communities and farmers, resulting in a waste of scarce resources.

Farmers and technicians also need informal field level training on the TSC land classification system and on field analyses and diagnosis of agroecological variables. Moreover, data collection and monitoring activities based on land use capability should be incorporated in field level projects in order to validate technology recommendations. Validation would ensure that recommendations are directed to farmer and farm agro-ecological characteristics. Trained soil and water and crop technicians should work at the field level to provide farmers with valid recommendations.

The proposed Soil Conservation Law should be approved in order to define SENACSA's role in soil and water conservation. The new Soil Conservation Law based on the TSC land classification system should consider zoning based on land use; propose credit and other incentives for sustainable agriculture practices; integrate institutions and management practices at the watershed level; and consider community participation in watersheds and resources management.

Financing is needed to enable NGOs and private enterprises to promote sustainable soil/water/forest management activities. Projects such as the CARE-funded watershed management projects at Rio Banano and Rio Quebradas also require clarification of soil-water conservation practices.

With respect to agrochemical use, the most important policy gap is the lack of an effective information and technology transfer organization to provide technical assistance to farmers. Demonstration plots and intensive technology transfer and education programs at the farm level could encourage reduced reliance on pesticides through adoption of other types of IPM practices. The programs could also demonstrate proper use of pesticides in those situations for which they provide the best pest management option. Other policies, such as subsidized credit for organic farming or for integrated pest management practices that include biological control, could provide further incentives.

ECODES' recommendation to create an agricultural information center specializing in environmental issues should be considered, along with the creation of an up-to-date data base that supports extension and environmental education projects. The data base should include recommended pesticides

according to crop and stages of pest attack in accordance with an integrated pest management system.

With respect to import regulations for agrochemicals, a more direct information channel is needed between EPA in the U.S. and the Ministry of Agriculture in Costa Rica in order to avoid dumping of EPA-banned products. ECODES recommends a legislative review on import regulations and applications of agrochemicals and the establishment of maximum levels for toxic residues for specific crops in accordance with international standards.

Adoption of IPM technologies will require farm level access to appropriate information, effective extension, control of dangerous chemicals, and possibly some type of subsidy as an incentive for farmers to use alternatives to pesticides.

Finally, economic incentives for farmers on fragile lands must be analyzed and defined so that long-term production and protection become part of farm management. Credit policies do not consider long-term management of the environmental resource base. With respect to non-traditional crops, credit and production incentives are needed for export-oriented and reforestation projects that follow zoning and land use recommendations. Credit and other incentives for sustainable management practices such as integrated pest management and agroforestry systems that promote trees, soil, and water protection practices, and soil cover should be introduced.

4. MANAGEMENT OF WATER RESOURCES

4.1 Water Pollution

4.1.1 Issue Description

Urban, industrial, agricultural, and mining activities are contaminating water to some degree in most of the country's watersheds. As a result, operation and maintenance costs are high in the hydroelectric and potable water treatment plants. In addition, the middle and lower watershed regions of several watersheds are facing population health risks and ecological deterioration.

4.1.2 The Policy and Institutional Framework

The Ministry of Health, through its Environmental Sanitation Division (DSA), is in charge of water quality control for the country under Law 5412 (1974), which created the Ministry of Health, and the General Law of Health (1974). The DSA regulates effluent contamination due to human activities, as well as all matters concerning solid waste and its treatment. A non-official program, the National Environmental Health Program (PRONASA), which the DSA established in 1982, sets effluent standards according to a water use classification system.

DSA shares responsibility with other institutions that have legal mandates for water conservation: the rural health centers, the Costa Rican Institute for Water and Sewer System (AyA), and the Ground Water, Irrigation and Drainage National Service (SENARA).

The Ministry of Health employs more than 100 sanitation technicians who work with some 350 rural health centers. They monitor water contamination caused by residential, industrial, commercial, and some agricultural activities. In complex cases, such as the impact of treated effluents or location of landfills on water quality, they consult the health center personnel or DSA in San Jose.

AyA's legal mandate covers the collection and disposal of sewage and industrial liquid residues, regulation of pluvial drainage in urban areas, and advice and coordination with other government institutions in the control of water resource contamination. DSA and AyA share responsibility for approving and regulating industrial sewage and pluvial effluents and regulating and setting norms to prohibit contamination in all potable water systems.

SENARA's objectives are to establish irrigation and drainage systems, establish flood protection, and ensure a fair and optimal use of superficial and underground water resources for agricultural and livestock uses. Under this mandate, SENARA should promote and direct collaboration with other institutions on preventing contamination and eliminating all types of contaminants from the waters of irrigation districts.

To a lesser extent and more indirectly, the Costa Rican Institute of Electricity (ICE), Municipalities and the Municipal Advisory and Development

32

Institute (IFAM), the National Forest Service (DGF) and the Geology, Mines and Hydrocarbon Division (DGMH) within the Ministry of Natural Resources, Energy and Mines (MIRENEM), and the Soil and Water National Conservation Secretariat (SENACSA) within the Ministry of Agriculture and Livestock (MAG), are involved in water contamination control.

A Forestry Law regulation mandates the Forest Service to protect a strip of land 200 meters on either side of mountain water sources, or 100 meters if the waters originate in the plains. A 50-meter band is protected along borders with steep embankments and a 10-meter band along flatter riverbanks.

4.1.3 Issue Analysis

What Works. AyA monitors and controls the water quality of its 125 potable water systems, using the Panamerican Health Organization (OPS) standards. Aya's potable water systems that supply more than half of the population.

The sanitation technicians who work under the jurisdiction of the rural health centers are also taking some preventive and corrective measures. DSA is eliminating or controlling some focal contamination points and exerting pressure on industries and agricultural activities to treat their wastes to some extent before they are dumped or washed into rivers or percolated into groundwater. The rural health centers are also consulted for advice on new industries and agricultural and livestock activities that may affect public health.

Some private industries and mines are treating and controlling their liquid wastes to some degree. Some communities are concerned about protecting their potable water systems and have taken legal action when deforestation or herbicide application occur close to their water sources.

Costa Rica has some capacity for and conducts some laboratory water quality analysis and sampling, although some sophisticated analyses, such as microorganic compound for agrochemicals and hydrocarbon by-products, have to be sent to specialized laboratories outside the country. Some laboratory installations exist at AyA, the University of Costa Rica (UCR), the National University (UNA), the Costa Rican Institute for Training and Research in Nutrition and Health (INCIENSA), the Ministry of Health, ICE, MAG, and several private bacteriological laboratories, but only AyA systematically conducts potable water quality analysis for its own systems.

What Does Not Work. The Government has not emphasized the control and maintenance of water quality in the tributary watersheds of potable water systems or the control of wastewater quality or disposal.

Despite their legal mandate, DSA and AyA have not set official quality norms for potable water or contaminating effluents. DSA's PRONASA program, which sets effluent standards according to a water use classification system is not official and has only the Tarcoles River watershed waters have been classified. Moreover, the standards are not applied to most of the Tarcoles

34

water bodies. Municipal potable water systems in rural areas outside of AyA's jurisdiction have little or no water quality control.

Because the water quality standards for different water uses, as set forth in the General Law of Health, are incomplete and have not been legally ratified, the court cannot fully and objectively enforce the law. As a result, court experience and clear proceedings for enforcing the contamination control law are limited.

The regulation protecting riverbanks is not enforced on private lands. The Government is required to provide relocation compensation to landowners who are displaced from land that has been developed. Although some landowners located in environmentally critical areas have been compensated, the government generally does not enforce this policy.

The General Law of Health declares water to be a public benefit and prohibits its contamination. However, informal and unwritten government policies have permitted industrial contamination to minimize production costs. For example, the commission to perform Environmental Impact Assessments (EIAs) for mining activities has inadequate authority and resources to oversee and control the necessary work. The Ministry of Public Works and Transportation (MOPT) and municipalities do some open pit mining of non-metallic materials for road construction, but they do not conduct EIAs. In general, open pit mining does not respect the 10- to 50-meter protected fringe along the rivers. Also non-metallic material is often washed into the rivers, producing great quantities of sediment.

Policies and programs are not coordinated among the institutions with legal responsibility for water conservation. For example, DSA and AyA do not coordinate and have no joint policy to control fecal contamination in river or aquifer waters. The two agencies should also work together to establish laboratories for chemical and bacteriological analysis also in the rural water supply systems.

Some institutions with legal authority for contamination control, like AyA and SENARA, contaminate rivers (the Virilla and the Tarcoles) with untreated sewage, drainage channels with agrochemicals, and groundwater with excessive percolation on over-irrigated lands (Arenal-Tempisque Project).

4.2 Competition for Water Resources

4.2.1 Issue Description

The past two decades of increasing demands for water, marked dry and rainy seasons, geographical concentration of both the population and water activities, and the lack of water use planning is causing overexploitation and competition among various water uses, including hydroelectricity, irrigation, domestic consumption, waste dilution, transportation, recreation, and navigation.

4.2.2 Policy and Institutional Framework

Three main national institutions, SENARA, AyA, and ICE, and approximately 1,400 community/municipal organizations, including local governments, administrative boards, Rural Aquaducts Administration Committees (CAARs), Users Societies (SUs), and private enterprises, mostly in the recreation business, use the country's water resources. SENARA is the technical institution in charge of groundwater investigation and irrigation and drainage development.

AyA uses, manages, and/or supervises all public domain waters that are indispensable for carrying out its legal obligations to administer and supervise potable water systems, urban and industrial sewage systems, and pluvial drainage. AyA can declare Water Reserve Zones to ensure future public supply or to prevent over-exploitation. In these zones, no water exploitation can legally take place without AyA's permission.

ICE develops and administers hydroelectric projects. In addition to ICE, a few administration boards and public service companies administer hydroelectric projects, such as the Electric Service Administration Board of Cartago (JASEC) and the Light and Force National Company (CNFL).

Forty-four of the eighty-one municipalities manage their own potable water supply systems. CAARs and some companies, such as Public Service Company of Heredia (ESPH), also administer potable water systems. SUs administer irrigation projects.

The National Electricity Service's (SNE) regulates tariffs on public services, such as electric energy and potable water supply. The Water Department in SNE is in charge of granting permits and concessions to all water users except for the public water supply which has priority over other uses and is under AyA's jurisdiction.

To prevent water use conflicts, the Water Law and its regulations mandate SNE to keep a registry of institutional and private concessions. SNE requires the installation of regulatory devices to control the yield authorized in the concessions. In the process of granting a concession, SNE consults AyA and neighbors who might be opposed to it and publishes the request for the concession.

In granting these concessions, SNE first issues an exploration permit after consulting AyA and SENARA. SNE requires both a pumping test and collection of technical and hydrogeological information from the drilling company or interested party, which is supervised by a registered hydrogeologist. If the water supply is sufficient to meet the requests in the concession and there is no apparent conflict with other users, then the concession is granted.

SNE and SENARA regulate groundwater exploitation in the coastal zone to prevent sea water intrusion in the aquifer. This regulation prohibits groundwater extraction from drilling wells within one kilometer of the

coastline, unless hydrogeological studies show no potential for sea water intrusion.

4.2.3 Issue Analysis

What Works. For some new water concessions, SNE consults AyA, SENARA and other users to avoid the risk of future water conflicts. Institutions, such as ICE, SENARA, and AyA, have negotiated water use schedules and have shared the water resources in a manner that satisfies each institution's needs to the extent possible,

The principal institutions of the water resources sector, MIRENEM, ICE, AyA, SENARA, DGF, MAG and SNE, signed the Interinstitutional Agreement for Integral Watershed Management in 1987 in order to improve institutional coordination for watershed management efforts and water resource prioritization and planning.

AyA has designated some reserve zones, including the Colima Aquifer Reserve Zone for the metropolitan area, the Barranca Aquifer Reserve Zone for the prevention of sea water intrusion, and the Banana River and Moin Reserve Zones for the City of Limon water supply. For the most part, these zones have helped to preserve the water availability for future public supply but occasionally public or private political pressures led to some illegal exploitation or concessions.

ICE has a good network of limnographs, which are instruments used to measure the height of rivers and estimate hydroelectric potential.

What Does Not Work. The Water Department lacks the resources and capacity for technical water studies, water use management and planning, and field control of water use. Only a small proportion of SNE resources are allocated to its Water Department. The department has approximately 10 employees, including professionals, technicians, and support staff, and receives some 1,000 water concession requests per year.

Despite its mandate, SNE plays a very passive role in water resource management. In granting a concession, SNE relies on studies conducted by the interested party but also considers its own plans. Concessions are granted to ICE for power generation projects and to SENARA for irrigation projects based on unilateral institutional studies and political factors rather than national technical planning criteria.

SNE also lacks the capacity to forecast possible direct or indirect conflicts with other users. Unless another affected institution or a private party identifies a problem and opposes the project, SNE takes no interinstitutional cooperative action. This unwritten policy often fails, and water competition among both private and public sector interests is beginning to be a serious problem in some national watersheds.

There are no integrated planning groups for water resource management at the national, regional, or local levels to systematically solve institutional and private water use conflicts.

Because there is no central planning office nor clear national policy for water resource development, each institution plans its activities and development without consulting the others. Institutional projects are generally implemented under political pressure and lack adequate interinstitutional technical analysis. This situation is beginning to cause serious institutional competition for and over-exploitation of water resources.

The institutional practice of conducting cost-benefit studies only to solve a specific water use problem and not to compare the project to alternative water or land use projects, may be causing long-term social and economic losses such as colonization of marginal lands, deforestation, dam siltation, and unsustainable agriculture. This marginal economic and social cost should be included in the net project cost and public service tariffs.

Although SNE requires and ensures the installation of regulatory devices to control the yield specified in a concession, it does not periodically check if the device remains in place.

Water quantity fluctuation is not monitored for potable water and irrigation systems. None of the existing 1,300 rural aqueducts and few of the municipal aqueducts keep water fluctuation records or test water for human consumption. Few of the irrigation projects control channel flow for better and more efficient water use. This lack of information constrains adequate regional and local water resource planning and the design of new water projects. For example, most rural potable water system designs are technically based on a limited number of water flow measures. However, without periodic measurements, it is impossible to evaluate the natural and artificial changes in a water regime which are needed to design a system that is effective in the long run.

The 1941 Water Law sets priorities for water uses, reflecting the status of the country's development at that time. However, conditions have changed and these priorities are no longer appropriate.

4.3 Watershed Deterioration

4.3.1 Issue Description

Inappropriate land use practices, unsustainable natural resource exploitation, and poor institutional coordination adversely affect the watershed recharge areas. Water contamination and reduction of water infiltration resulting in surface runoff are serious problems causing soil erosion, sediment load, and reduction of stream base flows and groundwater levels.

Short-term rapid economic growth has dominated Costa Rica's development process. The public sector has given priority to natural resource uses that generate short-term profits or solve temporary problems without an integrated vision of natural resource development. This socio-political behavior toward natural resources combined with the ecological fragility of most of the

national territory has provoked severe deterioration of most of the country's watersheds.

4.3.2 Policy and Institutional Framework

The ICE division of the country into 34 watersheds varying in area between 207.2 km2 and 5,079.7 km2 is officially recognized by international and government institutions. These 34 watersheds are grouped into six geographical regions by climatic characteristics.

National institutions have selected 10 priority macro watersheds for urgent management actions to protect national investments as well as social welfare. Priority was given to watersheds with relatively heavy public investment for hydroelectric projects, potable water systems and irrigation infrastructure, and areas with high forest and agriculture productivity and significant soil deterioration. The total area of these priority watersheds is about 18,490 km2, representing 36 percent of the national territory. The extent of action has been minimal so far, however, considering the magnitude of the problem.

At the community and municipal level, some 1,400 micro watersheds are being used for potable water systems and local irrigation activities. Their total area has been estimated at 39 percent of the national territory by a random field trip inventory and interviews at 12 sites with a mean area of 1,500 ha in approximately 20,000 km2. Much of this area overlaps the priority macro watersheds of the national institutions.

The Government's philosophy has been that each economic sector, including urban, industrial, mining, and agricultural, should be responsible for its impacts on natural resources. Consequently, a large number of institutions are considered responsible for watershed conditions.

4.3.3 Issue Analysis

What Works. Although the Executive Watershed Group (GEC) and STC are not yet consolidated enough to coordinate sound institutional watershed actions, they have been elaborating and formulating policies, strategies, and projects for institutional and community participation in watershed management.

Several institutions have undertaken diagnoses and studies to identify watershed management actions. For example, GEC, STC, and CATIE's Regional Watershed Management Project (PRMC/CATIE) have coordinated with over 12 institutions and community organizations to develop a watershed management plan for the upper Virilla River watershed, which had been declared a national pilot priority watershed.

ICE is undertaking other watershed diagnoses and management plans for the Boruca River Hydroelectric Project watershed and AyA is doing so in some of their water supply system watersheds.

Some municipalities and CAARs, unilaterally or with other institutional support, have formed watershed and natural resource groups. These groups are taking protective actions in their water supply watersheds, such as reforestation in recharge zones, and denunciations of deforestation and agrochemical, quarrying, or livestock pollution of watersheds.

Recently, donor agencies have included watershed management components in their natural resource project.

MOPT's general specifications for road construction include environmental protection guidelines. MOPT's Manual for Road Construction calls on the private contractor to conserve and restore private and public properties and the surrounding scenery affected by the road construction activities. The contractor must take precautions to ensure minimal damage to the environment from soil erosion, river sedimentation, and other threats to running water, irrigation systems, and water bodies. Discarding untreated wastes in water bodies is prohibited. For large road construction projects, the international funding institution usually requires an EIA.

What Does Not Work. Although there is some institutional and private capacity for developing watershed management plans, there are no institutional mechanisms to provide human or financial resources to implement them. This lack of support reflects the low value that traditionally has been assigned to the natural resource base and the misconception that Costa Rica's natural resources can be exploited forever without taking conservation and management actions.

At the watershed level, there is no systematic monitoring of the deterioration or improvement of natural resources. The lack of an appropriate methodology to monitor infiltration capacity, fertility, erosion, and water quality and quantity makes it difficult to keep statistical records of the watersheds needed to justify the cost of watershed management actions.

Institutions that use, control, and administer natural resources in the watersheds work in isolation, with minimal coordination, following no medium- or long-term integral management plan to respond to the needs of future generations. Other institutions have direct responsibility for regulating and controlling economic activities that could affect the natural water resources, but generally they lack the resources to carry out their duties. For example, Aya, SENARA, and ICE had a combined budget of 6 billion colones in 1986; however only 0.25 percent of these resources were allocated to watershed management.

The constitutional right to private property often overrides public environmental welfare laws, such as the General Law of Health, the Forestry Law and the Water Laws, impeding government efforts to regulate watershed management. The exception is when the state uses its powers to expropriate land.

Most of the private and public roads are constructed without appropriate conservation infrastructure, such as installing gabions and surface runoff control devices, and practices, such as planting vegetation cover. For small

construction projects, the private contractor is responsible for following MOPT regulations. However, the Government does not enforce the policies, and typically the contractor does not adhere to the environmental regulations. Most of the quarrying for road construction is conducted without the required permit from MIRENEM.

Although EIAs are required for mining activities, they are done by the interested party and thus prone to bias. These studies primarily consist of an inventory and description of natural resources in the area, rather than a concrete analysis and economic compromise for specific control, conservation, and recuperation.

4.4 Policy Gaps, Policy Alternatives and a Research Agenda

No national program monitors water quality or keeps statistics on water quality evolution. However, it is possible to implement a national coordinating program for water quality monitoring in Costa Rica using the existing laboratory capacity of governmental, university, and private facilities. The task of establishing official water quality standards should be given high priority on the Government's natural resource policy agenda.

An appropriate, simple technology for community/municipality groups to use in monitoring water quality in their supply watersheds has not been developed for Costa Rica. If this technology were available, these groups could supervise and take measures to correct negative land use practices that are producing sediments, waste disposal in water, agrochemicals in sensitive recharge areas, and surface runoff on road slopes and drainages. They could also make some simple water quality tests using field laboratory kits, periodically send samples to regional labs, and keep local statistics on water quality.

A national water resource management policy and an amendment to the 1941 Water Law or a new water law project are needed. A policy alternative currently under congressional review is the New Water Law Project, which proposes concepts for watershed management such as formation of watershed leader institutions and the Executive Secretariat of Water Resources (SERH), allocation of a percentage of the water user institution's annual budget to internalize watershed management costs, organization of watershed committees, water quality categorization of the nation's water bodies according to actual and potential uses, and a scaled tax on the use of water as a vehicle for the dilution of contaminants.

Individually, institutions such as ICE, SENARA AyA, and universities have valuable studies and basic data files that could be used for future institutionally integrated water projects. ICE's water monitoring network should be expanded to other monitoring stations so that information concerning potable water systems and irrigation projects can be shared.

Although several public institutions have legal responsibilities for watershed management, their professional staff lack the academic background and the experience and resources for watershed planning and management.

Moreover, because economic power and political decision making have been centralized, local governments and community organizations lack resources and experience for watershed planning and management. STC should be strengthened and institutionalized to foster the interinstitutional coordination needed for watershed management and to develop policies and mechanisms for community and individual participation in the local watersheds.

A process should be designed to enable local water organizations (CAARs) and agricultural organizations (CACs) to participate in watershed planning and management on behalf of their communities. Community and private organizations that operate and maintain water infrastructure such as potable water systems, irrigation systems, and hydroelectric projects, should also be empowered to manage their water resources.

The National Constitution should be amended to grant more economic and political power to the municipal governments for territorial planning and watershed management in their cantons and to state that citizens have the right to enjoy the environment as well as the obligation to protect natural resources for future generations.

5. PRODUCTION FROM FORESTS

5.1 Deforestation

5.1.1 Issue Description

During the last few decades rapidly accelerating deforestation has transformed Costa Rica from a country of abundant forest cover to one that faces a scarcity of forestland. Deforestation has occurred everywhere in the country except in the most inaccessible parts of the major mountain ranges.

5.1.2 Policy Framework

For over 20 years Costa Rica has had comprehensive forestry legislation which has established a national forestry agency, a national system of forest reserves, and the procedures and regulations for forest management.

The 1990 Forestry Law establishes the National Forest Service (DGF) within the Ministry of Natural Resources, Energy and Mines (MIRENEM). It describes its powers and duties, which relate to economic development and harvesting of forests as well as to their conservation and protection. The law declares the State Forest Patrimony which includes all public lands in reserves, parks, and protected areas. The law authorizes DGF to administer forest reserves for wood production.

The Forestry Emergency Decree of September 1987 reacted to national deforestation, stating that it has affected 60 percent of all forestland in the country. The decree directed DGF to determine how much forest remained and to take steps to control and protect it. It also ordered DGF to reduce the number of concessions and permits authorized for tree cutting.

The decree banned credit for agricultural and livestock activities that entailed removal of forest, ordered IDA to set aside 10 percent of the area of all parcels under its jurisdiction for forestry development, and banned exports of unfinished forest products.

The Forestry Action Plan for Costa Rica, completed by MIRENEM in 1990 with assistance from the Dutch Government, establishes priorities for national and international investment in forestry in Costa Rica. It approximates the levels of investment needed and allocates them among 31 projects and programs. With regard to controlling deforestation, the plan recommends actions to directly protect wild areas, a massive reforestation effort, management of several watersheds, and management of natural forests throughout the country.

The National Strategy for Conservation and Sustainable Development (ECODES) was published early in 1990 as the result of an intensive three-year effort that involved nearly 200 Costa Rican professionals. The Strategy highlights development choices in 19 sectors that Costa Rica needs to address. The discussion of forestry centers on deforestation and how to control it.

The National Parks Law, which the National Legislative Assembly is currently considering revising, establishes the National Park Service (SPN)

and sets out its mandate to administer and protect Costa Rica's national parks.

Land colonization laws establish the Institute for Agrarian Development (IDA) and grant it jurisdiction to dispose of certain public lands to private owners and to purchase and redistribute certain private lands.

5.1.3 Institutional Framework

MIRENEM was formed in 1986 by combining subdivisions of the Ministry of Agriculture (MAG), notably the DGF and SPN. The idea behind the reorganization was to place under one ministry most governmental functions dealing with natural resources and environment.

SNP administers the national park system and has a history of not tolerating trespassing inside the parks. A few years ago there was a confrontation between the SNP and gold miners who were mining inside Corcovado National Park in the Osa Peninsula. The SPN, with the support of public opinion, forced miners to leave the park and prevented their return.

DGF administers the National Forestry Law. The agency is currently undergoing internal restructuring. Its most recent organigram indicates it has seven departments, as follows: forest management and harvesting, reforestation, industrial development, rural development, wildlife, research, and law. DGF is fairly decentralized, with eight regional offices which employed a permanent staff of 270 from a total permanent agency staff of 459 in 1989. For the next fiscal year, which begins in October 1990, DGF has decided to focus on reforestation and control of deforestation.

The Technical Secretariat for Forestry, along with several other similar secretariats, was established within MIRENEM by the current Government. The secretariat has taken over the planning functions formerly assigned to DGF and has principal responsibility for follow up on the national Forestry Action Plan. It operates with a small permanent staff and has no responsibility for implementation, as that function remains with DGF.

The Institute for Agrarian Development (IDA) has an express mandate to dispose of large blocks of state land and blocks of land purchased from private owners by redistributing the land as small farms.

The National Commission for Indian Affairs (CONAI) oversees administration of Costa Rica's Indigenous Reserves, although they theoretically operate under autonomous management of the indigenous people who live on them. Most of the indigenous reserves contain substantial amounts of forest which some indigenous communities protect and manage well and some do not.

The Costa Rican Electricity Institute (ICE) has responsibility for providing electricity throughout Costa Rica. It operates the country's hydroelectric plants, several of which are suffering from the effects of poor watershed management, notably deforestation, in their catchments. ICE has not become directly involved in watershed management, control of deforestation, or

reforestation of watersheds, nor has it been successful in coordinating such actions through other agencies whose mandates relate more directly to land management.

Costa Rica's municipalities have the responsibility to supply drinking water. They have the capacity to establish water supply protection areas but often lack the managerial capacity to control deforestation in the protected areas.

Several conservation Non-Governmental Organizations (NGOs) have taken up the challenge of preventing deforestation. A few have become directly involved in reforestation projects and community level forest management. Others participated in ECODES or work in public education. The timber industry also has associations representing it which decry deforestation and the effects of loss of forest on the industry. In fact, forest industries, including forestry corporations and cooperatives, occupy three of the 10 seats on the National Forestry Council.

5.1.4 Issue Analysis

What Works. The state owns and administers national parks for the purpose of the perpetual protection of the country's natural patrimony. National parkland is not available for consumptive uses and cannot be sold. The public supports the vigorous protection of parks, which probably explains the Government's success at controlling deforestation inside them.

After years of criticism from national and international sources that connected high deforestation rates to national policies encouraging cattle raising, the Government discontinued the subsidies, partly through the forestry emergency decree. The Government has discontinued preferential credit for land clearing for the cattle industry. This, in turn, has led to abandonment of poor cattle lands which have been allowed to revert to brush and second-growth forest.

DGF believes recent changes in the rules for identifying logs under transport will help control deforestation. The new rules require each log to carry a metal tag that shows its origin. DGF issues the tags based on the number of logs allowed in the its permit to the logging operator. As the operator cuts the authorized number of logs, he gradually uses up the tags until the authorized total has been reached, no tags remain, and the operator cannot transport any more logs. DGF also plans to operate control points at all hours, thereby discouraging evasion of the control points during off-hours.

What Does Not Work. Forest reserves have been expressly established for extractive uses as well as for protection. In accordance with the forestry law, the state owns land within forest reserves and manages it for the production of goods and services for public benefit. The law prohibits private ownership of lands in forest reserves unless the ownership predates establishment of the reserve or it is a new claim of ownership based on actual agricultural use of land with agricultural potential.

45

In practice, these exceptions to the rule of public ownership operate to encourage trespassing in forest reserves. People enter the reserves, clear a small piece of land, erect a rustic shelter, and petition DGF to recognize their claim of ownership. Typically, DGF responds by informally acknowledging the occupants' presence and makes no effort to dislodge them. The settlers then continue to clear forest as they attempt to make a living from the land or to improve it for resale.

Moreover, hunting and fishing regulations are not well enough enforced inside forest reserves to afford adequate protection to certain species. All these activities directly contravene the purposes of the reserves and directly conflict with their intended uses, thereby reducing the capacity of the reserves to serve their functions and placing pressure on resources outside the reserves to fulfill these functions.

Traditionally, Costa Rican law has recognized rights to land based on property improvement by the person claiming the right. Forest management was not recognized as an improvement, whereas forest clearing was considered as such, even on lands with no sustainable capacity for uses more intensive than forestry. Parallel to the rules on improvements were rules that did not acknowledge forested land or trees as appropriate collateral for credit. The emergency forestry decree expressly authorizes the acceptance of standing trees as collateral. The general rules remain in place, however, and the public still generally believes that forest indicates unused land.

Some land under IDA ownership is located in forest reserves, which complicates reserve management for long-term forest uses. Other IDA land, though not located in forest reserves, contains forest and has no capacity to sustain agriculture or livestock. The redistribution to small farmers of IDA lands which have genuine agricultural potential works satisfactorily, at least from the point of view of land use. But problems arise when the IDA land lacks agricultural potential. Thus far, IDA has not recognized forest management as appropriate use of such lands by smallholders, nor has it developed forestry credit and technology packages for its clients similar to those it has developed for agriculture.

All harvesting concessions and permits which DGF authorizes require preparation of a forest management plan by the concession or permit holder and DSG's approval of the plan. DGF does not make adequate field inspections before approving the plans nor periodic inspections during the logging operation. The absence of a DGF field presence makes possible the use of harvest practices, including overcutting and felling techniques, that damage other trees, in some cases disturbing natural forest so much that it amounts to virtual deforestation.

5.2 Inappropriate Reforestation Practices

5.2.1 Issue Description

National reforestation efforts for commercial production suffer from use of inappropriate species, inadequate silvicultural management of plantations,

-46'

failure to define future products and markets, and poorly conceived and applied incentives.

Reforestation rates have remained low despite the various incentives developed to stimulate this activity since 1979. These efforts have suffered from poor definition of strategies and objectives, little regional and national coordination, both within and among government agencies and the private and industrial sectors, badly conceived and applied fiscal incentives, and an overall lack of technical knowledge on the establishment and management of plantations and the collection and management of appropriate genetic material. The complex array of regulations governing implementation of reforestation projects aggravates this situation.

5.2.2 Policy and Institutional Framework

The Forestry Law of 1990 mandates the DGF to administer various incentive programs for reforestation. These include exemption from property taxes for lands registered for reforestation or forest management; exemption from import duties on machinery brought into the country for reforestation purposes, as indicated in the respective management plan and approved by DGF; and exoneration from income taxes on wood harvested from plantations by the owner, a recent reform with enactment of the new law. The law also guarantees that lands committed to reforestation or forest management are protected against invasion by squatters.

The most important are the direct fiscal incentives to be paid over a five-year period during the initial stages of plantation establishment. After 1986, the incentives took the form of transferable bonds (Certificado de Abono Forestal or CAF), which could be used to pay taxes, or sold at slightly less than face value.

To obtain the incentives for reforestation, various prerequisites have to be fulfilled. Aside from registering the property as forest cover, a forest management plan must be presented that includes a physical and ecological description of the area, species and methods to be used to establish the plantation, description and location of infrastructure, an economic analysis of the project costs and expected profits, and a cartographic survey of each plantation, among other information. A description of future silvicultural treatments, including the timing of implementation, must be included. DGF must be advised of any changes in the management plan, which are then subject to DGF approval.

The Desarrollo Campesino Program was developed in order to direct some of the fiscal incentives to small farmers. The program is administered by DGF through community organizations, in particular the Cantonal Agricultural Centers (CACs). The CACs act as local administrators of the program, and are in charge of submitting the management plans and distributing the incentives among the soliciting farmers, as well as providing technical assistance. Currently, The Fondo Desarrollo Forestal (FDF), provides additional economic resources to Desarrollo Campesino Program.

Under this program, a farmer must reforest from one to five hectares per year over the five years. After participating in the program, a farmer is ineligible to receive incentives again through Desarrollo Campesino. The criteria for receiving the FDF-financed incentives, administered by Desarrollo Campesino, are essentially the same as CAF criteria, except for the following: 1) the maximum size of a qualifying farm is determined from a sliding scale based on the region of the country, areal extent of the farm, and the farmer's annual income; 2) farmers without titles but with a recognized right of possession are usually eligible; 3) while the CAF provided incentives to cover both materials and labor, the FDF finances only the materials and the farmer must provide the labor.

The Forestry Action Plan (TFAP) discusses past efforts in reforestation, and proposes various short-term (five year) and long-term (20 year) goals and strategies. The TFAP outlines 29 specific projects to be developed over five years. Of these, 11 contain reforestation as a major component. Many other proposed projects have components that in some way affect reforestation.

Many NGOs are directly involved with reforestation. Among the most active are The New Alchemists (ANAI), Arbolfilia, CARE, the Fundacion Neotropica with funding from the World Wildlife Foundation (BOSCOSA Project), and the GTZ. Most of these organizations are promoting reforestation by small farmers by providing access to materials, credit, and technical assistance. There are also many small local associations and organizations that are involved, directly or indirectly, in promoting reforestation and agroforestry.

There are essentially no policies for reforestation on public lands, or by public agencies. The only reforestation that occurs is on a very small scale is by the Ministerio de Obras Publicas y Transporte (MOPT), and by the Instituto Costarricense de Electricidad (ICE). In neither case can the amount of reforestation be considered having commercial potential.

The main institutions involved in reforestation research in Costa Rica are the Institute of Technology of Costa Rica (ITCR), CATIE, the Organization for Tropical Studies (OTS), and DGF. There exists a minor amount of investigative work on the part of some of the private reforesters, but this has not been available for dissemination to the public. The research has concentrated on nursery and establishment techniques, mensuration (volume growth rates) during the initial stages of plantation development, and species for reforestation. In the last few years there has been increased emphasis in silvicultural treatment of plantations, and the collection and storage of genetic materials (seeds).

5.2.3 Issue Analysis

What Works. Until 1979, there was virtually no reforestation through private initiatives. Since that time, when the fiscal incentives were first made available, 40,210 hectares have been reforested, 36,110 of which have enjoyed the incentives provided by the Costa Rican government.

As of 1989, 28 groups, representing over 1000 farmers, were involved in reforestation activities with CAF and FDF incentives through Desarrollo

Campesino, and 2,800 hectares have been reforested. Obviously, this is not a large proportion of the total area reforested to date, but the objective is more consciousness raising. It is felt that a large percentage of farmers that have participated in the program, and are no longer eligible to participate, continue reforesting or managing their lands in a more integrated fashion using agroforestry systems and appropriate land use practices.

What Does Not Work. Probably the most negative aspect about the initial reforestation incentives in Costa Rica was that they permitted, in effect, the removal of forest cover in order to reforest. Countless areas of "secondary forest" were removed in order to establish plantations under the one-time tax deduction incentive afforded to reforesters. The prevalent thinking was that the replacement plantation would produce more wood volume, at a faster rate, and be easier to manage, than natural forest.

Under these incentives, in effect until 1986, the removal of low-grade, secondary or residual forest was de facto permitted for establishing plantations. DGF was not well organized and lacked sufficient personnel to inspect and supervise reforestation projects. Moreover, the decree did not establish the reforestation incentives state that the removal of cover was, or was not, a legitimate pre-establishment activity for site preparation. Likewise, there was no clear interpretation of the physical requirements, as mentioned in the decree and subsequent regulations, for approving proposals for reforestation projects.

Prior to 1986, when the incentives were in the form of income tax deductions, they were an attractive means to reduce taxes of other businesses. Wealthier individuals and corporations often bought and reforested agricultural quality lands, particularly in the Central Valley, just to obtain the incentives. Many of these plantations suffered for lack of silvicultural treatment and proper maintenance. Moreover, the TSC system was not yet designated as the official system, so there were no guidelines to establish what lands should, or should not be reforested.

The 1986 regulations to the Forestry Law stated that if the parties interested in reforestation proposed in the reforestation plan, the removal of brush, secondary forest, or forest, for the purposes of reforestation, that the site be inspected jointly with DGF personnel, in order to determine if the elimination of the vegetation, and subsequent reforestation, could be done in stages. However, in most cases, DGF personnel agree with the reforesters that tropical forest are too difficult to manage, and once the valuable species are removed, they are not worth managing.

After 1986, projects that reforest lands with a use capacity of permanent or semi-permanent crops (class I-III), or less intensive uses (class IV-IX) are eligible to receive fiscal incentives. Preference is given for reforestation of class IV-IX over classes I-III lands when granting fiscal incentives. Despite this stated preference, lack of on site inspection by DGF officials and lack of training in the use of the land use capability classification system has led to the reforestation of class I-III lands under the incentive system.

Although there have been some reforestation gains under the Desarrollo Campesino program, it is questionable whether reforestation is occurring at a rapid enough pace to meet national demand. Moreover, high administrative costs per project relative to the reforestation achieved sets an economically feasible minimum land size that can be reforested. For this reason, the program did not consider granting CAFs to new groups in 1989.

Some other negative aspects of the program include: lack of clear title for many small farms (for CAFs), particularly in the Atlantic region (estimated at 80% of the farms); half-time technical assistance is often not enough; and the cost-benefit ratio for assistance to organizations becomes too large if there is less than 40 hectares to be reforested annually.

No proof of expenses or costs are needed to obtain the annual amount of the CAF from DGF, although continued authorization of the reforestation project is subject to the approval of DGF, based on their on site inspections, and the trimestral reports of the forester managing the project. This leaves a loophole whereby reforesters can cut establishment and maintenance costs and use the money from the CAF for other purposes.

Although DGF has been cognizant of this fact, and has intensified their inspection efforts, there is still the temptation to economize on plantation establishment and maintenance costs. In the end, these shortcuts are reflected in lower growth rates, increased susceptibility to disease and insect attacks, and higher mortality rates.

NGO forest projects generally are a mix of forestry and agroforestry projects, the relative amount of reforestation that takes place is small.

5.3 Ineffective Forest Management

5.3.1 Issue Description

Ineffective forest management practices reduce the quantity and quality of available forest resources. Historically, tropical forests have been viewed as unmanageable masses of timber standing in the way of development. This attitude still prevails to a large degree and is reflected in the manner in which Costa Rica has managed its forests. Forest management, in the true sense of the word, is essentially nonexistent in Costa Rica.

Current estimates of remaining forests with production potential are well below the 400,000 hectares believed necessary to supply domestic needs. Likewise, few large, unbroken blocks of commercial forest exist outside protected areas. These factors, plus the limited timber in remaining forests due to selective cutting; the scarcity of traditional, high-value species; and the increasing expansion of secondary forest emphasize the need for more intensive and careful natural forest management.

50

5.3.2 Policy and Institutional Framework

The Forestry Law defines forests, outlines the government's and the private sector's responsibilities in their management and protection, and sets forth the requirements for harvesting them. It also defines how governmental activities are financed in order to perform regulatory duties and investigations. Many of these components of the law indirectly and directly affect how natural forests are managed for production.

An individual or other entity can solicit the Government for a concession to harvest timber from state lands, particularly forest reserves and protection zones. DGF grants harvest permits and oversees the forest harvesting operations. Timber cannot be harvested timber without the approval of both DGF and the local community. All harvesting of natural forest and the construction of roads for harvesting must be according to a forest management plan prepared for that project. These plans are developed by a professional forester or a professional with demonstrated forestry experience, and must include information solicited by DGF in the regulations of the Forestry Law, which are currently under revision. The professional is required to inspect the harvesting operations periodically and is responsible for any infractions or inconsistency.

The Forestry Law also provides for the collection of taxes on inventoried standing timber to be harvested, based on 10 percent of its value, as determined by DGF. DGF operates on a budget funded largely by this timber tax on harvested logs. Current stumpage prices are between 2,300 and 3,700 colones per cubic meter, depending on the type of wood and the accessibility of the area. Eighty percent of the collected taxes are distributed to DGF through the Forestry Fund to finance operations of the agency. Ten percent of the taxes are channeled to the local municipality where the wood was harvested, and 10 percent to local cooperatives and corporations involved in reforestation or forest management. The harvested timber is exempt from taxes if it is to be used for high priority development projects or for domestic use by a rural population. Concessions are granted for only for the quantity of timber for which a need is demonstrated.

The law establishes various incentives for forest management, including exemptions from property taxes and the uncultivated land tax for lands voluntarily committed to permanent forest cover. DGF and the Rural Guard guarantee protection of these lands from invasion by squatters.

Regulations for management plans specify how the forest inventory is to be performed and what equations should be used to calculate volumes. They establish diameter limits for harvestable trees and regeneration, such as the 60 cm minimum diameter limit for harvestable timber. The regulations also require precise information on the extraction equipment to be used, cutting unit boundaries, and the scheduling of the cutting. DGF has to evaluate this information before approval of the plan; any subsequent changes must also be approved or harvesting operations can be shut down.

The Forestry Emergency Decree defines the responsibilities of DGF and other agencies regarding the supervision and control of timber harvesting.

The Tropical Science Center (TSC) Soil Classification of Land Use Capacity was designated as the official system for institutions related to land use. The Forest Emergency Decree also states that DGF should actively promote the integration of forest and industry (although the means and resources for doing so have never been defined) and permits the redistribution of DGF personnel to areas of more intensive forestry activity. One mechanism employed to combat illegal logging is control points on highways, used to ascertain if taxes had been paid on transported logs. A DGF official together with Rural Guard personnel generally staffs these control points. Logs without the appropriate papers and DGF inspector approvals are confiscated. Under the emergency decree, DGF also declared the nighttime transport of logs illegal.

TFAP proposes various strategies, plans of action, and projects relating to the forest industry sector. The most outstanding strategy is the integration of forest and industry, which includes the acquisition of forested lands by the industry, through outright purchase or the purchase of stumpage rights, or the incorporation of forestland owners into the industry through the issuance of shares.

TFAP also proposes one four-year project, with extensions up to 15 years, entitled the Implementation of Management and Integrated Harvesting in Natural Forest. The project contemplates the development of incentives for forest management, and the establishment of pilot projects for forest management and silviculture investigation and demonstration.

Only a few of the estimated 177 conservation, development, and environmental NGOs in Costa Rica work in forest management. Perhaps only the Neotropica Foundation in its BOSCOSA project and the Tropical Science Center are managing forests. In both cases, the work is in its initial stage.

Two universities (the National University and ITCR), CATIE, and OTS undertake most forest management research. The emphasis is primarily on silviculture and focuses little on the administrative or economic aspects of forest management. The ITCR is the only one of these institutions investigating harvesting systems to any degree.

DGF also has an investigation component. Work to date has concentrated on procuring, testing, and improving genetic material (seeds) and on managing certain ecological types of forest. The work on genetic material is hampered by lack of funding. The latter activity tends to focus on silvicultural treatments, and avoids the economic and administrative facets of forest management.

5.3.3 Issue Analysis

What Works. It is believed that the integration of forest and industry would motivate private companies to become better custodians of the forests, managing them sustainably for quality materials. The integration of forest and industry would grant forest product processing industries control the forests that produce the needed raw materials, either by outright purchase of the lands, by leasing, or by issuing shares in the company to forestland owners. No formal policies have been adopted on the integration of forest and

52

industry, but the private sector has taken some action. Portico, S.A., probably the best example of these efforts, has an active campaign of purchasing or leasing forestland in the northeastern part of the country

What Does Not Work. The forest management plans required by DGF are largely descriptive and require details that are meaningless for forest management. Most woods operators view the management plan as a requirement, rather than a tool for outlining management objectives. Thus, they tend to try to complete an inventory and plan with as little investment as possible. Typically, a forester is employed to inventory the forest, and the plan is written by someone else who often has no forestry experience. Many professionals use a boilerplate format for the first and second parts, providing numbers and descriptions where necessary. In other cases, the data are manufactured. A DGF official is supposed to inspect the inventory plots to determine if the data are authentic, but cases of negligence are common.

Although the regulations for the forest management plans require periodic follow-up inventories, little is done to incorporate these inventories into the management of the resource. Often, the inventories are performed by a forester other than the one who wrote the original management plan. In essence, the plan then becomes a description of the amount of wood to be extracted during the first cutting cycle and future harvesting plans are nothing more than speculation. Since there is no assurance that the same forester will continue supervising the project, continuity of the original objectives is a problem.

Some harvesting regulations are inappropriate. For example, in other countries setting diameter limits for harvestable trees is usually left to the discretion of the professionals managing the forest, based on silvicultural and forest product objectives. The government's objective of imposing a limit is to guarantee that sufficient natural regeneration is left behind. What the limit actually does is promote the harvesting of the largest and best quality trees, leaving behind a mass of poorly formed, suppressed trees.

However, many forestry professionals consider the Forestry Law to be a generally satisfactory mechanism for conserving forest resources. The problem lies in its uneven and undirected application to forest management, which establishes requirements that hamper private management efforts. Essentially, the law and its regulations result in forest management through DGF on a regulatory, rather than silvicultural basis.

Most decisions regarding approval of management plans or infractions of the law are made locally. On the surface, this seems appropriate. Field professionals are more in touch with actual situations than office-bound foresters in San Jose. However, the decentralization of DGF has led to different requirements in different districts, and inconsistences in the interpretation of the regulations by different officials.

As a result, confusion arises among foresters writing management plans and soliciting harvesting permits, because none of the regional requirements are available at the central office or other regional offices. Foresters writing management plans are spending inordinate amounts of time traveling to

:ermine specific regional regulations that cannot be
l offices or by telephone. Moreover, much of the
by the region is requested in order to facilitate or
ns or to validate forest inventory data or the logistical
e management plan. Most of the regional requirements have
:tual management of the forest resource.

of all the harvesting regulations have created an
ad for regional personnel and a difficult climate in which
forest resources. It is common for a local DGF official to
spect, and consider for approval 100 or more forest management
gion in one year.

:st point in the concession system is probably that timber is
the stumpage established by DGF, and not through competitive
; practice reinforces the notion that forests are cheap sources
al. As a result, concessionaires do not take care to prevent
sidual trees, soils, and roads. Likewise, there is a tendency to
cutting more in a given area than permitted or cutting outside
ed area. Lack of DGF inspections and supervision is a major

crol point inspection of logging trucks is effective in stopping a
tion of the transportation of illegally harvested logs, and nighttime
t of logs continues. Checkpoints are unsuccessful for many other
, including bribery of officials. High officials have announced their
d actions in advance, ostensibly for political purposes. On one
on, a leading newspaper carried an article that mentioned dates, times,
e area of the highway where checkpoints would be set up to deter
port of logs after dark.

DGF arguably does not control stumpage prices, but by fixing a low tax
standing timber, it reinforces the concept of forests as a low-value
ource. Since timber sale contracts between loggers and landowners are
formal, DGF has no documents showing actual timber value on which to base
heir tax. Instead, it must establish a price for categories of wood and
harge accordingly. For a landowner desiring to manage a small tract of
timber, the advance payment of a forest tax is a disincentive to manage
forest, especially when combined with the costs of producing a management plan
and paying a deposit.

The DGF tax collection is also inefficient. Moreover, the deposit
requirement, enacted just in the last year, has motivated loggers to report
less wood volume in order to pay a lower deposit. Given these conditions, DGF
is perennially short of human, economic, and physical resources, which limits
the amount of on-site inspection of harvesting and forest management
operations it can perform. Technical assistance to landowners is also not
offered.

The recently passed Forestry Law stipulates that management plans must
be authorized by a forester or other professionals with demonstrated forestry
experience. Unfortunately, the law does not specify how to enforce this

BEST AVAILABLE COPY

provision, although it mentions a possible sanction of the professional forester. While it places the responsibility squarely on the shoulders of the foresters, it gives them no leverage over the logger or landowner. Nowhere is it mentioned that the logger or landowner must retain a professional forester during harvesting operations. Thus, the current Forest Law is really placing the burden of inspection, formerly DGF's responsibility, on the professional forester, with no recourse for ensuring that the plan is followed.

5.4 Inefficient Use of Forest Resources

5.4.1 Issue Description

Utilization of only a few forest species, combined with waste and inefficiency in transforming raw materials into finished products, conflicts with sustained production of forest products and forest conservation. On average only about 54 percent of the 50.8 cubic meters of wood harvested per hectare made it to the sawmill. The sawmills managed to convert only 46.5 percent of this total to useable products, almost a 75 percent loss of material between forest and consumer. The Industrial Development Department of DGF currently estimates the mill conversion figure at 48.1 percent, which means that the industry still converts only 20-30 percent of the commercial volume of a tree to products.

5.4.2 Policy and Institutional Framework

The Forestry Law (1990) states that DGF will try to foment the integrated development of the forest industry by rationing, reorganizing and relocating it. The law contemplates a series of actions by which DGF will regulate the industry. These include issuing operating permits to existing sawmills and new ones that have a permanent, adequate, source of raw material; the closing a plant or mill that is using logs not obtained under a harvesting permit; and denying approval of low-interest loans from the national banking system, originating in the Forestry Fund, if the entity has not duly registered its facilities or complied with DGF policies with respect to the source of its raw materials, its location, or the type of machinery to be used.

In accordance with policies promoted by DGF, the law also establishes fiscal incentives, such as exemption from import duties, accelerated depreciation of assets, and export tax credits, for industries that reorganize, relocate, or increase their efficiency.

Several articles of the Forestry Emergency Decree of 1987 directly affect the wood industry by regulating, through DGF, the transport, processing, and commercialization of wood. Both the Forestry law and Emergency Decree explicitly prohibits the exportation of wood in the form of logs.

Various groups representing the different sectors of the wood processing industry, ie landowners, loggers, truckers and sawmill operators, have evolved over the years. Probably the best known of the lobbying groups are the Camara

Nacional de Industrias Madereros (CANAIMA), the Camara de Industria de Costa Rica (CICR), and the Camara Nacional de Empresarios Forestales. These organizations had representatives working on the TFAP, as well as on various commissions of the Forestry Emergency Commission established by the Emergency Decree.

In 1980, the Ministry of the Economy, Industry and Commerce, decreed certain official norms for the commercialization of wood in logs and green-sawn lumber in an attempt to standardize dimensions for sawn lumber. It decreed the adoption of the metric system in the wood industry, declared the long-used "mecate" or string measurement system as the official method for determining the volume of wood in logs, and established accepted tolerances for variations in the length, width, and thickness of green lumber.

5.4.3 Issue Analysis

What Works. The prohibition of the export of wood from certain species and certain wood products, coupled with select approval for export of high value-added wood products, or products from under-utilized species, has effectively halted the exportation of wood in the form of logs or crudely finished products. Moreover, these policies have directed some forest industries toward the development of high-quality product lines, the use of nontraditional species, and a realization of the economic potential of wood product exports. The policies have been successful because they are enforceable simply by inspecting shipping invoices and containers as they leave the country.

Some incentives for the modernization of the wood processing industry have promoted some improvements in efficiency. Two incentives in particular, the exemption from import duties on machinery and tools and the accelerated depreciation of assets, seem to be the most attractive to national businesses. The idea behind theses two policies has been to motivate sawmill owners to modernize their equipment. The few companies that have taken advantage of these incentives to modernize have felt it was worth the effort. These industries tend to be those that have secured a permanent, future source of raw materials and are actively exporting wood products that are highly finished or are made of under-utilized species.

What Does Not Work. Lumber in Costa Rica is typically cut from logs and sent directly to outlets for sale, with little or no drying or finishing. Although some partial standards or dimension tolerances have been decreed, they are not used or enforced. When some standards are used, it is due to client specifications and not to some national or trade criteria. Since there is no price differential between dried or green wood or quality grades of lumber, there is no incentive for the kiln drying or grading of lumber. Likewise, without applicable log and lumber grading standards with lumber priced accordingly, there is no incentive to saw logs for the highest yield of the best combination of quality and quantity.

The traditional unit of wood measurement, the tico inch, also provides no incentive for efficient transformation of wood products. All wood is sold in tico inches in spite of a government decree stipulating the use of the

metric system. Since the tico inch is a product measurement representing an idealized board it should not be used to measure a cylindrical object like a log, because it will overestimate the amount of wood. To get around this problem, industries use the "mecate" or string method for measuring logs, which tends to underestimate the cubic volume of a log by 32 percent on average. This figure is very high by standards of the forestry profession and tends to provide too much leeway in the transformation of logs to lumber. As a result, large amounts of material are wasted in the transformation process.

While the policies mentioned above stimulate modernization of the industry, few companies have taken advantage of them. The primary wood processing industry is seen in Costa Rica as a custom industry and operates as such, and not an industry that yields a standard product for processing by secondary industries. Again, the selective use of certain timbers, the lack of implementation of quality standards, the irregular dimension of lumber, and primary processing based on custom orders all reflect this attitude. Another major limitation is seen to be the uncertain future of the forest resource: There is little incentive to modernize if by 1995 no forest will remain outside of protected areas. This gives the advantage to industries with their own source of raw materials, and the impetus to industries and institutions that promote the integration of forest and industry.

The Department of Industrial Development of DGF has the responsibility to provide technical assistance to the industry. Nevertheless, its participation in the assistance process has been nil, due to the large number of sawmills and their diverse locations, and the myriad of other functions assigned to the department, many with higher political priorities. This is complicated by the relatively few staff members assigned to technical assistance. Only two of a technical staff of nine in the central DGF office specifically provide technical assistance to the industry.

5.5 Policy Gaps and Alternatives and a Policy Research Agenda

Costa Rica has no policies that provide disincentives for wasteful forest product transformation practices. Most policies promote modernization of the sawmill's physical plant through tax breaks and import duty exemptions on equipment. Many mills operate with obsolete, poorly maintained, and fully depreciated machinery, and their owners see no need to upgrade machinery or improve milling practices, especially in light of the rapidly disappearing industrial forest resource. At this time, it may be better to consider stronger disincentives or even sanctions for industries whose conversion efficiency does not meet an established goal. At the same time, technical assistance to the industry should be more available, and loans with easy credit terms should be more accessible to industries who make the effort to meet efficiency goals. These policy alternatives require a strong will on the part of the Government as the strength of industry lobbying groups has increased in recent years.

The lack of adequate training of loggers, tractor operators, and sawmill personnel in efficient industrial practices is a recognized limitation to the modernization and efficient operation of the industry. Nevertheless, there have never been programs to train workers in proper tree felling and bucking

techniques, sawing for high grade and volume yields, proper log scaling techniques, proper machinery maintenance (including saw sharpening), and other important industry techniques. Poorly trained personnel will continue to be a limitation in the industry until policies are defined and actions taken to remedy the situation. A distinct policy for Costa Rica would be the promotion of training in these industries, possibly through the establishment of an industry technicians school to train sawyers, loggers, woods workers, and lumber graders.

There have been no written policies promoting or recognizing the difference in lumber quality. No lumber grading system exists in Costa Rica, and consumer demand has not created the need for one. It is interesting to note that most U.S., Canadian, and European lumber and roundwood grading systems are industry standards, which were not developed or implemented by governments.

Dimensional standards must be established. One alternative is to adapt standards from other countries, but it would be preferable to develop a Costa Rican system that conforms with international guidelines. Its implementation needs to be determined, since the industry lacks the will to regulate itself. One possibility is to tax lumber not meeting the guidelines, based on the amount of waste that the non-measured and ungraded lumber is believed to have generated. Meanwhile, intensive consumer educational campaigns should be undertaken to promulgate the advantages of the lumber standards.

The integration of forests with the industry has become a popular topic and much has been written regarding incentives and mechanisms to promote this objective. Nevertheless, there is neither a concrete policy nor any incentives for integrating forests with industry. The Government and the forest product industries have taken no action on the recommendations of the Forestry Emergency Decree or TFAP. Thus, while integration is a viable alternative for conserving forest resources, it raises many questions, including the role of government in this process.

There is no recent data on nor any evaluation of the industry's importance to the Costa Rican economy. It will continue to be difficult to make policy decisions regarding this sector, without updated information coming from periodic evaluations of the forest products industry. Under this same program, the types of wood products to be imported should be determined, and their phased importation should be regulated.

6. MANAGEMENT OF WILDLANDS

6.1 Inadequate Conservation of Biodiversity and Consolidation of Wildlands

6.1.1 Issue Description

Over the past few decades, Costa Rica has established a system of protected areas for the purpose of protecting the environment and conserving national biodiversity. There has been a gradual consolidation of the protected areas and extension of their reach to include additional biological and cultural resources that had formerly been unprotected. During this period, however, forested areas throughout the country have suffered intense pressure for clearing for settlement and cattle raising. This deforestation has greatly reduced the areas of most of Costa Rica's terrestrial habitats and this has reduced available living space for the nation's plants and animals.

Today, close to 25 percent of Costa Rica's national territory lies within one or another of the more than sixty public management land units that have been established across the country. These units range from areas of highly restricted use, such as national parks and biological reserves, through natural reserves, national monuments, wildlife refuges, and protective zones, to forest reserves in which a variety of uses are permitted and encouraged. In actuality, under this system, about 12 percent of the country benefits effectively from strict protection.

Costa Rica, then, currently faces the issue of how to fully protect and conserve biodiversity and simultaneously obtain economic benefits from its protected areas. In the course of dealing with this issue the concept of "conservation areas" has gradually evolved. Conservation areas consist of groupings of wildlands, contiguous to or close to each other, which are zoned for purposes of management, considering their ecological characteristics and the participation of neighboring citizens and communities. The areas have one or more core zones, reserved primarily for conservation of biodiversity, and surrounding zones allocated to sustainable development that supports a degree of land use which permits the movement of animal species from one core zone to another. Because the conservation area concept is unproven and its administration entails innovation, it remains uncertain whether it could truly conserve Costa Rica's biodiversity.

6.1.2 Policy and Institutional Framework

The most significant laws for protected areas and conserving national biodiversity are the National Parks Law, the Forestry Law and a series of wildlife laws, all of which fall under the jurisdiction of the Ministry of Natural Resources, Energy and Mines (MIRENEM). The National Parks Law of 1977, establishes the National Park Service (SPN) and confers responsibility upon it to manage and protect natural and cultural resources present inside national parks, biological reserves, and national monuments. Each such conservation unit is established by executive decree. The management objectives for each type of unit restrict activities that could produce adverse impacts on the resources under protection within the unit. The law

authorizes the Park Service to define technical criteria that will safeguard conservation inside each unit under its management.

The Forestry Law of 1990, establishes the National Forest Service (DGF) and sets out policy for managing Costa Rica's forest reserves. The forest reserves function as a source of forest products from public lands but also as reserves to conserve forest resources in their diversity and in their availability for future use.

A series of wildlife laws establish National Wildlife Refuges, and the Wildlife Division within the Ministry of Natural Resources. The Wildlife Division administers wildlife refuges for the protection and management of their flora and fauna. These laws prohibit hunting and capture of endangered animals and control hunting and fishing generally by establishing seasons, size limits, and other protective measures.

Debt for Nature Swaps have been one mechanism whereby the government has encouraged private sector involvement in conservation. In the past, Costa Rica actively encouraged purchase of public debt instruments by international conservation Non-Governmental Organizations (NGOs) for conversion to local currency to apply to management of conservation areas. However, the Central Bank has recently suspended public debt for nature swaps.

Costa Rica has recently begun to experiment with innovative ways to accomplish conservation administration with national public funds. The government has authorized the establishment of "Patrimonial Funds" in which public monies appropriated for conservation are administered by national NGOs like Fundacion Neotropica under the direction of a board of directors composed of public officials and private persons. Patrimonial Funds have the legal capacity to accept money from private as well as public sources.

In addition to MIRENEM, the National Commission on Indigenous Affairs has the responsibility of protecting natural and cultural resources inside Indigenous Reserves. Although it does not directly define the management policies for each reserve, the Commission does coordinate management with the indigenous Development Associations and local groups. Incipient coordination between the Commission and MIRENEM should increase if the concept of conservation units gains ground.

There are several NGOs that are very active in the field of natural resource conservation. The most noteworthy Costa Rican NGOs are the National Biodiversity Institute (INBio), the National Parks Foundation (FPN), the Tropical Science Center (TSC) and the Organization for Tropical Studies (OTS). International conservation NGOs and public agencies also provide financial and technical assistance for Costa Rica's conservation areas. Their participation in the management of these areas has helped consolidate the national program. Among the many organizations involved, World Wildlife Fund (WWF), The Nature Conservancy, Conservation International, the International Union for the Conservation of Nature and Natural Resources (IUCN), and The United Nations Educational Scientific and Cultural Organization (UNESCO) merit special recognition.

60

Costa Rica recently has supported two major studies on strategies for natural resource conservation. The Costa Rica Conservation Strategy for Sustainable Development (ECODES), published in 1989, was developed over a period of two years under the direction of MIRENEM, with the participation of over 200 professionals from various public and private institutions. The strategy establishes guidelines for sustainable development and examines issues related to wildlife protection and conservation of biodiversity. The second study, The Tropical Forestry Action Plan (TFAP), was prepared by MIRENEM in 1989, with funding from FAO. TFAP establishes priorities for managing wildlands and seeks financial support from international development assistance agency to carry out those priorities.

6.1.3 Issue Analysis

What Works. Popular support and respect for the protection of national parks and biological reserves is strong. With this public support, Costa Rica has protected its national parks effectively from settlement and from incursion for logging, hunting, and other activities that are incompatible with strict protection. With respect to wildlife, flora and fauna that are inside national parks receive satisfactory protection that assures their existence.

Costa Rica has achieved consensus among public and private (NGO) interests to ensure the management and administration of protected wildlands. NGOs like WWF, OTS, TSC, and Fundacion Neotropica have responded to MIRENEM policy initiatives by providing technical and financial support.

The presence of InBio makes it possible, for the first time in Costa Rica, to consolidate most of the existing information on biodiversity and to expand this information base through basic and applied research. It also increases national capacity to provide scientific training on how to collect, organize, and process data on biodiversity.

Long-term financial support mechanisms have the capacity to attract investment in both national and international currencies and apply it to Costa Rica's conservation priorities. Properly applied, they guarantee the conservation of biodiversity and promote sustainable development in designated conservation areas.

What Does Not work. Some proposed conservation areas do not have clearly defined legal or institutional support because of differences of opinion over where to establish their boundaries, what kinds of activities to undertake inside the areas, and which institutions should have jurisdiction over which functions of the areas. In most instances there is consensus, however, that the proposed conservation areas do exhibit high potential to conserve biodiversity.

Several of the conservation units are not accomplishing the objectives for which they were established and hence are not conserving biodiversity as well as they should. For instance, many of Costa Rica's plants and animals are not inside the protected areas. For them, especially those that are rare or which require large territories, the situation is much more precarious.

61

Their numbers, and in some cases, their survival are threatened from two causes: habitat destruction and direct exploitation.

Similar observations as those just made with regard to establishment of protected areas hold true for their management. Because biodiversity has not been fully studied, precise methodologies for managing natural areas to conserve biodiversity do not exist yet. This has created a vacuum with respect to how to really manage the resources inside declared conservation areas.

Up to now, the several national agencies responsible for applying policy and managing natural resources have not concurred in regional goals or plans or coordinated their respective activities at the regional level. This has led to conflicts and ineffectiveness with regard to conserving biodiversity. It is important to formalize inter-sectoral, regional mechanisms that will reduce pressures that damage conservation areas.

With regard to the management of indigenous reserves, although clear legislation exists on administrative procedures and governmental support to the people who live in the reserves, the law is not obeyed and the indigenous peoples do not have the benefit of sound management an conservation of the resources within the reserves.

6.2 Inappropriate Land Uses in Buffer Zones

6.2.1 Issue Description

The interrelation of geographic, physical, and climatic factors within a relatively small area has created a wide variety of environments. Studies indicate that over half a million species, equivalent to seven percent of the known biodiversity of the planet, are found in Costa Rica. Based on the Holdridge classification system, Costa Rica has 12 distinct ecological life zones, each with impressive biodiversity. The ecologically diverse area supports a wide variety of organisms: 848 species of birds, 205 mammals, 218 reptiles, 160 amphibians, 130 freshwater fish, and about 9,000 plants. Eleven bird species and 16 mammal species are officially endangered.

Approximately 11 percent of Costa Rica's territory is under strict protection that prohibits any extraction of resources. Forest reserves and protective zones comprise another 10.2 percent of the national territory. Within these areas, extraction of resources is permitted under certain conditions.

Comparisons of the locations of biological resources with the sites of protected areas demonstrate that the protected areas are not optimally located to preserve the country's biodiversity. Studies indicate that 17 of the 53 vegetation types in Costa Rica are not represented inside strictly protected areas, and eight have absolutely no protection; 14 percent of strictly protected wildland is disturbed by some type of land use, most notably agriculture; of 760 records on the location of important species, only 24.7 percent occur in strictly protected areas.

62

Protected areas benefit from buffer zones which surround them and which enhance conservation within the protected areas through compatible land use practices in the buffer zones. At the conceptual level, the idea of buffer zones has gained widespread acceptance among conservationists in Costa Rica. But at the field level, buffer zones have not yet been incorporated into the management plans of the country's protected areas. Efforts to promote appropriate land use on private lands and in forest reserves adjacent to conservation areas have been inhibited by the absence of policy mechanisms to promote compatible uses that are economically viable and to restrict incompatible uses.

6.2.2 Policy and Institutional Framework

Although the buffer zone concept has no explicit source in formal policy in Costa Rica, several laws and policy statements impinge on the concept, including the National Parks Law, the Forestry Law and ECODES. These laws and policies and their associated institutions are discussed above in Section 6.1.2.

A series of laws establish National Wildlife Refuges, establish the Wildlife Division within the MIRENEM, and set out provisions for managing and protecting certain species of animals and regulating hunting and freshwater fishing. The Wildlife Division administers wildlife refuges for the protection and management of their flora and fauna. Other agencies, notably the Rural Guard, enforce the fish and game laws. Both aspects of the wildlife laws relate to buffer zones.

Costa Rica intends to apply the buffer zone concept de facto in several conservation areas, for example in Braulio Carillo National Park and surrounding lands and in the La Amistad Biosphere Reserve.

6.2.3 Issue Analysis

What Works. Several field projects currently under implementation in Costa Rica demonstrate that economically productive land use practices could serve as models for buffer zones. The U.S. Agency for International Development (USAID) Northern Zone Project centers around community development and sustainable agriculture. Another project at Gandoca, south of Limon, with assistance from the New Alchemists Society (ANAI), incorporates cultivation of non-traditional fruits into conventional agricultural production systems. The BOSCOSA project, in the buffer zone that adjoins Corcovado National Park on the Osa Peninsula, works with traditional and non-traditional tree crops - cacao, guanabana, and pejibaye - as well as subsistence food crops. The BOSCOSA project expects to move beyond the planning stage soon in its projected component in natural forest management.

What Does not Work. Although the attention to buffer zones as extensions of the protected areas they surround is new, they have always been present adjacent to protected areas. Typically the lands in buffer zones in Costa Rica have limited productive capacity. These lands have suffered deterioration from deforestation and soil erosion that spring from

nonsustainable land use practices. National policies related to soil conservation, forest management and watershed management all affect buffer zones. To the extent that these policies have not been effective to accomplish their direct purposes, they have likewise not been effective for enhancing protected areas through buffer zones. More effective policies to promote generally appropriate land use would also make buffer zones more effective for enhancing protected areas.

6.3 Inadequate Long Term Planning for Ecotourism Activities

6.3.1 Issue Description

Tourism has become the third largest source of hard currency earnings to Costa Rica's economy. Costa Rica's natural and environmental attractions and its rich biodiversity, notably those which are protected under the national parks system, provide the country a comparative advantage in ecotourism. Although efforts are being made to develop well organized ecotourism in the country, in protected areas and on privately owned lands, lack of coordination and planning among public and private institutions reduces the effectiveness of these efforts.

6.3.2 Policy and Institutional Framework

Costa Rica has not promulgated any formal policy statements that refer directly to ecotourism. However, many of the laws that establish national natural resources agencies and policies for managing natural resources impinge on ecotourism.

The enabling act for the Costa Rican Tourism Institute (ICT), 1955 authorizes the institution to carry out a series of activities for tourism promotion including encouraging visits from overseas tourists and promoting the construction and maintenance of tourism facilities. Several other laws and regulations come under the jurisdiction of ICT, notably the Tourism Law of 1960, the Law for the Regulation of Travel Agencies of 1973, and the Law for Incentives for Tourism Development of 1985.

As the ICT has come to recognize the increasing significance of tourism, it has carried out several studies including preparation of a Master Plan for Tourism Development. So far the ICT effort has focused mainly on general tourism with emphasis on beaches and volcanos.

The Coastal Zone Law on the Marine and Terrestrial Zone (MTZ), of 1977 regulates development and land use planning in coastal zones. Tourism is one of the law's focal points, especially with reference to scenic beaches. The law promotes collaboration between ICT and municipal governments, the National Housing Institute (INVU), the Ministry of Public Works, and banks. This law would influence ecotourism development of protected areas in coastal zones.

The National Parks Law, the Forestry Law, and the wildlife laws establish and set up the basic management of protected areas in Costa Rica, which provide much of the attraction for nature tourism to the country. The

management of the areas could readily incorporate ecotourism objectives so long as these are consistent with the fundamental function of the protected areas to conserve the nation's biological and ecological diversity. Section 6.1.2 discusses these laws and their association institutions in detail.

In addition to these laws, Costa Rica recently has supported two major studies on strategies for natural resource conservation. The Forestry Action Plan for Costa Rica formulates a series of policies on forestry and natural resources issues for the entire country for the next twenty years with particular emphasis on the next five years. It encourages ecotourism as one avenue toward attaining conservation of biodiversity. Second, The Costa Rica Conservation Strategy for Sustainable Development (ECODES), published in 1989, was developed over a two year period under the direction of MIRENEM, with the participation of more than 200 professionals from various public and private institutions. The strategy proposes the consolidation of the ecotourism industry as an important factor in socio-economic development for the country. The strategy discusses a series of tourism-related actions that include education, promotion, regulation of construction and land use zoning.

The policy framework for ecotourism also includes many informal elements. Private sector efforts have made the development of ecotourism possible in Costa Rica and, therefore, many of the actions taken represent decisions over which government has had little influence.

6.3.3 Issue Analysis

What Works. Nonprofit organizations have been instrumental in bringing the richness of Costa Rica's biological resources to international attention. This has enabled them to undertake international ecotourism successfully. Informal government recognition and support of these efforts has facilitated their expansion and smooth operation. The success of these nonprofit ventures has reinforced profit-making private sector ecotourism and stimulated government interest in ecotourism as an important activity for national economic development.

The rise in demand for wildlands tourism has increased the interest of local businessmen and communities surrounding protected areas to promote and develop this activity. Local people are beginning to reap economic benefits from wildlands resources by operating small hotels and restaurants and by providing guide services and other services to tourists seeking experiences in ecotourism.

The incentives for the promotion of tourism established by Law have stimulated some large scale investment in construction of tourism infrastructure oriented toward ecotourism. These incentives consist of duty-free importation of machinery and equipment and exoneration from income taxes for the proceeds of the investments. These incentives are available for many types of investment; they have not been specifically tailored to ecotourism.

What does not Work. Lack of coordination among institutions, partly due to the absence of formal policy statements on ecotourism, has inhibited ecotourism development. So far though, little collaboration between ICT and

MIRENEM specifically directed toward ecotourism has occurred and the few joint projects and agreements they have entered into have yielded poor results.

Unfortunately, small-scale investments, especially in family operated hotels and accommodations, often do not qualify for incentives the government provides for tourism development. One factor that inhibits small operators from seeking the incentives is that ICT requires people to obtain construction permits and administrative approvals in order to qualify for them.

6.4 Policy Gaps, Policy Alternatives and a Research Agenda

Costa Rica produces national development plans that set development goals based on economic evaluations. These evaluations do not consider the economic value of wildlands and thereby ignore the contribution wildlands can make toward economic development and the satisfaction of human needs. The national planning process should include economic evaluation of wildlands.

Conservation areas might enjoy better management if more of the management decisions affecting them were made at the regional rather than national level. Dependence on the central offices of MIRENEM delays action and strains the system. If each conservation area had strong agency support in the regional offices, the central offices could become facilitators to define policy and provide technical support. MIRENEM should undertake a pilot program in regional decision making for some conservation areas.

Although Costa Rica has benefitted from very favorable experiences in private conservation, these experiences occurred in the absence of any formal policy to support or encourage them. It would probably be advisable to formalize policy and to encourage establishment and management of more private conservation areas and to promote development projects within them: For example, a specific policy to include NGOs officially in conservation management would help unify technical and scientific criteria for managing the areas and would improve financial and managerial efficiency.

Zoning the conservation areas would identify locations for appropriate uses of land and resources that would be consistent and compatible with the central conservation objectives of the conservation areas. Zoning would facilitate management planning for the areas and implementation of action plans for their development.

In order to enhance the capacity of the conservation areas to conserve biodiversity, biological corridors should be established between them that would allow animals to move from one to another. This alternative relates closely to buffer zones as it refers to lands outside the conservation areas per se, the use of which affects the effectiveness of the conservation areas.

Costa Rica should evaluate and determine whether it wishes to declare formal policy on buffer zones or whether it will continue to apply the concept in an ad hoc fashion. A national policy on buffer zones would need to focus on two aspects of buffer zones: first, criteria for their designation; and, second, mechanisms for encouraging economically viable and conservation

compatible land uses and discouraging incompatible land uses inside them. Such policy would address the questions of which protected areas would require buffer zones in order to conserve biodiversity adequately, the size of the buffer zones, their locations, the types of land and land uses to include within them, and the set of economically viable activities feasible within a buffer zone.

Policy implementation, if not the policy statements themselves, would also need to include public relations components. Even though the buffer zone concept might attain the protection of biodiversity in the short run, it could pose long-term risks to conservation if nearby communities and producers - farmers, cattlemen, loggers, and others - are not integrated into buffer zone protection and, more important, into compatible production activities in the buffer zones. Therefore, one aspect of buffer zone policy could center around the definition and demonstration of economically feasible production activities. Ideally, the design and implementation of these activities would entail active community participation.

In many instances in Costa Rica, people who live near protected areas do not have sufficient information about the areas to appreciate them. National policy to strengthen public participation in wildlands management should begin with increasing information about protected areas. Better information will support the more fundamental objectives of community participation. Ancillary considerations for strengthening community participation include dealing with local and national NGOs and whether to provide incentives for land use practices in buffer zones that benefit conservation.

Costa Rica has taken two important steps toward improved coordination among institutions that deal with buffer zones. It has consolidated natural resource management functions in the Ministry of Natural Resources and it has formed several interinstitutional secretariats composed of agencies that manage natural resources. Having made the policy decisions to increase coordination, Costa Rica now needs to concentrate on making those decisions fully operational. Policy research in this area needs to focus on whether coordination really functions and how to make the coordinating mechanisms stronger and more effective.

The incipient experience in Costa Rica in appropriate land use practices for buffer zones would benefit from formal financial and political support. Continuing research, probably best carried out in the field by NGOs and local communities, should include identifying which activities in sustainable agriculture, natural forest management and ecotourism are economically viable and work best to "buffer" the protected areas and how do these different activities relate to each other: spacially; temporally; socially; and economically.

With respect to ecotourism activities, few policies exist to encourage the private sector to invest in nature-oriented tourism. The incentives which do exist are not available across the whole private sector. As an example, businesses receive tax reduction incentives for developing a tourism site. But an NGO that establishes, protects and manages a reserve which generates tourism, does not qualify for these incentives. Given the prominence of

national and international NGOs in Costa Rica's conservation movement, some incentives should apply to support NGO-based conservation.

ICT promotes tourism in general but has only recently begun to recognize ecotourism as an important subset of total tourism. A national effort is required to analyze all of the country's protected areas. This analysis should declare objectives and priorities for each unit in the system and determine the ecotourism potential of each. In this context, the planning and zoning studies ICT has already undertaken are a good first step.

In addition to identifying ecotourism sites and prospective facilities, the national analysis of ecotourism potential needs to examine several issues, including how ecotourism can best promote the economic and social interests of local communities and how to share responsibility and authority for ecotourism development between the public and private sectors. Eventually, the continuing analysis of ecotourism potential and ecotourism development should lead to regulations that protect ecotourism sites by providing for zoning of site uses, environmentally harmonious infrastructure, and waste disposal and pollution control.

Analyzing national potential for ecotourism and putting the results of that analysis into practice will require coordination among all the actors involved in ecotourism. Coordination must include government agencies, NGOs, the private sector, and local communities and it must relate to both economic development and to natural resource conservation. General agreement exists in Costa Rica that such coordination is necessary and desirable. So far the mechanisms to attain it are not in place, however. Closer cooperation between MIRENEM and ICT, perhaps beginning with a more effective technical coordination commission, would be a good place to start. For example, ICT and MIRENEM should coordinate with regard to selecting ecotourism sites and defining models for sound ecotourism development. Such coordination should eventually extend to include the private sector, both those investing in ecotourism ventures for profit and nonprofit NGOs with technical know-how in biodiversity conservation. Such multi-institutional coordination would enable allocating ecotourism investment to those sites that have both high ecotourism potential and high environmental capacity to sustain ecotourism.

Economic incentives should exist to promote ecotourism through the action of local communities. These incentives could operate through local tourism chambers like those which currently function at Monteverde and La Fortuna de San Carlos.

Properly structured incentives could affect placement of ecotourism infrastructure by promoting such infrastructure on appropriate sites. Criteria for site related incentives could support both community development objectives and biodiversity conservation objectives. An ancillary effect of such a policy could be a broader spread of benefits to various regions of the country.

Another aspect of ecotourism incentives could relate to the distribution of benefits from ecotourism. The incentives could be structured to favor

investments that kept benefits in Costa Rica as opposed to allowing them to accrue to foreign investors.

7. MANAGEMENT OF COASTAL AND MARINE RESOURCES

7.1 Lack of Coastal Zone Management

7.1.1 Issue Description

Poor planning and the lack of effective controls combined with excessive exploitation is causing economic losses and environmental degradation in the coastal zones. Embayments and near-shore waters are badly contaminated with stream-borne agricultural chemicals, solid and liquid industrial and urban wastes, and mine and soil sediments originating inland. Nearly all mangroves and other coastal wetlands are degraded by continuous overcutting, while pollution, landfills, and agricultural draining destroy necessary habitat for wildlife, mollusks, and the reproductive cycle of commercial saltwater fish. Beaches and coral reefs suffer massive plastic waste deposits, illegal harvesting of turtle eggs and shellfish, contamination from the excrement of domestic livestock, and mining of mineralized sands and shells. Uncontrolled development for tourism and second homes, cattle ranching, and subsistence cultivation wreak havoc on the scenic value of shorelines, beach property, and rock promontories.

7.1.2 Policy and Institutional Framework

By far, the most important law for coastal management is the Law on the Marine and Terrestrial Zone (MTZ) of 1977. Only the national and local levels of government are involved in the management and development of coastal areas under the MTZ law. The Institute of Tourism and the National Urban Institute are the two central powers that manage the coastal areas and plan for development under the MTZ law. Local governments, for the 21 cantons (counties) and six cities located on the coast also participate in implementing and enforcing the law and national policies. Planners lack adequate training and experience in coastal zone and marine science and they fail to consider inter-sectoral issues.

Government management strategies under this law incorporate sectoral planning, protected areas, environmental impact assessments, shoreline restrictions, and special area or regional plans. National and local agencies prepare development plans for MTZ and issue permits.

This law designates a 200-meter wide MTZ extending inland from the mean high tide line which is divided in two: the 50-meter public zone is devoted to public access with private ownership and development prohibited. The 150-meter restricted zone is regulated by a concession and permit system based on a detailed plan designed at the canton (county) level of local government.

The law sets the annual charge for a concession as a percentage of the value of the parcel, which is reassessed every five years. Concessions become commodities which may be privately negotiated. The cantons receive all revenues from the concessions and must allocate 20 percent to compensation for structures that have been demolished or relocated outside the MTZ and 40 percent to maintaining or improving infrastructure in the MTZ.

The Forestry Law of 1986 (revised in 1990) declares mangrove forests to be forest reserves. Freshwater swamp forests are not included automatically in this semi-protected category. As a policy issue, forest reserves require an approved management plan to be exploited. Mangroves are under the jurisdiction of the National Forest Service (DGF) and policies are administered by the pertinent regional offices.

The policies for protecting the marine sector in wildlife protected areas on the coast are very weak. The overall marine ecosystem is generally not considered in formulating policies.

Water policies have been developed specifically for the coastal areas. Regulations supporting the Water Law prohibit the drilling of wells for irrigated or potable water in a one-kilometer coastal zone to avoid saline intrusions. Permits are required for both exploration and exploitation of water. The National Electricity Service (SNE) and the Ground Water, Irrigation and Drainage National Service (SENARA) are responsible for implementing regulations concerning the drilling of water wells in the coastal areas.

Under the Health Law, all tourist facilities, including those on the coast, must submit requests for building permits to the Ministry of Health, Department of Environmental Control, and the local municipal government. The requests must include a plan for soil and liquid waste disposal.

7.1.4 Issue Analysis

What Works. The Law on the MTZ applies to 78 percent of all beaches in Costa Rica defined as having value for tourism. Concessions refer to a development right on a specific parcel of land, for a specific land use and a fixed time. Policies of granting concessions are based on a detailed regulation plan designed by the local canton in collaboration with Costa Rican Tourism Institute (ICT) and the National Institute for Housing and Urbanization (INVU).

Institutional responsibility is clearly divided between the ICT and INVU. ICT is not subject to political whims and unstable funding because 90 percent of its revenue is generated directly from special taxes on airline tickets, hotels, and restaurants which are not required to pass through the national budget process in the legislature.

What Does Not Work. The Law on the MTZ does not apply to the 30 percent of coastal land which was privately owned and registered before October 1970 or to cities, national parks, and refuges located on the coast or in ports or wetlands and estuaries. Approximately 90 percent of the coastal wetlands are mangroves (Pacific) and 10 percent freshwater palm swamps (Caribbean).

Areas without national tourism value such as agricultural areas, mostly hilly lands bordering the sea, are under the jurisdiction of the MTZ law, but it does not address the planning of these areas. Furthermore, ICT gives little administrative and regulatory oversight to these often scenic areas. Regulation schemes, which are less detailed than the regulation plans for

designated tourism areas, are prepared for areas perceived as having no direct tourist value. As of November 1989, only four regulation schemes for non-tourist areas had been developed.

As of November 1989, 34 regulations plans, which refer to 89 km of the coast with tourism value, had been completed and seven were being written. It is estimated that 141 regulation plans are be needed to cover the entire jurisdiction of the law. Thus, there is great pressure to develop the remainder of the areas without regulation plans.

Enforcement of the MTZ law at the canton level is weak. Canton inspectors often do not inform property owners of the prohibition against development without a regulation plan. They also often fail to respond to complaints about violations and they lose or delay paperwork and court decisions. Canton governments sometimes fail to carry out court orders for evacuation and demolition thereby allowing offenders to continue illegal development.

Only 30-40 percent of ICT claims of violations of conditions stipulated in a concession are upheld in court. Constant turnover in judges in rural areas, the lack of court experience in these matters, and the general hesitancy of the courts to get involved in local issues help explain the low success rate in prosecuting violators.

Protection of the marine resources along coastal boundaries of national parks is sporadic and weak. The lack of personnel is the most significant negative factor preventing the development and implementation of research, management, and control policies for the marine resources sector within the national parks.

The mangrove forests, coastal swamp palm forests, and associated estuaries and canals are inadequately protected from human exploitation of nearly all their resources. Examples of environmental damage include salt production along the Pacific coast and cutting of mangroves on private cattle ranches to illegally extend their pastures to shorelines.

Given the official desire to develop foreign exchange-earning tourism, regulatory plans have been designed to attract tourism from abroad. As a consequence, conflicts have not been satisfactorily resolved between competing demands and styles of infrastructure appropriate to national as opposed to international beach tourism and private residential housing.

Many drilling companies do not request permits to drill wells, and their activities extend illegally into the one-kilometer coastal area. Although tourist businesses request permission to build on the coast and their plans to dispose solid and liquid waste are approved, they often fail to follow those plans when developing the sites. An even more serious problem exists in the construction of housing in mangrove areas. Not only are mangroves destroyed, but toilet facilities are located in a manner that results in contamination of the places where water is extracted for domestic use. With no enforcement and

monitoring by the municipalities and the Ministry of Health, the estuaries become contaminated.

7.2 Unsustainable Fishery Yields

7.2.1 Issue Description

Fisheries are a limited resource in Costa Rica, given problems of water contamination from agriculture, industry, and urban activities, destruction of mangroves from land clearing and salt production, and human population growth. Thus, in addition to sound water and land use policies, there is a need for conservation of marine resources and sustainable fishing practices.

Current commercial fishing practices are unsustainable: Fishing is concentrated on a few species with high economic value in limited geographical areas. Destructive fishing techniques, combined with this general overfishing, deplete commercial fish and shellfish stocks to the point of no return, and commercial longliners are decimating naturally scarce recreational fish species.

Moreover, foreign fleets have taken over the potential for a managed and lucrative national tuna fishery in patrimonial waters.

7.2.2 Policy and Institutional Framework

Several international, regional, and bilateral policies directly relate to the fishing industry. Costa Rica follows the international convention of the high seas and the international convention on fishing and conservation of living resources of the high seas. An international convention on ocean dumping was signed by 26 countries, including Costa Rica, in 1972. The Convenio Constitutivo de la Organizacion Latinoamericana de Dearrollo Pesquero (OLDEPESCA) of 1984 calls for regional cooperation in conservation, consumption, and promotion of commercial systems and improvement of productive and institutional capacity with respect to marine resources. The Convention for Tuna Fishing in the Eastern Pacific Ocean, 1983, between Costa Rica, Panama and the US, establishes a licensing system for tuna fishing fleets to guarantee the rational exploitation of the tuna resources. Panama and Costa Rica have signed a treaty on the Delimitation of Marine Areas and Cooperation, 1981, which sets the marine boundaries between the two countries and calls for cooperation to protect the resources found in their seas.

However, the main policies affecting the marine resources fall under the national fisheries law. The Law on Fresh and Saltwater Fishing (1948) and its regulations (1949) includes the official government policies and rules concerning fishing in estuarine, coastal, and maritime territorial waters. Its stated objective is to set the conditions that maximize economic and social benefits while ensuring a sustainable level of production of marine resources. Promoting sport fishing as an avenue for tourism is also an objective. The fisheries law and its regulations provide the Ministry of Agriculture (MAG) with appropriate authority to manage the fishery resources.

In addition, there are several decrees directly concern the protection of marine resources, such as turtles and pianguas, and the regulation of fishing, such as size and type of net and fishing boat licenses.

The Fisheries Law is administered by the Department of Fish and Aquaculture Resources within the MAG. The Department includes the sub-departments of Fisheries, Protection and Registration, and Aquaculture. Regional departments exist for Puntarenas, Guanacaste, Golfito, and Limon.

In addition to MAG, 10 other public or quasi-government institutions have some relation to the fishery sector. Four institutions are research centers: el Centro de Investigacion en Ciencias del Mar y Limnologia (CIMAR) at the University of Costa Rica, with laboratory and computer facilities, is dedicated to research on marine and fresh water ecosystems, and the conservation and rational use of their respective resources; the School of Biology at the National University offers degrees in marine biology, aquaculture, and fishing technology and conducts marine biology research; the Centro Nautico Pesquero del Instituto Nacional de Aprendizaje offers several technical and practical courses related to fishing in an 18-month certified program, and the Colegio Universitario de Puntarenas offers a degree in fishing and sea navigation.

The other six institutions have offices or departments especially devoted to fishery issues: el Consejo Nacional de Produccion (CNP) is concerned with commerce in fisheries under the CNP program; el Instituto Costarricense de Puertos de Pacifico (INCOP), administers infrastructure such as ports and dikes; el Instituto de Fomento Cooperativo (INFOCOOP) organizes and supports fishing cooperatives and offers credit; el Ministerio de Planification y Poltica Economica (MIDEPLAN) develops plans for the fishing industry; and the Instituto Mixto de Ayuda Social (IMAS) formulates and executes development projects and offers credit (1,663,500 colones in 1982 and 1,1000,000 colones in 1983).

In the private sector, 14 fishing cooperatives, four chambers, one labor union, and two federations are located on the Pacific coast. The Corporacion Costarricense de Desarrollo (CODESA) and the Junta Administracion Portuaria y de Desarrollo Economico de la Vertiente Atlantica (JAPDEVA) investigate the feasibility of developing the aquaculture sector along the Atlantic coast. There are no profession associations directly related to fishing.

7.2.4 Issue Analysis

What Works. Under the auspices of the Fisheries Law, MAG has established regulations to protect the main resources. The most important include the prohibition against lobster fishing in three areas, including the Golfo de Nicoya, a prohibition against fishing with gill nets during three months of every year in the Golfo de Nicoya, regulations on sizes of fishing nets used by artisan fishermen, the prohibition against fishing in river outlets and the protection of all turtle species that nest in Costa Rican waters.

Under the powers granted by the Fisheries Law, MAG for the first time issued a prohibition against fishing in Golfo de Nicoya for three months every year in order to counteract the natural resource depletion from past overfishing.

Several institutions publish information on the fisheries sector. MAG periodically publishes statistical and technical information; CIMAR has a computerized databank on fisheries; La Asociacion Bananera Nacional Publica publishes a newsletter on agriculture that periodically includes information on aquaculture; the Instituto Technologico disseminates technical information to a limited audience of scientists concerning construction of boats and physical properties of the sea; and the University of Costa Rica disseminates scientific information on results of research projects to the fishermen and aquaculture producers, which also covers socio-economic and legal aspects of the industry. The Consejo Nacional de Investigaciones Cientificas y Tecnologicas established in 1985 el Sistema de Informacion en Ciencias Marinas, Recursos Pesquesros y Acuacultura (SIMPA), with the mandate to process and disseminate information related to marine science and fisheries. SIMPA issues a periodic bulletin with bibliographic information.

What Does Not Work. The major problem in relation to the marine resources is the lack of a clear political framework. An analysis of the Planes Nacionales de Desarrollo in the last 12 years demonstrates that marine resources have not received the needed priority. Without this national long-run commitment, short-term policies are formulated at MAG. However, MAG's human capacity is concentrated in agriculture, not fisheries. The policies, lacking an integrated vision of the problems and based on inadequate technical advice, often have a negative impact. This situation leaves a very small margin at the Direccion de Pesca, which generates technical policies and scientific justifications for them.

Scientific and technical information concerning the marine resources is relatively limited. Consequently, it is difficult to establish, apply, and verify necessary regulations to ensure the protection of the resources. For example, the number of fishing permits granted continues to increase but no criteria for sustainability are set.

7.3 Policy Gaps, Policy Alternatives and a Research Agenda

No policy relates to the holistic management of coastal and near-shore resources. As a result, more than half of the nearly 1,400 km of mainland coastline have limited or no management under this program. Moreover, priority has been given to the Pacific coast, where a generally calm ocean breaks on a highly scenic, beach-studded shoreline with alternating embayments, estuaries, islets, and rocky promontories. Beach-type tourism is favored here and foreign developers have already invested heavily in infrastructure.

Because of lack of ICT funds and initiative, no evaluation of the implementation of any beach regulation plan has been conducted. Yet, there is

25

anecdotal evidence of significant gaps between what the plans say and what actually develops.

The MTZ law is generally good insofar as it goes, but it simply does not go far enough: Its policy framework and the relevant institutions fail to treat the coastal zone as an ecological and geographic entity, and they totally disregard the adjacent ocean and tidal estuaries linked to it. The ICT's mandate is to promote the development of tourism so it is not focused on the management and use of the coastal zones. On the other hand, the municipal governments lack the technical capacity and economic resources to adequately fulfill their responsibilities for coastal zone management.

Few other laws exist to fill the gap. Forestry laws now apply to the exploitation of the mangrove and other coastal wetland forests, yet they are hardly enforced. These forests are considered marginal to the major issues of inland sawtimber forestry and are exploited principally for non-sawn timber products: charcoal, firewood, tanbark, salt, and shellfish.

In the numerous bays, gulfs, and estuaries and the near-shore waters where public recreation takes place, water is contaminated with solid and liquid wastes, including untreated effluent from the nation's major cities. Agriculture is another major contributor to marine pollution, and its toxic and often carcinogenic by-products are passed to the public via ingested fish and mollusks. Yet neither the nation's laws nor the Ministry of Public Health address marine pollution. For example, no policy exists to clean up beaches fouled by plastic and other non-biodegradable objects. This contamination affects both recreational users of the ocean and the fish, birds, and animals which inhabit it.

Thus, no policy provides an effective remedy for the problem, informs or protects the public: The ocean appears to be invisible to both the public and decision makers. Moreover, Costa Rica lacks the scientific equipment to test the fish for chemical damage: Only correlative and not causal evidence can be provided.

It would appear that new policies should be introduced to supplement the old rather than making major policy changes. These additions plus minor changes might be incorporated in a modified MTZ and/or in additions and changes to the regulations set up under the existing law. However, the current beach zoning law should be modified to more fairly balance all national interests, including national and international recreation and tourism.

A major addition to the law would be to extend its geographic coverage by including all ecologically relevant areas, including wetlands, estuaries, islands and islets, non-beach uplands terminating at the water's edge, inland areas impacting directly on the littoral zones, and urbanized and port facility areas. Rules specific to the conservation and optimal long-term uses of each of these ecosystems would be developed by committees of specialists in consultation with all economic and social interest groups.

76'

The foregoing implies a need to broaden the number of public and private institutions involved in any way in coastal zone management plans under the law. Of particular importance would be the establishment of mechanisms to obtain effective institutional coordination and cooperation in this process. One national institution should have overall authority and responsibility in achieving this goal, including development of needed research activities and training of specialized personnel. This institution must have the capacity to generate specific key policies concerning management, zoning, and sustainable use of the coastal zones. Specific attention must be given to the impact of policies on the coastal environment and adjacent waters and on their biological resources. From this perspective, the ICT and municipality governments could offer support but not be responsible for executing the policies.

A third addition to the law would be to recognize and assert in a broader, deeper law and regulations that the adjacent sea is an integral part of the coastal zone. This would entail incorporating both legislation and several public institutions, especially those relating to health, agriculture and forestry, commercial fisheries, science, transport, and national security, in an integrated coastal zone management process.

Establishment of a public prosecutor for coastal-marine related legislation would strengthen the presently weak enforcement of laws relating to this sector.

No single dominant institution creates and implements the rules of fishing and no formal system exists to disseminate information on fisheries in Costa Rica. For example, the legal framework does not specifically identify one institution responsible for issuing permits for mollusks or cultivation of fish in suspended cages in estuary zones. Consequently, no single policy guarantees the integral and sustainable development of marine resources based on technical and scientific criteria. Moreover, the institutions active in the fishery sector have no coordination, resulting in a high project failure rate, duplication of efforts, and large economic losses.

Finally, the economic potential of both the Pacific and Atlantic marine resources needs to be investigated, particularly the potential for aquaculture production of shrimp and clams.

8. CONCLUSION

This inventory was conducted to gain a comprehensive understanding of the specific influences of relevant policies, or lack thereof, and the political, institutional, social and economic factors which surround natural resource conditions. In addition to several macro policy issues, 15 natural resource policy issues are presented and over 100 policies analyzed. These policy influences are largely qualitative matters, often involving incommensurable factors of political power, social, and economic forces. Seldom can they be documented quantitatively. Yet this complexity does not decrease their importance.

The inventory demonstrates that Costa Rica's policy environment is complex with both positive and negative elements affecting the management and use of the country's renewable natural resources. Many laws and policies are in place or recent policy reforms have brought significant improvements in the management of Costa Rica's natural resources. Problems often arise at the policy implementation stage. For example, watershed management policies in Costa Rica lack a community participation component which contributes to the failure of watershed management projects. With respect to the management of Costa Rica's forests, some government policies are appropriate, such as the requirements to submit and adhere to forest management plans, however, the National Forest Service lacks the resources necessary to effectively implement these policies. The inventory also identified significant policy gaps. Some examples include: (1) government agencies do not follow a standard land classification system which is impairing Costa Rica's ability to follow a sustainable path of development, particularly in the agricultural sector; (2) the Water Law is outdated and a new law is needed to reflect Costa Rica's current priorities for water resource policies and (3) no policy relates to the holistic management of coastal and marine resources.

Further research on policies will be needed over time to clarify the impacts and assess new responses and evolving conditions. The inventory of policies in this report is designed to fulfill the need for better information on existing strategies which will help stimulate the design of policies and actions for sustainable, equitable development and natural resource management in Costa Rica and the entire Central American region.

78

AGRICULTURAL POLICY ANALYSIS PROJECT, PHASE II

Under contract to the Agency for International Development, Bureau for Science and Technology, Office of Agriculture
Project Office Hampden Square, 4800 Montgomery Lane, Suite 500, Bethesda, MD 20814 • Telephone: (301) 913-0500
Telex: 312636 • Fax: (301) 652-7530 • Fax: (301) 652-7791

COSTA RICA NATURAL RESOURCE POLICY INVENTORY USAID/ROCAP RENARM PROJECT

VOLUME II

THE INVENTORY

OCTOBER 1990

TECHNICAL REPORT NO. 112

**Conducted under contract with Abt Associates Inc.
and the Agricultural Policy Analysis Project, Phase II (APAP II)
in collaboration with the Tropical Science Center (San José, Costa Rica)**

Main Authors: **Theresa Bradley**
Thomas Divney
Marcelino Losilla Penon
Dennis McCaffrey
Francisco Rodriguez Vega
Joseph Tosi

BEST AVAILABLE COPY

Prime Contractor: **Abt Associates Inc.,** 55 Wheeler Street, Cambridge, MA 02138 • (617) 492-7100

Subcontractors: **Harvard Institute for International Development,** Harvard University, One Eliot Street, Cambridge, MA 02138 • (617) [illegible] 164
Food Research Institute, Stanford University, Stanford, CA 94305-6084 • (415) 723-3941
North Carolina State University, Department of Economics and Business, Box 7645, Raleigh, NC 27695-7645 • (919) [illegible] 187
Abel, Daft & Earley, 1410 King Street, Alexandria, VA 22314 • (703) 739-9090
International Science and Technology Institute, 1129 20th Street, NW, Suite 800, Washington, D.C. 20036 • (202) 785-[illegible]31
International Food Policy Research Institute, 1776 Massachusetts Avenue, NW, Washington, D.C. 20036 • (202) 862-5600

79

TABLE OF CONTENTS

VOLUME ONE: EXECUTIVE SUMMARY

ACKNOWLEDGEMENTS ix

ABSTRACT x

ACRONYMS xi

1. INTRODUCTION 1
   Contents of the Report 1

2. KEY MACRO ISSUES 2

   2.1 Macroeconomic Issues 2

   2.2 Population Growth and Demands on Natural Resources 6

   2.3 Private Property Rights 6

   2.4 National Strategies for Development 7

3. SUSTAINABLE AGRICULTURE 9

   3.1 Improper Soil, Water and Land Use Management Practices 9
      3.1.1 Issue Description 9
      3.1.2 Policy and Institutional Framework 9
      3.1.3 Issue Analysis 10

   3.2 Misuse of Agrochemicals 12
      3.2.1 Issue Description 12
      3.2.2 Policy and Institutional Framework 12
      3.2.3 Issue Analysis 13

   3.3 Agricultural Technology Research and Extension Services 13
      3.3.1 Issue Description 13
      3.3.2 Policy and Institutional Framework 14
      3.3.3 Issue Analysis 14

   3.4 Policy Gaps, Policy Alternatives and A Research Agenda 16

4. MANAGEMENT OF WATER RESOURCES 18

   4.1 Water Pollution 18
      4.1.1 Issue Description 18
      4.1.2 Policy and Institutional Framework 18
      4.1.3 Issue Analysis 19

   4.2 Competition for Water Resources 20
      4.2.1 Issue Description 20
      4.2.2 Policy and Institutional Framework 21
      4.2.3 Issue Analysis 22

9P

4.3 Watershed Deterioration 23
4.3.1 Issue Description 23
4.3.2 Policy and Institutional Framework 24
4.3.3 Issue Analysis 24

4.4 Policy Gaps, Policy Alternatives and A Research Agenda 26

5. PRODUCTION FROM FORESTS 28

5.1 Deforestation 28
5.1.1 Issue Description 28
5.1.2 Policy Framework 28
5.1.3 Institutional Framework 29
5.1.4 Issue Analysis 30

5.2 Reforestation 31
5.2.1 Issue Description 31
5.2.2 Policy and Institutional Framework 32
5.2.3 Issue Analysis 33

5.3 Ineffective Forest Management 35
5.3.1 Issue Description 35
5.3.2 Policy and Institutional Framework 36
5.3.3 Issue Analysis 37

5.4 Inefficient Production from Forest Resources 40
5.4.1 Issue Description 40
5.4.2 Policy and Institutional Framework 40
5.4.3 Issue Analysis 41

5.5 Policy Gaps, Policy Alternatives and A Research Agenda 42

6. MANAGEMENT OF WILDLANDS 44

6.1 Inadequate Conservation of Biodiversity and Consolidation of Wildlands 44
6.1.1 Issue Description 44
6.1.2 Policy and Institutional Framework 44
6.1.3 Issue Analysis 46

6.2 Inappropriate Land Uses in Buffer Zones 47
6.2.1 Issue Description 47
6.2.2 Policy and Institutional Framework 48
6.2.3 Issue Analysis 48

6.3 Inadequate Long Term Planning for Ecotourism Activities 49
6.3.1 Issue Description 49
6.3.2 Policy and Institutional Framework 49
6.3.3 Issue Analysis 50

6.4 Policy Gaps, Policy Alternatives and A Research Agenda 51

7. MANAGEMENT OF COASTAL AND MARINE RESOURCES 55

7.1 Lack of Coastal Zone Management 55
7.1.1 Issue Description 55
7.1.2 Policy and Institutional Framework 55
7.1.3 Issue Analysis 56

7.2 Unsustainable Fishery Yields 58
7.2.1 Issue Description 58
7.2.2 Policy and Institutional Framework 58
7.2.3 Issue Analysis 59

7.3 Policy Gaps, Policy Alternatives and A Research Agenda 60

8. CONCLUSION 63

VOLUME TWO: THE INVENTORY

PREFACE ix
Purpose of the Report ix
Background Context of the Policy Inventories x
Contents of the Report xi
Summary xi

ACKNOWLEDGEMENTS xiii

ABSTRACT xvi

ACRONYMS xv

LIST OF CHARTS AND MAPS xx

CHAPTER ONE: INTRODUCTION 1

1.1 Scope and Orientation of the Analysis 1
1.1.1 Natural Resource Themes 1
Sustainable Agriculture. 1
Production from Forests. 1
Management of Water Resources. 1
Management of Wildlands. 1
Management of Coastal and Marine Resources. 2

1.1.2 Criteria for Selecting Policies 2

1.2 An Overview of Costa Rica's Environment 3
1.2.1 Physical Diversity 3
1.2.2 Climatic Diversity 5
1.2.3 Ecological and Biological Diversity 5
1.2.4 The Natural Resources 6
Soils 6
Land Use and Land Capability 7
Soil Erosion 8
Water 9
Forests 10
Coasts 11

CHAPTER TWO: THE MACRO POLICY ENVIRONMENT 13

2.1 Introduction 13

2.2 Human Ecological Factors 13

2.3 Macroeconomic Factors 15
2.3.1 Historical Perspective 15
Sustained Import Substitution. 16
Economic Instability and the Move Toward a Planned Economy,1973-79. 17
Economic Crisis and Fiscal Retrenchment, 1980-90. 18

2.3.2 Economic Policies and Patterns of Land Use.
Finacial Incentives 20
Property Rights 21

2.4 Political and Institutional Factors and Their Consequences for Long Run Natural Resource Management Policies 22

2.5 Cultural Factors 24

CHAPTER THREE: SUSTAINABLE AGRICULTURE 25

3.1 Improper Soil, Water and Land Use Management Practices 25
3.1.1 Issue Description 25
3.1.2 Policy Framework 26
3.1.3 Institutional Framework 27
3.1.4 Issue Analysis 28
3.1.5 Policy Gaps, Alternatives and a Policy Research Agenda 31

3.2 Misuse of Agrochemicals 32
3.2.1 Issue Description 32
3.2.2 Policy Framework 33
3.2.3 Institutional Framework 33
3.2.4 Issue Analysis 34
3.2.5 Policy Gaps, Alternatives and a Policy Research Agenda 35

3.3 Agricultural Technology Research and Extension Services 36
3.3.1 Issue Description 36
3.3.2 Policy Framework 37
3.3.3 Institutional Framework 37
3.3.4 Issue Analysis 38
3.3.5 Policy Gaps, Alternatives and a Policy Research Agenda 39

CHAPTER FOUR: MANAGEMENT OF WATER RESOURCES 41

4.1 Water Pollution 41
4.1.1 Issue Description 41
4.1.2 Policy and Institutional Framework 42
4.1.3 Issue Analysis 43
4.1.4 Policy Gaps and Alternatives 45

4.2 Competition for Water Resources 46
4.2.1 Issue Description 46
4.2.2 Policy and Institutional Framework 47
4.2.3 Issue Analysis 48
4.2.4 Policy Gaps and Alternatives 50

4.3 Watershed Deterioration 51
4.3.1 Issue Description 51
4.3.2 Policy and Institutional Framework 53
4.3.3 Issue Analysis 56
4.3.4 Policy Gaps and Alternatives 59

4.4 Policy Research Agenda and Policy Alternatives 60
4.4.1 Water Laws Reforms 60
4.4.2 National Water Plan 61
4.4.3 Watershed Management Secretariat (STC) 61
4.4.4 Water Monitoring Program 61
4.4.5 Water Management Strategies and Concepts 61
4.4.6 National Constitutional Reforms 62

CHAPTER FIVE: PRODUCTION FROM FORESTS 64

5.1 Deforestation 64
5.1.1 Issue Description 64
5.1.2 Policy Framework 64
5.1.3 Institutional Framework 65
5.1.4 Issue Analysis 67
5.1.5 Policy Gaps, Alternatives and a Policy Research Agenda 69

5.2 Reforestation 70
5.2.1 Issue Description 70
5.2.2 Policy Framework 70
5.2.3 Institutional Framework 73
5.2.4 Issue Analysis 75
5.2.5 Policy Gaps, Alternatives and a Policy Research Agenda 79

5.3 Ineffective Forest Management 80
5.3.1 Issue Description 80
5.3.2 Policy Framework 81
5.3.3 Institutional Framework 83
5.3.4 Issue Analysis 84
5.3.5 Policy Gaps, Alternatives and a Policy Research Agenda 87

5.4 Inefficient Production from Forest Resources 88
5.4.1 Issue Description 88
5.4.2 Policy Framework 90
5.4.3 Institutional Framework 92
5.4.4 Issue Analysis 92
5.4.5 Policy Gaps, Alternatives and a Policy Research Agenda 94

CHAPTER SIX: MANAGEMENT OF WILDLANDS 96

6.1 Inadequate Conservation of Biodiversity and Consolidation of Wildlands 96
6.1.1 Issue Description 96
6.1.2 Policy Framework 101
6.1.3 Institutional Framework 102
6.1.4 Issue Analysis 103
6.1.5 Policy Gaps, Alternatives and a Policy Research Agenda . . . 105

6.2 Inappropriate Land Uses in Buffer Zones 106
6.2.1 Issue Description 106
6.2.2 Policy Framework 107
6.2.3 Institutional Framework 108
6.2.4 Issue Analysis 108
6.2.5 Policy Gaps, Alternatives and a Policy Research Agenda . . . 109

6.3 Inadequate Long Term Planning for Ecotourism Activities 111
6.3.1 Issue Description 111
6.3.2 Policy Framework 112
6.3.3 Institutional Framework 114
6.3.4 Issue Analysis 114
6.3.5 Policy Gaps, Alternatives and a Policy Research Agenda . . . 116

CHAPTER SEVEN: MANAGEMENT OF COASTAL AND MARINE RESOURCES 118

7.1 Lack of Coastal Zone Management 118
7.1.1 Issue Description 118
7.1.2 Policy Framework 118
7.1.3 Institutional Framework 119
7.1.4 Issue Analysis 120
7.1.5 Policy Gaps, Alternatives and a Policy Research Agenda . . . 123

7.2 Unsustainable Fishery Yields 125
7.2.1 Issue Description 125
7.2.2 Policy Framework 125
7.2.3 Institutional Framework 128
7.2.4 Issue Analysis 129
7.2.5 Policy Gaps, Alternatives and a Policy Research Agenda . . . 131

CONCLUSION 132

APPENDIX A: LIST OF CONTACTS A-1

APPENDIX B: REFERENCES B-1

APPENDIX C: TEAM MEMBERS C-1

VOLUME III: TECHNICAL APPENDICES

TECHNICAL APPENDIX A: PUBLIC POLICIES A-1

TECHNICAL APPENDIX B: PUBLIC INSTITUTIONS B-1

TECHNICAL APPENDIX C: NON-GOVERNMENTAL ORGANIZATIONS C-1

PREFACE

Purpose of the Report

Natural resource management for sustainable development is particularly needed in the region of Central America, where severe problems of environmental degradation are inextricably connected to economic crises and social unrest. In recent years numerous studies, reports, and articles have documented and drawn attention to predicaments of resource deterioration in Central America--from deforestation and soil erosion to agrochemical pollution--and to the debilitating socio-economic problems generated from the resource deterioration. Some institutions have recognized the urgent need to change the prevailing patterns of resource exploitation and to pursue new directions of sustainable economic development and natural resource conservation in this region. Governments, non-governments organizations and international donors have begun to develop policies and projects to resolve these seemingly intractable dilemmas.

The Regional Environmental and Natural Resource Management Project (RENARM) is a comprehensive new ten-year program intended to address these problems. Its central goals are to help create "conditions for sustained use of natural resources in a manner that minimizes damage, protects biodiversity, and provides the means for equitable and sustainable economic growth," and to "assist public and private institutions to generate, transfer and apply the information and technologies essential for sustained use of natural resources." The development of natural resource policies is a crucial component of RENARM, which will complement and shape the other components (i.e. education, wildlife conservation, sustainable agriculture and forestry, and institution building). The policy component is based on the following premise:

> "Attention to the political and legal framework which governs economic policies, regulations, enforcement, land use, economic incentives and environmental protection is a required element for successful strategies. Project interventions and long-range planning cannot proceed effectively without supporting and compatible policies and laws."

The objectives of the policy component are to help create effective public policy and enforcement measures conducive to sustainable resource use, overcome policy constraints that jeopardize the environment and development, promote policy dialogue between government and donors, and support constructive processes of policy-making for this purpose. The expected products include new legislation with effective enforcement measures, improved inter-agency cooperation, greater awareness of environmental policy issues, and incentives for improved management of land, watersheds, energy, fisheries, agrochemicals, forests, and wildlands.

A policy inventory providing essential background information for RENARM entails the following tasks:

a) identifying critical policies and laws from both the public and private sectors at the regional, macroeconomic, and local levels which affect natural resources (including those pertaining to the economy, commerce, agriculture, forestry, energy and industry);

87

b) identifying institutions and agencies (both government and non-government) that create and implement such policies;

c) conducting a qualitative assessment of the impacts of each policy on economic growth and the natural resource base in both the short and long run; and

d) analyzing the interactions of these policies, discussing significant gaps in the current policy set and determining principal policy alternatives for a research agenda.

Natural resource policy inventories will be conducted for Guatemala, Belize, Honduras, El Salvador, Costa Rica and for the Central American region as a whole. This report presents the results of the policy inventory for Costa Rica.

Policy analysis is the second step within the policy component of the RENARM strategy. The inventories will contribute to the preparation of country-specific strategies for implementing RENARM. The policy analysis component of RENARM will analyze alternative environmental and natural resource policy options indicated in the inventories; adapt, improve and evaluate a range of methods for analyzing policy options; and characterize the political/institutional milieu in which policies are developed and implemented. The policy analysis component supports the policy dialogue and reform required to achieve RENARM's objectives.

Background Context of the Policy Inventories

Concern for the environment arises at a time when the energies of Central American countries are devoted to development goals that highlight expansion of production and alleviation of poverty. However, through the global economic crises, deepening debts and declining terms of trade of the last two decades, the governments of Central America have faced increasing economic pressure to expand export production, repay burgeoning loans, and raise gross national product (GNP) in the short term. Governments have established policies and laws, including fiscal measures (such as taxes and subsides), credit systems, colonization schemes, and land use legislation, which often maximize short-term profits and rapid growth. Large-scale monocultural enterprises, such as beef-cattle and cotton, and small-scale export crops have received particularly strong state support. These sectors have contributed greatly to the increase of exports, thereby generating badly needed foreign exchange.

On the other hand, maximizing short-term growth has produced long-run negative impacts on the environment for two reasons: the production activities damage the environment directly through resource degradation and indirectly by ignoring longer term issues like availability and quality of renewable natural resources.

The main objective of the policy inventory is to prioritized avenues of policy reform in which the goals of environmental conservation and economic growth are compatible. However, there are no "blueprint" policies and actions to resolve these complex dilemmas. The citizens and leaders of the individual countries need to adapt policy measures to their own situations.

At the same time, these countries urgently need to collaborate and learn from each other in the process of identifying successful measures. Some environmental and natural resource problems are regional predicaments that do not observe national boundaries. Inter-country exchange of information and formation of region-wide policies are essential initiatives that serve the interest of all Central American people.

The RENARM initiative of conducting policy inventories for natural resources in five Central American countries and one for the region as a whole was designed with these concepts in mind.

Contents of the Report

Volume I is a summary of the results and conclusions of the Costa Rica Natural Resource Policy Inventory. It is non-technical and geared for a wide audience. Illustrative examples are used to support the inventory's main conclusions.

Volume II is organized into seven chapters. Chapter 1 provides the scope and orientation of the inventory by dividing the analysis into five natural resource themes: sustainable agriculture, management of water resources, production from forests, management of wildlands, and management of coastal and marine resources and setting the criteria for selecting policies analyzed in the inventory. Costa Rica's soils, water, forest and coastal resources are also described. Chapter 2 analyzes how Costa Rica's natural resource policy framework has been and is shaped by macro policies and human ecological, institutional and cultural factors. Chapters 3 through 7 correspond to the five natural resource themes described in Chapter 1. In each chapter, two to four policy issues are identified. An issue is a problem in natural resources management that could be ameliorated by policy change. For each issue, the inventory presents the issue description, policy framework, institutional framework, issue analysis of what does and does not work, and policy gaps, alternative and a research agenda. In total, the inventory identified 15 policy issues and analyzed over 100 policies.

Volume III contains three technical appendices. Appendix A presents seventeen policy inventory tables that support the policy discussions of Chapters 3 through 7. Over forty public policies and laws are grouped into these seventeen major policy categories. Each table describes the major policies framing a policy category, its corresponding institutions, and evaluates its impact on the environment and natural resources and the economy. Appendix B briefly describes the characteristics and objectives of over twenty public sector institutions involved in Costa Rica's natural resource policy issues. Appendix C lists over 100 international, national, regional and local Non-Governmental Organizations (NGOs) active with natural resource agendas in Costa Rica.

Summary

This inventory was conducted to gain a comprehensive understanding of the specific influences of relevant policies, or lack thereof, and the political, institutional, social and economic factors which surround natural resource conditions. These policy influences are largely qualitative matters, often involving incommensurable factors of political power, social, and economic

forces. Seldom can they be documented quantitatively. Yet this complexity does not decrease their importance. Further research on policies will be needed over time to clarify the impacts and assess new responses and evolving conditions. The inventory of policies in this report is designed to fulfill the need for better information on existing strategies which will help stimulate the design of policies and actions for sustainable, equitable development and natural resource management in Costa Rica and the entire Central American region.

ACKNOWLEDGEMENTS

The Tropical Science Center (Centro Cientifico Tropical), which provided logistic and technical support in Costa Rica, is gratefully acknowledged. The team would like to thank the many people and institutions who provided information, frank opinions and helpful comments. We would also like to acknowledge the supportof the USAID/Costa Rica mission and USAID/ROCAP. In particular, Ann Lewandowski and Peter Kranstover made numerous valuable comments and suggestions. Editing by Bill Levine and Paula Hirschoff, and preliminary discussions with Ruben Nunez at Abt Associates in Washington D.C. are gratefully acknowledged.

91

ABSTRACT

Under The Regional Environmental and Natural Resource Management Project (RENARM), the U.S. Agency for International Development/Regional Office for Central Amercian Programs (USAID/ROCAP) funded country case studies of policies affecting the management of natural resources in Central America. This report presents the results of the Costa Rica Inventory.

Volume I is a summary of the results and conclusions of the Costa Rica Natural Resource Policy Inventory. Volume II is organized into seven chapters. Chapter 1 provides the scope and orientation of the inventory by dividing the analysis into five natural resource themes: sustainable agriculture, management of water resources, production from forests, management of wildlands, and management of coastal and marine resources and setting the criteria for selecting policies analyzed in the inventory. Costa Rica's soils, water, forest and coastal resources are also described. Chapter 2 analyzes how Costa Rica's natural resource policy framework has been and is shaped by macro policies and human ecological, institutional and cultural factors. Chapters 3 through 7 correspond to the five natural resource themes described in Chapter 1. In each chapter, two to four policy issues are identified. An issue is a problem in natural resources management that could be ameliorated by policy change. For each issue, the inventory presents the issue description, policy framework, institutional framework, issue analysis of what does and does not work, and policy gaps, alternative and a research agenda. In total, the inventory identified 15 policy issues and analyzed over 100 policies.

Volume III contains three technical appendices. Appendix A presents seventeen policy inventory tables that support the policy discussions of Chapters 3 through 7. Over forty public policies and laws are grouped into these seventeen major policy categories. Each table describes the major policies framing a policy category, its corresponding institutions, and evaluates its impact on the environment and natural resources and the economy. Appendix B briefly describes the characteristics and objectives of over twenty public sector institutions involved in Costa Rica's natural resource policy issues. Appendix C lists over 100 international, national, regional and local NGOs active with natural resource agendas in Costa Rica.

-92

ACRONYMS

ACORDE	Costa Rican Association for Development (Asociacion Costarricense para el Desarrollo)
ANAI	New Alchemists Society (Asociacion de las Nuevos Alquimistas)
AyA	Costa Rican Institute for Water and Sewer Systems (Instituto Costarricense de Acueductos y Alcantarillados)
BGS	British Geological Survey
BNCR	National Bank of Costa Rica (Banco Nacional de Costa Rica)
CAAR	Rural Aquaducts Administration Committee (Comite de Administracion de Acueductos Rurales)
CAC	Cantonal (County) Agricultural Center (Centro Agricola Cantonal)
CAF	Forestry Bond Certificate (Certificado de Abono Forestal)
CANEFOR	National Chamber of Forestry Businessmen (Camara Nacional de Empresarios Forestales)
CAT	Tax Bond Certificate (Certificado de Abono Tributario)
CATIE	Tropical Agronomy Teaching and Research Center (Centro Agronomico Tropical de Investigacion y Ensenanza)
CATSA	Tempisque Sugar Company (Compania Azucarera del Tempisque, S.A.)
CFIA	Federated College of Engineers and Architects (Colegio Federado de Ingenieros y Arquitectos)
CIALA	Interinstitutional Commission for the Water Law Preliminary Project (Comision Interinstitucional para el Anteproyecto de Ley de Aguas)
CIDA	Environmental Information and Documentation Center (Centro de Informacion y Documentacion Ambiental)
CIMAR	Center for Research in Marine Science and Limnology (Centro de Investigacion en Ciencias del Mar y Limnologia)

CINDE/ CAAP	Costa Rican Coalition of Development Incentives/ Private Agriculture Enterprises Coalition (Coalicion Costarricense de Iniciativas de Desarrollo/ Consejo Agropecuario Agroindustrial Privado)
CNFL	National Light and Power Company (Compania Nacional de Fureza y Luz)
CNHR	National Council for Water Resources (Consejo Nacional de Hidro-Recursos)
CNP	National Market Stabilization Board (Consejo Nacional de Produccion)
CODESA	Costa Rican Development Corporation (Corporacion Costarricense de Desarrollo)
CONAI	National Commission for Indigenous Affairs (Comision Nacional de Asuntos Indigenas)
CONICIT	National Science and Technology Research Council (Consejo Nacional de Investigaciones Cienctificas y Tecnologicas)
CPP	Priority Pilot Watershed (Cuenca Prioritaria Piloto)
DGF	National Forest Service (Direccion General Forestal)
DGMH	Bureau of Geology, Mines and Hydrocarbons (Direccion de Geologia, Minas e Hidrocarburos)
DSA	Environmental Sanitation Division (Direccion de Saneamiento Ambiental)
DSE	Office for Power and Fuel (Division Sectorial de Energia)
DVS	Division of Wildlife (Division de Vida Silvestre)
ECODES	Strategy for the Conservation and Sustainable Development of Costa Rica (Estrategia de Conservacion para el Desarrollo Sostenible de Costa Rica)
EEC	European Economic Community
EIA	Environmental Impact Assessment (Evaluacion del Impacto Ambiental)
EPA	Environmental Protection Agency

94

ESPH	Public Service Company of Heredia (Empresa de Servicios Publicos de Heredia)
FAO	Food and Agriculture Organization of the United Nations
FDF	Forestry Development Fund (Fondo de Desarrollo Forestal)
FODEA	Law for the Promotion of Agriculture and Livestock Development (Ley de Fomento del Desarrollo Agropecuario)
GEC	Executive Watershed Group (Grupo Ejecutivo de Cuencas)
GIS	Geographical Information System
GTZ	German International Technical Cooperation Agency
ICAITI	Central American Institute for Industry Research and Technolgoy (Instituto Centroamericano de Investigacion y Tecnologia Industrial)
ICE	Costa Rican Electricity Institute (Instituto Costarricense de Electricidad)
ICT	Costa Rican Tourism Institute (Instituto Costarricense de Turismo)
IDA	Agrarian Development Institute (Instituto de Desarrollo Agrario)
IDB	Interamerican Development Bank (Banco Interamericano de Desarrollo)
IFAM	Municipal Advisory and Development Institute (Instituto de Fomento y Asesoria Municipal)
IMN	National Metereological Institute (Instituto Metereologico Nacional)
INBio	National Institute for Biodiversity (Instituto Nacional de Biodiversity)
INCIENSA	Costa Rican Institute for Training and Research in Nutrition and Health (Instituto Costarricense de Investigacion y Ensenanza en Nutricion y Salud)
INVU	National Institute for Housing and Urbanization (Instituto Nacional de Vivienda y Urbanismo)
IPM	Integrated Pest Management (Manejo Integrado de Plagas)

ITCR	Costa Rican Institute of Technology (Instituto Tecnologico de Costa Rica)
IUCN	International Union for the Conservation of Nature and Natural Resources
JAPDEVA	Atlantic Port Administration and Economic Development Council (Junta de Administracion Portuaria y de Desarrollo Economico de la Vertiente Atlantica)
JASEC	Cartago Electric Services Administration Board (Junta Administradora de Servicios Electricos de Cartago)
MAG	Ministry of Agriculture and Livestock (Ministerio de Agricultura y Ganaderia)
MEIC	Ministry of Economy, Industry and Commerce (Ministerio de Economia, Industria y Comercio)
MICIT	Ministry of Science and Technology (Ministerio de Ciencia y Tecnologia)
MIDEPLAN	Ministry of National Planning and Economic Policy (Ministerio de Planificacion Nacional y Politica Economica)
MIRENEM	Ministry of Natural Resources, Energy and Mines (Ministerio de Recursos Naturales, Energia y Minas)
MOPT	Ministry of Public Works and Transportation (Ministerio de Obras Publicas y Transportes)
MS	Ministry of Health (Ministerio de Salud)
MTZ	Marine and Terrestrial Zone Zona Maritima-Terrestre
MV	Ministry of Housing (Ministerio de Vivienda)
NGO	Non-Governmental Organization
OPS	Panamerican Health Organization (Organizacion Panamericana de la Salud)
OTS	Organization for Tropical Studies (Organizacion para Estudios Tropicales)
PCZN	Northern Zone Consolidation Project (Proyecto de Consolidacion de la Zona Norte)
PID	Project Identification Document

PRMC	Regional Watershed Management Project (Proyecto Regional de Manejo de Cuencas)
PRONASA	National Environmental Health Program (Programa Nacional de Sanemiento Ambiental)
ROCAP	Regional Office for Central Amercian Programs
SENACSA	National Soil and Water Conservation Service (Servicio Nacional de Conservacion de Suelos y Aguas)
SENARA	National Service for Ground Water, Irrigation and Drainage (Servicio Nacional de Aguas Subterraneas, Riego y Avenemiento)
SEPSA	Executive Secretariate of Agriculture and Renewable Natural Resources Sector Planning (Secretaria Ejecutiva de Planificacion Sectorial de Desarrollo Agropecuario y de Recursos Naturales Renovables)
SERH	Executive Secretariat for Water Resources (Secretaria Ejecutiva de Recursos Hidricos)
SNE	National Electricity Service (Servicio Nacional de Electricidad)
SPN	National Parks Service (Servicio de Parques Nacionales)
STC	Technical Secretariat for Watersheds (Secretaria Tecnica de Cuencas)
SU	Users Societies (Sociedades de Usuarios)
TFAP	Tropical Forestry Action Plan (Plan de Accion Forestal Tropical)
TSC	Tropical Science Center (Centro Cientifico Tropical)
UCR	University of Costa Rica (Universidad de Costa Rica)
UNA	National University (Universidad Nacional)
UNED	State Correspondence University (Universidad Estatal a Distancia)
UNESCO	United Nations Educational Scientific and Cultural Organization
USAID	U.S. Agency for International Development

91

LIST OF MAPS

MAP 1: Physical Map of Costa Rica 4

MAP 2: Costa Rica's Watersheds 55

MAP 3: Costa Rica's Wildlands under Strict Protection 97

MAP 4: Costa Rica's Wildlands under Limited Protection 98

MAP 5: Proposed Conservation Areas 100

1. INTRODUCTION

This chapter provides an analytical framework for the policy inventory. It defines the main natural resource themes and the parameters for identifying critical policies. It also describes the state and rate of deterioration of Costa Rica's natural resources.

1.1 Scope and Orientation of the Analysis

This section defines the six natural resource themes relevant to Costa Rica that form the structure of the report. The methodology of the inventory, including the development of criteria for determining whether to include a policy, is also described.

1.1.1 Natural Resource Themes

The natural resources discussed in this inventory are the country's renewable resources. Natural resources defined on a micro scale include soils, water, plants, and animals. This policy inventory analyzes natural resources on a macro scale by organizing issues under the themes of sustainable agriculture, management of water resources, production from forests, management of wildlands, and management of coastal and marine resources. For each natural resource theme, policy issues are analyzed. In this inventory, an issue is a problem in natural resources management that could be ameliorated by policy change. Precise definitions of each natural resource theme follow.

Sustainable Agriculture. A production process associated with a given state of technology is sustainable if it maintains availability and quality of the resources that support the process. Sustainable agriculture ensures that the soil, water, and genetic resources used in farming practices are renewed at a rate that is sustainable over the long run, from both an environmental and economic perspective.

Production from Natural Forests. Production from natural forests refers to the extraction of raw timber from the forest and its subsequent transformation to marketable finished and semi-finished products. It also refers to the production of non-timber products, usually on a small scale, such as ornamental and medicinal plants, fish and game, and materials for artisanal industries. Continuous production of all these products depends on the development of sustained yield forest management techniques that prevent permanent damage to the forest resource base and its associated ecosystem components.

Management of Water Resources. Management of water resources deals with the optimal, integrated, and multiple use of water. It also entails the conservation of the quality and quantity of the water resource and the physical infrastructure, both natural and synthetic, used to capture and regulate the water flow. Proper use, pollution control and conservation require continuous evaluation and monitoring of the water resources. Thus, management of water resources also refers to civic, public, and institutional participation and responsibility in water resource use and conservation.

Management of Wildlands. Wildlands are lands in their natural state that

are relatively undisturbed by human beings. The purpose of protecting wildlands is to preserve their natural condition, thus providing benefits such as water, wildlife, medicinal plants, and beauty, as well as serving as a reservoir of genetic diversity. Wildlands management consists of planning and implementing policies and regulations to conserve their wild character. These policies and regulations include both macro-level administrative management and local or field level protection of the wildlands.

Coastal Resources. This theme deals with issues of coastal zone and marine resource management. Coastal areas in the tropics and subtropics are richly endowed with renewable resources such as fisheries and mangroves, as well as recreational resources such as waters, beaches, and shorelands. Coastal zone management connects coastal environmental systems with private sector economic activities and public services in coastal zones. Physically, it refers to areas which extend from the ocean environment across the transitional shore environments to some inland limit.

It is important to note that the five themes concentrate on rural rather than urban issues. Thus, problems such as air pollution, urban migration and population pressures on city resources, and inadequate sewage treatment facilities are only briefly mentioned. These urban problems are relevant to this discussion only to the extent that they affect the issues defined under the five natural resource themes.

1.1.2 Criteria for Selecting Policies

Policies are defined as rules or norms that influence human behavior. This very general definition covers not only legislation or formal written policies of governments, but also policies emanating from the private sector and from a society's culturally determined beliefs and practices. The latter two sources of policies are the dominant factors affecting the management of natural resources when government policies or laws do not exist or are not effectively implemented.

Under this definition, a wide range of policies affects a country's natural resource management. Criteria must be developed to focus on the key issues and the policies corresponding to those issues. Based on the team's expertise and information collected from documents and interviews, between two and four issues are developed for each natural resource theme. An issue is a problem in natural resource management that could be ameliorated by policy change. The issues identified are considered the most critical for long-term sustainable management of the resources included under that theme. Thus, the criteria for selecting issues focus on the natural resource base rather than on economic growth considerations.

Next, the most significant policies regulating the management of resources as defined under a particular issue are identified. The criteria for selecting the most significant policies under each issue focus on the degree of compatibility between policy objectives for economic growth and long run sustainability of the resource base. Those policies with the greatest compatibility or conflict receive highest priority.

100

Using this methodology, the inventory identifies those critical issues that can be affected by policy change, focuses the analysis on the policies or policy voids having the greatest impact on the economy and natural resource base, and suggests policy alternatives which could diminish differences between economic and conservation objectives.

1.2 An Overview of Costa Rica's Environment

This section briefly discusses the current state of Costa Rica's natural resources. It describes the physical, climatic, ecological, and biological diversity of the country and discusses the implications on the formulation of policies designed to promote sustainable resource management.

1.2.1 Physical Diversity

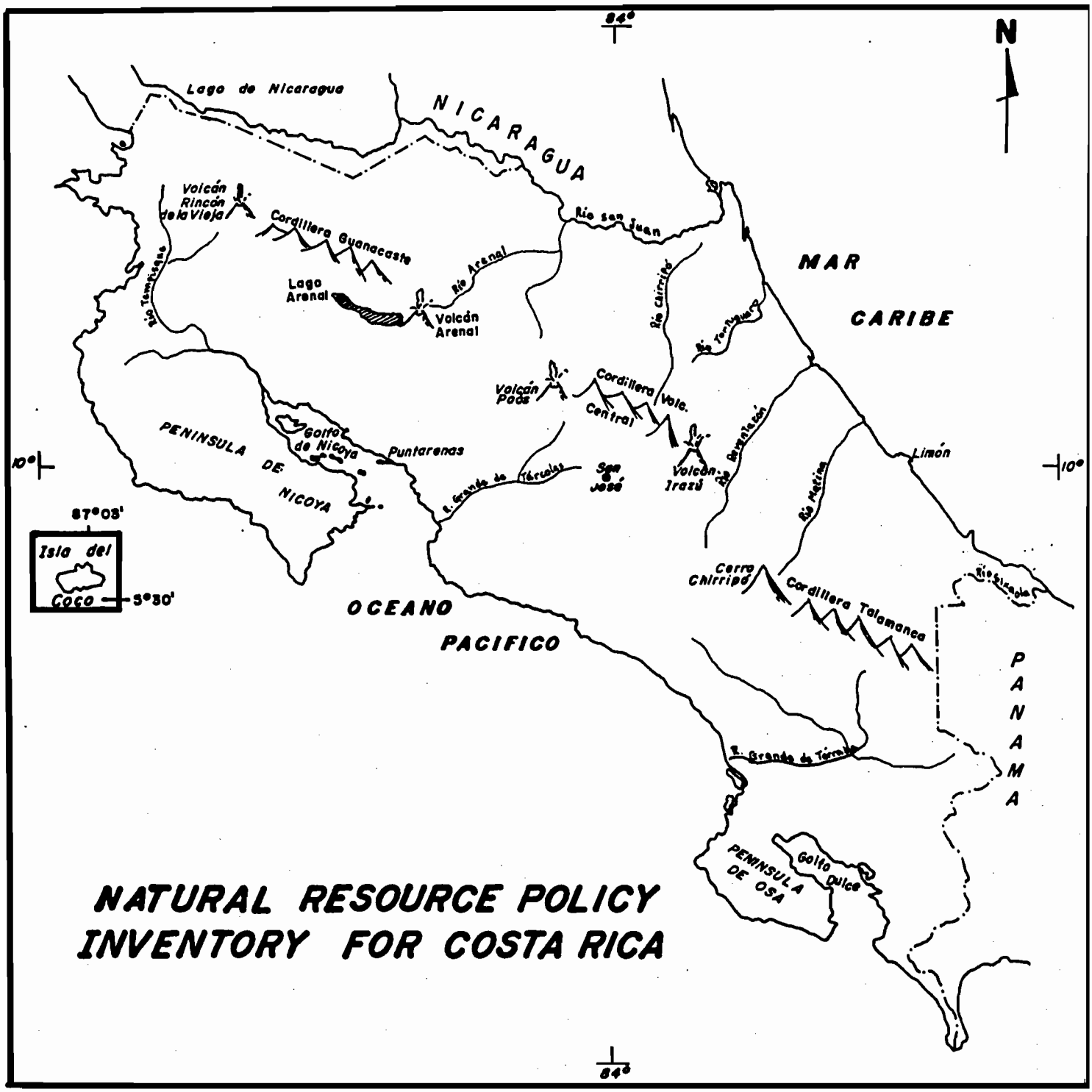
With an area of 51,000 km2, Costa Rica is the second smallest republic in Central America, bordered by Nicaragua on the north, Panama on the south, the Pacific Ocean on the west, and the Atlantic Ocean on the east (MAP 1). No point in Costa Rica lies more that 80 km from a major body of water. Costa Rica's only oceanic island, Cocos Island, with an area of 28 km2, is located in the Pacific. The Pacific coast exhibits a mix of long beaches, rock headlands, peninsulas, bays, and estuaries. Four peninsulas, Santa Elena, Burica, Nicoya, and Osa distinguish the Pacific coast. The latter two peninsulas, which shelter the deep water gulfs of Nicoya and Golfo Dulce, are comprised of low rugged hills that confine flatlands to peripheral plains and short narrow river valleys. Extensive mangroves are found on the deltas of major rivers draining into the Pacific. In contrast, the 118 km of the Atlantic coastline is less diverse, consisting mainly of deltas, canals, alluvial plains, and freshwater swamps fronted by long barrier beaches.

Three main mountain ranges, Cordillera de Guanacaste, Cordillera Central and Cordillera de Talamanca, running northwest-southeast divide the national territory. The Cordillera de Guanacaste in the northwest consists of five volcanic massifs, with Volcano Miravalles the highest at 2020 m. Roads can easily cross the 300-500 m passes in the Cordillera de Guanacaste. Extensive lowlands extend from the Cordillera de Guanacaste foothills to the Caribbean coast, covering about 20 percent of the country. Nearly two-thirds of these lowlands are drained by rivers flowing north to Lake Nicaragua and its Caribbean outlet, the Rio San Juan.

The Cordillera Central consists of four volcanic massifs, ranging from Poas at 2705 m to Irazu at 3432 m. The 1500-2000 m passes in the Cordillera Central are significant barriers for major highway crossings. The Central Valley, bordered by the Cordillera Central to the north and Cordillera de Talamamca to the south, is densely populated and agriculturally productive. It includes the capital, San Jose, and three provincial capitals. Waters flow into the Rio Grande de Tarcoles to the west and the Rio Reventazon to the east.

MAP 1:

Physical Map of Costa Rica



The Cordillera de Talamanca, formed from tertiary marine sedimentary rocks and small volcanos, reaches nearly to the Atlantic coast. The only significant lowlands in this area occur along the rivers that flow directly to the Caribbean. The two main valleys in southern Costa Rica, El General and Coto Brus, are less important agriculturally than the Central Valley, largely because of the absence of recent volcanic soils.

The Pacific lowlands almost disappear south of Punta Leona due to the proximity of coastal hills. North of Puntarenas, they widen and merge with the broad Tempisque valley.

1.2.2 Climatic Diversity

Costa Rica lies within the tropical latitudinal region. With an average of 3300 mm of rainfall per year, it is one of the wettest countries in the world. There are two main rainfall regimes. The Pacific regime has a predictable pattern of heavy rains between late April or early May and mid-November and a pronounced dry season between December and April. The Atlantic regime also is characterized by this pattern as well as a secondary pattern related to the subtropical high pressure belt in the northern hemisphere which spreads southward over the country during the dry season. During this period of generally lower air temperatures and clean, dry air, there are strong easterly trade winds. These winds pick up appreciable moisture as they pass over the Caribbean Sea. These winds are wedged up by the mountain ranges, bringing rainfall to the Caribbean coastal plain and eastern mountain exposures during this normally dry period. The two rainfall regimes result in drier than average conditions for two major areas of the country: the northern Pacific lowlands and the Central Valley.

The country's altitudinal and coastal characteristics generate a wide climatic diversity. Mean monthly air temperatures range from 26oC and 27oC on the Atlantic and Pacific coasts, respectively, to 4.5oC on Mount Cirripo, the highest elevation.

1.2.3 Ecological and Biological Diversity

The interrelation of geographic, physical, and climatic factors within a relatively small area has created a wide variety of environments. Studies indicate that over half a million species, equivalent to seven percent of the known biodiversity of the planet, are found in Costa Rica (Gamez, 1990). Based on the Holdridge classification system, Costa Rica has 12 distinct ecological life zones, each with impressive biodiversity. Two life zones, tropical moist forest and tropical wet forest, cover almost 50 percent of the country. The tropical subalpine rain paramo life zone, covering 0.2 percent of the country, is the only life zone in Costa Rica naturally without forest cover. The ecologically diverse area supports a wide variety of organisms: 848 species of birds, 205 mammals, 218 reptiles, 160 amphibians, 130 freshwater fish, and about 9,000 plants. Eleven bird species and 16 mammal species are officially endangered.

Approximately 11 percent of Costa Rica's territory is under strict protection that prohibits any extraction of resources. National parks, biological reserves, national monuments, strict natural reserves, and wildlife

refuges fall within this category. Forest reserves and protective zones comprise another 10.2 percent of the national territory. Within these areas, extraction of resources is permitted under certain conditions. There are also indigenous reserves dedicated to the conservation of indigenous cultures and their environments.

Comparisons of the locations of biological resources with the sites of protected areas demonstrate that the protected areas are not optimally located to preserve the country's biodiversity. The Fundacion Neotropica ("Evaluacion de la Conservacion de los Recursos Biologico," 1988) states that 17 of the 53 vegetation types in Costa Rica are not represented inside strictly protected areas, and eight have absolutely no protection; 14 percent of strictly protected wildland is disturbed by some type of land use, most notably agriculture; of 760 records on the location of important species, only 24.7 percent occur in strictly protected areas.

1.2.4 The Natural Resources

Soils. Six major categories of soils are found in Costa Rica: organic, volcanic, alluvial, fluvial-lacustral, colluvial-alluvial, and residuals.

The organic soils, which cover 186 km2, or less than one percent of the country, are found in small areas in the northern and Atlantic humid tropical zones. They occasionally can be used for pasture.

Alluvial soils, covering 9150 km2 (17.9 percent) of Costa Rica's territory, are found in the Pacific, Atlantic, and northern zones. In the Northern Pacific and Central zones, these soils are excellent for agriculture and appropriate for all types of cultivation but require irrigation to achieve optimal productivity. Alluvial soils in the Southern Pacific and Atlantic zones are generally good for agriculture and adaptable to a variety of crops suited to a warm humid climate, but they require drainage. These soils in the Northern Zone, between the rivers Reventazon and Sarapiqui are very productive and appropriate for all crops suited to the region. In the flat areas surrounding the San Juan River and Lake Nicaragua, heavy alluvial soils with poor drainage can occasionally be used for pasture, and with some drainage, for agricultural production.

Volcanic soils, representing 15.2 percent or 7775 km2 of the national territory, are distributed across the Guanacaste and Central mountain ranges, the Central Valley and the Coto Brus Zone. Because these soils are generally porous and deep and retain water well, they support a wide variety of vegetation. However, in areas with steep terrain and high rainfall throughout the year they are highly susceptible to erosion. Protected cropping systems, agroforestry, and cultivation of permanent crops are the most appropriate agricultural uses for these soils under adverse conditions of climate and terrain. In contrast, when found in areas with dry seasons such as the Central Valley, the Guanacaste mountain range, and parts of the Cordillera Central, these soils are very productive and appropriate for a wide variety of crops, including annual and permanent crops such as coffee, sugar, and fruit.

Fluvial-lacustral soils are found on only 800 km2 or 1.5 percent of the national territory. These soils are very fertile and productive but difficult

104

to manage, because they require drainage and irrigation for agricultural production.

Colluvial-alluvial soils cover 8.8 percent of Costa Rica. In the Northern and Atlantic zones, they have low natural fertility and low productive capacity because of the hot climate and strong rains. These soils in the Valle de General, which are considered to be the oldest soils in Costa Rica, also have low fertility and productive capacity because of their age. In the northern and central areas of the Pacific Zone, these soils are more fertile due to moderate rainfall. In the Central Valley, these soils have good productive capacity.

Residual soils cover roughly 55 percent of Costa Rica. They vary in composition, depth, and fertility, but, in general, they are difficult to work and exhibit low productivity.

Actual Land Use and Land Use Capability. Preliminary analysis of actual land use and land use capability reveals two major, critical land use problems in Costa Rica: the conversion of forest to pasture on steep and excessively humid land which is incapable of sustaining this use, and the underutilization of large areas of potentially productive cropland for extensive pasture. This analysis is based on comparison of actual land use with a generalized soil map, using data collected for five land use-capability categories and eight erosion risk classes. (Hartshorn, et al., 1982). Disagreement among professionals regarding how to classify land for land use capability complicates the issue.

Table 1

LAND USE CAPABILITY AND ACTUAL LAND USE

	Land Use Capability(*)		Actual Land Use(**)	
	Km2	%	Km2	%
Annual Crops	9,437	19	1,998	4
Perennial Crops	8,158	16	3,254	6
Pastures	4,656	9	22,290	44
Forest Production	16,088	32	22,334	44
Forest Protection	12,417	24		
Other Uses			881	2
TOTAL	50,757	100	50,757	100

(*) Source for land use capability: Hartshorn, et al. (1982)
(**) Source for actual land use: SEPSA, DOC-SEPSA 107, El Sector Agropecuario, 1986. Taken from Rodriguez (1989).

105

Soil Erosion. The adverse consequences of inappropriate land use are severe because over 78 percent of Costa Rica's soils are moderately to extremely susceptible to erosion. In 1985, more than 40 percent of the soils were subject to some degree of erosion (Rodriguez, 1989). Table 2 illustrates the degree of susceptibility to soil erosion for specific land use capability categories.

Table 2

SOIL EROSION RISK
(hectares)

Soil Risk (hectares)	Land Use Capability Category: Clean-tilled Crops	Pasture	Permanent Crops	Forestry	Protection
Very low or nil (12,076)	7,290	1,021	110	2,955	700
Moderate (6,835)	2,147	430	429	3,829	0
High to very high (16,839)	0	3,205	7,619	6,015	0
Extremely high (15,080)	0	0	0	3,289	11,791
ALL LAND (50,830)	9,437	4,656	8,153	16,088	12,491

Source: Hartshorn, et al., Costa Rica: Country Environmental Profile, 1982.

Recent estimates of actual soil erosion suggest 17 percent of the country is severely eroded and 24 percent, moderately eroded. The Pacific side of Costa Rica is seriously eroded while the flat plains and remaining primary forest suffer little. Eighty percent of annual soil loss is caused by overgrazing on lands used for pasture. Rapid urbanization in the Central Valley aggravates the situation by using some of the country's best agricultural soils (Hartshorn, et al., 1982).

Following the "colonization" phase of economic development and amid growing pressure on fragile soils in the Pacific and Central areas of Costa Rica, the "frontier" has shifted to the tropical lowland rain forest in the north Atlantic area, the steep slopes of the main mountain ranges, and the Osa Peninsula. These areas will require an intense coordinated effort to preserve the natural resource

base and to achieve a reasonable, stable balance between sustainable agriculture on converted lands and conservation of existing rain forest (Sanchez, 1988).

The technology to achieve these goals exists; the key is an integrated approach consisting of 1) development, application, and sustainable management of technologies for tropical soils and 2) appropriate government policies to discourage further deforestation. Deforestation can be reduced by the widespread adoption of sustainable management practices that permit the use of cleared land on an indefinite basis.

Most of the options are based on low-input systems that serve as transition technology for other options such as agroforestry systems, legume-based pastures, continuous crop rotations, and options developed in humid tropical Asia and Africa, including paddy rice, perennial crop production, and forest plantations. Although additional research is needed, there is no question that the technology is available now for sustainable management of acid soils in the humid tropics.

For every hectare that farmers devote to these sustainable soil management technologies, five to ten hectares of tropical rainforest per year could be saved. The higher productivity of the better managed land means that less land will have to be cultivated (Sanchez, 1988).

Water. Costa Rica's rugged topography and high rainfall provides an incredible wealth of water resources, estimated at 9 million Kw of hydroelectric potential (ECODES, 1990) and 130 cubic kilometers per year of runoff in only 51,000 km2 of area (Losilla, 1983). Approximately 36 percent is groundwater flow and the remainder is surface runoff (Losilla, 1986a). Officially, the country is divided into 34 watersheds, ranging from 207 to 5,080 km2.

Although water is abundant, its distribution is subject to significant seasonal and spatial variations. In the low Pacific and Atlantic Versant regions, excess water causes flooding, while in the Central Valley and Dry Pacific Region, the resource is relatively scarce during the four- to six-month dry season.

Water resources play an important role in Costa Rica's economy, public welfare, and health. The main uses of water are hydroelectric power, human consumption, industry, and irrigation. River navigation is not important because of the steep river gradations, fluctuating river flows, uneven distribution of rivers, and the well-developed road infrastructure.

Approximately 8.5 percent of the country's estimated hydroelectrical potential of the country is being used; however, by the year 2020 all this potential power will be exhausted, assuming the present demand and no generating losses by siltation of dams (ECODES, 1990).

Groundwater (wells and springs) satisfies over 70 percent of total national demand for potable water, and about half of the public and industrial demand for water is in the Central Valley (Losilla, 1986). Although the water supply is ample to meet current demand for potable water, the waste of water and the seasonal fluctuation in some water systems, especially from the harnessing of surface water, often cause water shortages.

The country has about 1,469 potable water systems (PWS) under three different types of administration: 125 PWS administered by AyA, 44 PWS administered by municipalities, and 1300 PWSs administered by the Rural Aqueduct Administration Committees (CAAR). All three types of aqueducts are operated and maintained downstream, starting from the location of the water harnessing. Traditionally the management of the tributary watershed or recharge area is not included as part of a potable water system. Many communities are concerned about the quality of their water and take some protective and conservation measures around the river intake or spring capture area (PID for Community Watershed Management Project, 1990).

About 25,0000 ha in the country potentially need irrigation, and only 20,000 ha have some irrigation. Plans are underway to increase this area by 12,000 hectares in the near future (Castillo, personal communications 1990). National Service for Ground Water, Irrigation and Drainage (SENARA), Users Societies, and private farmers administer the irrigation projects. In general, irrigation efficiency is minimal because of poor irrigation practices and lack of soil and water management information. Up to 80 percent of the water used is wasted through deep percolation and surface runoff (Castillo, personal communications 1990). Irrigation takes place mainly in the Dry Pacific, Central Pacific, and Central Valley zones which have a dry season. Irrigation is beginning to compete with residential, industrial, and hydroelectric needs for available water.

Water quality has deteriorated and base flow diminished with the growth in the economy and the population over the last 15 years. Deforestation and watershed deterioration have been caused by urban expansion, extensive cattle grazing, cultivation of hillsides, industrial production, and poor mining practices. National institutions have assigned priority for conservation and management to 10 watersheds, covering about 36 percent of the national territory ("Cuencas Prioritarias," 1988).

As a consequence, competition for water among public institutions and private enterprises and demand for effective management of the water resources has increased. For instance, the current use of the Pacuare River for white water tourism conflicts with ICE's proposal to build a hydroelectric dam. Environmental impact and watershed management studies will be conducted before further action is taken.

These conflicts are more intense in the Central Valley where dense population and scarce water resources during the dry season place particularly high demands on the Virilla River, the natural drain for the Central Valley, and its downstream partner, the Grande de Tarcoles River. The diluting capacity of the Virilla River, despite its great natural recuperating capacity, is practically saturated. The urban effluent in the Central Valley, particularly liquid effluent from the coffee industry, is not treated before entering the river. This pollution is intensified during the dry season when the river has very little diluting capacity.

Forests. Over 99 percent of Costa Rica was originally covered with natural forests. The structure and composition of the forests directly reflects the climate that surrounds them. Tropical wet and tropical moist zones, as

108

exemplified in the northern plains, the Atlantic region, and the Osa Peninsula support tall, dense forest with high diversity of species. Drier climates like that of Guanacaste support forest which is relatively less dense, shorter, and less complex in its composition. Cooler climates incident to increasing altitude give rise to dense forests which are shorter and less diverse than those at lower elevations. The highest elevations are covered by cloud forest - masses of contorted, intertwined trunks of a handful of species of trees, nearly buried in epiphytes, and only a few meters tall.

Each type of forest exhibits unique composition of plant species, distinct from each other type of forest. Relatively few tree species are found in more than one type of forest. Just as plant communities differ from one type of forest to another so do the animal communities that inhabit the forests.

Over time, most of Costa Rica's forests have been cleared and the land used for other purposes, primarily agriculture and grazing. Deforestation proceeded especially rapidly between 1950, when forests still covered over 60 percent of Costa Rica, and 1977, when forest cover had been reduced to an estimated 31 percent of the country (Hartshorn, et al., 1982). Most of the forest that remains today occurs in remote areas at high elevations. Some of this forest lies in national parks and other protected areas and benefits from effective protection. About half of the remaining forest, however, occurs on private lands or on public lands available for timber removal.

Costa Rica's forests have sustained an important national timber industry that provides wood for construction, for furniture, and for export. Historically this industry has used very few of the total number of tree species available, concentrating production in the few most valuable woods like mahogany, cedar, pochote, and laurel. As the availability of uncut natural forest declines in Costa Rica, it will engender several changes in the national forest situation. More wood will come from species of lower commercial value that formerly went unused, from farms instead of forests (Costa Rica's farmers have a long tradition of husbanding trees like alder that sprout naturally in their fields and pastures) and from planted trees like the cypress that is so conspicuous on the upper slopes of the central mountains. Second growth forests, many on land that was cleared for pasture and is going out of production because of low cattle yields and a shift away from cattle raising, will also become important, both for wood supply and to provide other benefits like watershed protection.

Coasts. Costa Rica has 1,397 km of coastline: 1,164 km on the Pacific and 215 km on the Atlantic. Compared to the Atlantic, the Pacific coast has greater tides, rocky headlands, sandy beaches, deepwater bays and major estuaries. Both coasts have mangroves, but they are much more extensive on the Pacific coast. The largest coral reef is located at Punta Cahuita on the southern Atlantic coast. Coastal areas encompass some 62 urban centers, including six coastal cities. Five percent of the population lives within 5 km of a coast.

The coastal zones have not been protected from uncontrolled development. Embayments and near-shore waters are badly contaminated with stream-borne agricultural chemicals, solid and liquid industrial and urban wastes, and mine and soil sediments originating inland. Nearly all mangroves and other coastal wetlands are degraded by continuous overcutting, while pollution, landfills, and

agricultural draining destroy necessary habitat for wildlife, mollusks, and the reproductive cycle of commercial saltwater fish. Beaches and coral reefs suffer massive plastic waste deposits, illegal harvesting of turtle eggs and shellfish, contamination from the excrement of domestic livestock, and mining of mineralized sands and shells. Uncontrolled development for tourism and second homes, cattle ranching, and subsistence cultivation wreak havoc on the scenic value of shorelines, beach property, and rock promontories.

110

2. THE POLICY ENVIRONMENT

2.1 Introduction

In Costa Rica, the relationship between government policies and natural resource degradation is clear and direct: Many of the regulatory policies established to curtail resource degradation have been ineffective. Furthermore, numerous public policies have inadvertently encouraged natural resource degradation. This section will discuss the context in which resource management policies are made in Costa Rica. It will attempt to identify general socioeconomic conditions and formal institutional arrangements that (1) affect patterns of natural resource use; and (2) influence the formulation and implementation of resource management policies.

During the course of this policy inventory, interviewees identified a number of broad contextual factors which act as obstacles to the making or implementation of sound resource management policies. Four general classes of socio-economic factors were consistently identified as problematic:

- Changes in the size and distribution of the population that affect patterns of human settlement and resource use;
- General economic conditions that influence the character and intensity of resource use as well as the fiscal soundness of regulatory institutions;
- Formal institutional arrangements, including laws, regulations, management practices, technical capabilities, and budgetary constraints affecting the capabilities of regulatory agencies; and
- Cultural factors influencing the attitudes and behavior of resource users and policymakers.

Each of these broad sets of conditions will be discussed in general terms in this section. Wherever pertinent, specific public policies and regulatory agencies will be discussed in greater detail in the technical sections that follow.

2.2 Human Ecological Factors

Until recent decades, Costa Rica has always been characterized by a comparatively small population and an open agricultural frontier. Throughout much of the nation's history, the availability of frontier lands for homesteading served as the principal solution to many of the country's social and economic problems. However, in the last 25 years, that frontier has gradually closed. All the land is now claimed by private owners or the national government. Moreover, regardless of ownership, the unoccupied lands are not suitable for sustained agricultural or pastural use. Nonetheless, migration continues. In fact, the rate of internal migration is higher now than at any point in Costa

Rica's history. Although urban areas absorb much of this internal migration, a substantial portion of the migrant population has in recent years moved into the nation's protected areas. Unfortunately, this process is being exacerbated by government policy, insofar as the Instituto de Desarrollo Agrario (IDA), created to deal with the landless, recognizes that squatters have implicit rights. One such right is indemnification for "improvements," if evicted. Improvements here almost always mean clearing forests. In effect, IDA's procedures have created incentives for "professional" squatters to move from parcel to parcel, which often are marginal lands. The result is deforestation, erosion and destruction of wildlife habitat. IDA's statistics illustrate the magnitude of this problem: over 380,000 hectares of marginal lands have been allocated for "settlement" while another quarter of a million hectares remain in squatters' hands (Nelson, 1988).

Costa Rica's population has reached 2.9 million. The annual growth rate of 2.67 percent (National Census, 1984) is the result of: (1) a moderately high fertility rate (3.6 children per woman); (2) the age structure of the population (a high percentage is or will soon be of child bearing age); and (3) a low death rate. At current growth rates, the population is expected to double in 24 years (Asociacion Demografica Costarricense).

Even the most conservative projections of population growth imply significant increases in the demand on the nation's economic and natural resource base over the next few decades. Three related issues are of particular concern: (1) the growing problem of landlessness, which has contributed to the colonization of large areas that are not considered suitable for sustained agricultural or pastoral use; (2) expanded urbanization pressures in the Central Valley, where prime agricultural production acreage is giving way to housing, thereby forcing farmers to increasingly marginal lands; and (3) increased demand for education, health care, and other public services during an era characterized by a chronic government fiscal crisis. Unless increases in government revenues can keep pace with the demand for public services--which is unlikely to occur--the agencies charged with regulating natural resource use will probably find themselves in escalating competition for public funds with those that provide essential public services.

A number of developments in Costa Rica's land use geography have exacerbated the impact of population growth on resource degradation. First has been the long-term shift to less labor-intensive systems of agricultural or pastoral production, the most notable examples being (1) the expansion of Costa Rica's cattle industry from the 1950s until well into the 1980s and (2) the large-scale shift from banana cultivation to the production of African oil palm in the province of Puntarenas during the mid-1980's. The production of both cattle and African oil palm requires intensive labor to clear the land and plant pasture or trees. However, once land preparation and planting are completed, neither enterprise requires much labor. Consequently, after production is established, regions that specialize in cattle or palm oil are characterized by high rates of outmigration. Many of these emigrants make their way to the capital city or the forested public reserves. The cattle industry is also associated with the concentration of land ownership, which exacerbates the growing problem of landlessness.

112

From 1950 to 1984, the date of the last agricultural census, the conversion of forest to pasture was by far the principal cause of deforestation in Costa Rica (Censo Agropecuario, 1950, 1955, 1963, 1973 and 1984). This process was greatly exacerbated, first by the government's aggressive road building programs which opened large tracts of forested areas, and subsequently by availability of credit to cattle interests on very concessionary terms. Perhaps as much as two million hectares of forested lands passed into the hands of these interests between 1960 and 1980 (Nelson, 1988).

Since 1984 there has been much uncertainty regarding trends in land use. Considerable amounts of pasture reportedly have been abandoned in recent years due to low beef prices and the reduction of government subsidies for the cattle industry. One recently published source estimates that as much as 600,000 ha of pasture has been left fallow and is gradually reverting to second growth forest ("Plan de Accion Forestal," 1990, p. 6). However, neither that estimate nor any similar speculation is based on credible data.

It is also worth noting that the decline in banana production has been reversed since the mid-1980s; the area dedicated to banana cultivation is also being expanded, at least in the Atlantic region. To date, however, the expansion does not appear to have measurably affected labor markets in the Pacific littoral where the aforementioned development has had a dramatic impact on migration into the Osa Peninsula and the Amistad Biosphere Reserve.

Yet another factor contributing to inappropriate land use patterns has been the expansion of the San Jose metropolitan area, which has been associated with large-scale conversion of prime agricultural land to commercial or residential use in the Central Valley. At current rates of urbanization, it is estimated that 28,000 ha of land will be converted to urban use over the next 35 years (Asociacion Demografica Costarricense). Included in the conversion will be class I agricultural lands--well-drained volcanic soils that in the past were largely dedicated to commercial coffee production. Increasingly, agricultural activities are being displaced to outlying regions, many of which are less suited to sustained cultivation than the Central Valley lands. As stated above, Costa Rica's population growth has been one of the prime causes of urban expansion with concomitant pressures on water resources, nonpoint pollution, and industrial waste disposal.

2.3 Economic Factors

2.3.1 Historical Perspective

For conceptual purposes, the economic history of Costa Rica over the past 30 years can be divided into three broad phases, each characterized by a distinctive strategy of national economic development, and each introducing a new set of problems for Costa Rica's natural resource management:

- 1960-73, a period characterized by a policy of sustained import substitution;
- 1973-79, a period noted for continuation of the import substitution

- 113

model, but in the context of dramatically increased government intervention in the economy in the form of price controls, subsidies, and an expanded state industrial conglomerate;

- 1980-90, a period of economic crisis, structural adjustment, and fiscal retrenchment.

Between 1950 and 1979 the Costa Rican economy experienced a sustained rate of growth. During this period productivity increased at an average annual rate of 6.7 percent, with per capita productivity growing at an average of 3.3 percent per year, and per capita consumption rising at 2.9 percent per year. Throughout this period of prosperity, real wages rose and enough new jobs were created to adequately absorb new entries into the labor force. Unemployment remained below 6 percent and the middle class grew markedly. The percentage of national income going to middle income groups rose from 34 percent in 1961 to 44 percent in 1983. This growth was achieved largely without stimulating excessive inflation; the average annual inflation rate remained below 5 percent throughout this extended period.

Sustained Import Substitution. During the 1960s and 1970s, successive administrations pursued a general policy of sustained import substitution. The principal features of these programs were: (1) efforts to stimulate the development of traditional export commodities; (2) growth of the industrial sector based on the expansion of the Central American common market; (3) government initiatives to develop the infrastructure necessary to diversify and modernize productivity; and (4) borrowing abroad to finance increased imports of inputs for industry and agriculture (Trejos, 1987). The price of both industrialization and improvement in the standard of living was increased foreign debt.

This period was characterized by modernization of traditional agriculture, largely through increased agrochemical inputs and the introduction of improved varieties. In 1963 only 17 percent of Costa Rican farms used fertilizers; by 1973, 50 percent (of what was by then a larger number of farms) did so. Problems of agrochemical runoff and pesticide contamination largely date from this time. The period also witnessed a sustained effort to increase beef production, not so much by raising productivity per unit of land, as by bringing more land into production and converting forest to pasture. Between 1950 and 1963 the total area dedicated to agriculture increased by 47 percent. Very little of this increase was in cropland; most was in new pastures. The expansion of pasture was particularly notable during the early 1970s, when ranchers enjoyed high prices and credit subsidies. Although the massive conversion of forest to pasture was associated with a temporal increase in domestic production as measured in the national income accounts, this development brought about a long-term decline in the total productivity of the altered ecosystems (World Resources Institute/Tropical Science Center, forthcoming). According to the National Forest Service (DGF), only 5.3 percent of Costa Rica's national territory is considered suitable for sustained pasture management. Nonetheless, by 1984 fully 49 percent of the country had been converted to pasture.

As noted above, the expansion of cattle production displaced a substantial portion of the rural population, causing migration to both forested areas and to

114

the cities where the push to industrialize created new job opportunities. Urbanization exacerbated local problems of solid waste disposal. Industrialization without the benefit of environmental regulation also contributed to water pollution, particularly in the rivers of the Central Valley and the Gulf of Nicoya near the city of Puntarenas.

Economic Instability and the Move Toward a Planned Economy, 1973-79. Over the long term, import substitution programs were accompanied by a gradual increase in the size and scope of government activities. From 1950 to 1980 the government grew faster than any other sector of the economy. In 1950 government expenditures accounted for 5.38 percent of the gross national product; by 1980 they had risen to 15.19 percent of GNP. The expansion of the national government, in terms of both size and scope of activity, was especially notable between the oil crises of 1973 and 1979. This period was characterized by the expansion of regulatory agencies and state enterprises and growing government intervention in the economy through price controls (on gasoline and basic foodstuffs) and subsidies (for industry, cattle, and basic grains). Moreover, it was during this period that the Costa Rican Development Corporation (CODESA), a state-owned conglomerate, moved aggressively to nationalize a broad range of industrial and service enterprises. The growth of CODESA marked a change in planning philosophy from government promotion and guidance of development to government entrepreneurship on a large scale.

The dramatic expansion of Costa Rica's system of national parks and reserves also dates from this period. Part of a much broader move to establish regulatory control over activities formerly beyond the purview of public officials, was a move to bring large tracts of public reserve land nominally owned by government under regulatory control. Many lands that were declared reserves were areas of active colonization. Because regulatory agencies typically lacked sufficient funds to purchase nationalized lands from their occupants or to adequately patrol the newly created reserves, those management problems remained unresolved.

The changing circumstances of the 1970s contributed to progressively more serious problems with the import substitution model. Public expenditures continued to rise throughout the decade. Furthermore, new developments in the international economy, particularly the disintegration of the Central American Common Market and the oil crises of 1973 and 1979, were associated with sharply deteriorating terms of trade and increasingly serious domestic financial problems. The 1973 oil crisis caused the rate of inflation to rise from 2 percent (in 1972) to 31 percent in 1974. Although robust coffee and banana prices in the mid-1970s helped to temporarily control inflation, these problems returned with a vengeance in 1979, when the price of imported oil rose sharply and that of coffee fell. As the terms of trade deteriorated, government revenues, heavily dependent upon import and export duties, also fell. To sustain current expenditures, the Carazo administration borrowed heavily abroad. During this period the foreign indebtedness that was to become a principal obstacle to future economic growth emerged as a problem.

The trends in natural resource use and degradation continued in the 1970s. Encouraged by generous credit subsidies through the national banking system, settlers and ranchers continued to convert forest to pasture throughout the

-115-

decade. By this time, virtually all of the land thought to be suitable for sustained pastoral use was already in pasture. Thus, most of the pasture expansion of this period was on less desirable land. MAG estimated that by 1976 some 400,000 ha of pasture was on land that could not sustain that use. This situation increasingly led to diminishing returns on investment and the inability of ranchers to pay their debts. During this period, problems of air and water pollution and solid waste disposal increased as a result of continued unplanned urban growth and unregulated industrialization.

Economic Crisis and Fiscal Retrenchment, 1980-90. During the first half of the 1980s, the principal economic indicators showed a dramatic deterioration of the country's economic performance. Per capita domestic product fell, reaching a point in 1982 lower than that reported for 1972. The 1980s were characterized by a seemingly intractable government fiscal crisis and a continuous cycle of negotiations between the government of Costa Rica and multilateral lenders over the terms of the foreign debt. Each new round of debt negotiations brought renewed pressures to: (1) introduce a combination of cost cutting and revenue generating measures designed to bring government expenditures in line with revenue; and (2) increase hard currency export earnings by devaluing the colon and introducing programs to promote non-traditional exports. During the Monge and Arias administrations there was a hesitant, gradual, and incomplete shift away from the state-building philosophy of the 1970s. By 1987, after two rounds of negotiations with multilateral lenders, the debt had reached a point where interest payments were equal to 50 percent of national savings and the total cost of servicing the debt was equal to 40 percent of the value of all goods and services exported.

At present, the principal indicators of employment and production are reasonably robust. Nonetheless, long-term economic performance is still hampered by persistent problems of an intractable public deficit and a chronically negative balance of payments. These problems have been compounded by the recent decline in coffee prices which followed the collapse of the international coffee agreement and the elimination of taxes on coffee exports during the last days of the Arias administration. The current inability to bring public expenditures in line with revenues is primarily the result of: (1) binding arbitration that constrains the government's ability to limit wage increases for public employees; (2) an unsustainably generous pension system for public employees; and (3) the elimination of the export duty on coffee.

The current administration has yet to define its economic policies in detail. Nonetheless, the new Government is presently pursuing an energetic program of structural adjustment and fiscal reform which has as its main elements: (1) significant reduction of the public deficit within the first 18 months of the current administration through a combination of cost cutting and revenue generating measures; (2) immediate negotiation of a short-term agreement with the International Monetary Fund so as to reactivate the flow of foreign credit; and (3) policies to promote exports. To date, cost cutting measures have consisted primarily of removing subsidies for basic goods and services. This has brought substantial increases in utility rates, mass transit fares, and the price of staple foodstuffs. Thus far, the new package of revenue generating measures has eschewed increases in income or property taxes, focusing instead on increasing the efficiency of tax collection and raising fees on transactions that

are easily monitored and where revenues are consequently easily collected. The costs of this fiscal package have fallen most heavily on lower income wage earners.

In terms of natural resource management, the most conspicuous feature of the present situation is the chronic fiscal crisis of the central government. For the past 10 years, all the mainline government agencies charged with protecting natural resources and safeguarding public health have faced stringent budgetary constraints which has caused critical problems such as shortages of vehicles and gasoline required for fieldwork, a general freeze on the size of staff, and an inability to attract the most talented professionals. For the National Parks Service (SPN) and the Forest Service (DGF), the budgetary constraints come on the heels of the expansion of the system of parks and reserves which began in the 1970s and continued through the 1980s. These agencies are now charged with managing huge tracts of land, but lack the wherewithal to do so effectively. Much the same may be said for those institutions responsible for safeguarding public health. The rapid urbanization and industrialization of recent decades have created regulatory problems of increased scope and complexity for these institutions.

As regulatory agencies have been largely unable to exert effective control over natural resource use, the locus of political power regarding natural resources has shifted to agencies that determine monetary and fiscal policies. In other words, in the absence of effective regulation, the public policies that have the most influence over the behavior of resource users are those that influence relative prices.

The shift of de facto decision-making authority to the Central Bank need not be a harmful development for natural resource management. For example, efforts to curtail protectionism and agricultural subsidies (particularly for cattle) and the liberalization of prices are expected to produce positive changes in current patterns of land use. Specifically, it is hoped that once subsidy schemes are definitively removed, agricultural and pastoral production on lands that are not well suited for those activities will be abandoned. But it is also worth noting that the central bank planners generally adhere to a short-term timeframe when setting goals of economic performance. The rational management of natural resources requires a frame of reference that transcends that of short-term political economy. While central bank economists tend to be aware of this problem, many ignore it by adhering to a neo-classical conceptual framework that assumes infinite substitutability of factors of production. It is assumed that the exhaustion of a given resource will result in a change in relative prices which will lead to the use of a reasonable substitute.

2.3.2 Economic Policies and Patterns of Land Use

Shifts in public policy aside, multiple incentives that favor unsustainable use of the country's renewable natural resources are embedded in Costa Rica's economic and legal structure. Most will be discussed in the chapters on specific resource management issues. However, the subject of economic incentives that influence general patterns of land use is pertinent to all of the narrower issues discussed in this report. Therefore, it is included in this section as part of the survey of contextual factors that condition a broad range of resource

management decisions. Two broad classes of incentives and disincentives are identified here: (1) specific financial incentives in the form of taxes, credits, and subsidies; and (2) those features of Costa Rica's distinctive system of land laws that influence patterns of land use.

1. Financial Incentives:

Property Taxes. Property taxes in Costa Rica are low and have declined in real terms over time as the result of the fall of the colon and the tendency of the Ministry of Hacienda to reassess property values at infrequent intervals. The significance of a low property tax is that it offers little disincentive to inefficient patterns of land use such as cattle ranching. Were taxes on pastures to be raised, large areas of marginally productive land would most likely be abandoned to secondary forest.

Credit for Cattle. For more than 30 years the cattle industry was favored by the national banking system. Compared to other agricultural activities, cattle ranchers received large amounts of credit at lower interest rates with a long payback period. The desire to capture loans at negative real rates of interest resulted in the extension of pasture to many areas that were not ecologically suitable for that use. In effect, the national banking system subsidized the conversion of forest to pasture over a 30-year period.

In recent years, the amount of credit available to cattle ranchers has been reduced and subsidies have generally been curtailed. One notable exception to this trend occurred in 1987 and again this year: Under the Promotion of Agriculture and Livestock Development (FODEA) program the cattle industry has been favored by a countercyclical lending policy designed to protect marginal producers against low prices and diminishing returns due to soil exhaustion. This program directly assists ranchers on the verge of bankruptcy. The 1987 package offered a moratorium on debt payments, refinancing at favorable interest rates loans that were in arrears, and the elimination of taxes on factor inputs. The more recent package allows ranchers to pay back their loans at a fraction of their face value. The impact of FODEA has been to maintain marginal pastures in production at times when market conditions favor abandoning them to secondary forest.

Despite the fact that credit for cattle has been reduced and the terms of loans are much less favorable than they once were, loans for cattle are the only means of capitalizing a farm for the many farmers who lack title to their land. Costa Rican banks quite reasonably do not give mortgage loans to those who lack title to their farm. However, they allow farmers to mortgage movable assets, such as cattle. For those who lack title, this system has created an incentive to convert forest to pasture which persists to the present, although it is less of a problem now.

Credit for Wildlife Protection. There has been little coordination between the lending policies of the national banking system and the regulatory agencies charged with protecting wildlands. Until 1988, National Bank of Costa Rica (BNCR) granted loans for cattle to the occupants of government forest reserves. In effect, the national banking system subsidized the conversion of forest to pasture inside protected areas. Cattlemen whose pastures are inside government

118.

reserves were eligible for the 1987 FODEA program and appear to be eligible for FODEA credits as well.

Credit for Agriculture. The national banking system tends to offer credit for agricultural development without sufficient consideration of land use potential. As a result, agriculture and pastoral use have long been financed on sites not suitable for that purpose. In addition to government banks, numerous non-governmental organizations channel credit to small producers who similarly give little or no attention to land use potential.

2. Property Rights:

Until the 1960s, Costa Rica was a frontier society in that it retained large areas of forested public reserve lands that were legally open to homesteading. Since the last century, Costa Rican governments have facilitated the colonization of these public domain lands as an expedient solution to the nation's economic problems and social conflicts. The principal instrument of this open frontier policy was a body of land law that: (1) recognized the occupation and use of public domain lands as acts which convey certain property rights upon the occupants; and (2) established a legal mechanism by which homesteaders could petition for recognition of their claims (Saenz P. and Knight, F., 1971). Although these land laws have been amended in important ways in recent years, the general legal principles remain pertinent.

The notion that the use and "improvement" of land conveys property rights to the user has important implications for natural resources. First, according to both rural tradition and Costa Rican land law, forestland was historically regarded as "idle" and clearing forest was regarded as an "improvement." Currently, it is illegal to homestead on public lands and to clear forest without a permit. Nonetheless, both practices remain quite common, and clearing forest remains a means to establish claims within public reserves.

In the last 20 years, the creation and dramatic expansion of Costa Rica's system of forest and wildlife reserves has caused a qualitative change in the character of homesteading. When a reserve or a national park is established, the government is legally obliged to: (1) purchase the lands of those occupants who have title; and (2) to compensate untitled occupants for their "improvements," which effectively means to purchase their usufruct right. Much of the land in question is not suitable for sustained agricultural or pastoral use. Consequently, prior to its nationalization, this marginal land had little value and was, in many cases, formerly unoccupied. The act of declaring such lands a reserve often enhances their value by introducing the government as a potential buyer. This would not be a problem were the DGF and Department of Wildlife (DVS) to: (1) move rapidly to determine who is occupying land in a reserve at the time of its creation; (2) patrol the reserve to prevent further occupation; and (3) not recognize the claims of those who occupy reserve lands after their creation. None of these policies has ever been consistently executed. Consequently, homesteaders commonly infiltrate government reserves after their creation to establish a claim largely to sell it to the national government. To establish a claim, it is necessary to begin cutting the forest. Because funds are seldom immediately available for these buy-outs, the process of compensation and relocation frequently drags on for many years.

The movement to homestead on marginal lands inside government reserves is facilitated by the method government functionaries use to assess the value of the occupied lands. Although the current method considers proximity to roads, the amount of cleared land, and the existence of permanent crops, pasture, buildings, and other improvements, it ignores soil type and climatic characteristics. This failure to consider the land's suitability for agriculture creates an incentive to establish farms by cutting trees and planting pasture or fast-growing permanent crops. The Government refuses to compensate landowners for the value of their standing timber and pays considerably more for cleared land than for forest. Consequently, if a landowner knows that his land is to be expropriated, he has every incentive to clear the property before it is assessed.

Finally, the many farmers who lack clear title to their land find it difficult to acquire agricultural credit as well as to qualify for public subsidies designed to improve land use. For example, without title one cannot register a forest management plan with the forest service, making it difficult to qualify for reforestation subsidies. Thus, conservation related programs seldom reach the poorest farmers who reside on the most fragile lands.

2.4 Political and Institutional Factors and Their Consequences for Long Run Natural Resource Management Policies

During the 1970s, a consensus developed in Costa Rica that the best way to resolve national problems was through legislation and the creation of new public institutions. However, in the last three years, different diagnostic studies, including the Estrategia Nacional de Conservacion y Desarrollo Sostenido (ECODES) and the Plan de Accion Forestal, have indicated that with regard to natural resource management, public institutions have expanded more than enough but they need to increase their efficiency.

Part of the current problem is simply the extent to which institutions have proliferated. In the public sector alone more than 45 institutions deal with natural resource issues.[1] This situation inevitably leads to duplication of effort, problems of coordination, competition for turf and funding, and fundamental contradictions in public policy.

Another aspect of the problem is that over the past two decades government institutions have become the great employer. Every four years, a new administration offers employment to its supporters without laying off existing employees (most of whom are protected by the civil service code). In this fashion, the number of public employees has multiplied to the extent that most institutions spend the majority of their budget on salaries and fixed costs rather than on discretionary funds that can be used more flexibly. Many mainline regulatory institutions, including The Ministry of Agriculture and Livestock (MAG), The Ministry of Natural Resources, Energy and Mines (MIRENEM), and The Agrarian Development Institution (IDA), are top heavy with central office staff but lack the basic transportation necessary for the fieldwork that is an

[1] The objectives, structure and functions of 25 of these public institutions are presented in Volume III, Technical Appendix B of this report.

140

indispensable part of their principal missions.

The bureaucratic culture that has emerged within these institutions has a generalized fascination with planning and centralized political control. The raisons d'etre of many mid-level functionaries in MIRENEM are the development of management plans and attendance at interminable meetings for the purpose of inter-institutional coordination. There is little awareness that over-centralized institutional arrangements may hinder research, entrepreneurship, or other productive activities.

Through the course of the fiscal crisis of the 1980s government agencies charged with natural resource management have faced stringent budgetary constraints at the same time that their area of management has increased dramatically. It is perhaps ironic that in the midst of this government fiscal crisis, international concern over deforestation in the humid tropics has increased dramatically. Along with that concern and the special attention that has been focused on Costa Rica as a model of natural resource management in developing nations, has come an unprecedented flow of donations to non-governmental organizations interested in supporting conservation initiatives. In addition, bilateral assistance for conservation initiatives has increased in recent years.

For the most part, Non-Governmental Organizations (NGOs) and bilateral donors have been unwilling to channel these funds through state agencies. Consequently, the institutional character of the conservation movement has been significantly transformed in last 10 years. The key feature of this transformation is that it is usually NGOs and not regulatory agencies that are taking the lead in new conservation initiatives of all sorts. Whereas during the 1970s conservationists' efforts were generally focused on strengthening the newly formed park service, their attention is currently focused on a wide variety of resource management experiments undertaken by NGOs.

Volume III, Technical Appendix C sets out a list of NGOs operating in Costa Rica, including 13 international and 56 national conservation NGOs. Many of the national conservation NGOs are small, but a few are large and influential. Fundacion Neotropica, for example, collaborates with several international NGOs to carry out field conservation projects, like the BOSCOSA Project in the Osa Peninsula, and regional conservation strategies that apply the concepts developed in ECODES at the local level.

Technical Appendix C also lists over fifteen producers associations and trade associations. These associations have a long history in Costa Rica of successfully promoting the interests of their members within the country and abroad. Frequently, producer interests have clashed with conservation interests. For example, cattlemen associations, including the Asociacion de Camaras de Ganaderos de Costa Rica and the Asociacion Camara Nacional de Ganaderos de Costa Rica, successfully lobbied for policies that promoted deforestation to expand lands available for grazing, and coffee producers, represented by lobbying groups such as the Camara Nacional de Exportadores de Cafe and Federacion de Cooperativas de Caficultores, resist efforts to restrict agrochemicals and control dumping of organic coffee wastes into watercourses. As the close relationship between natural resources conservation and economic productivity

121

becomes more apparent in Costa Rica, however, it should be possible to gain the support of the trade and producers associations for conservation programs that do not conflict with their interests.

2.5 Cultural Factors

Costa Rica's long history of internal migration and frontier colonization has had a deep impact on both the culture and the legal system. Historically, public reserve lands covered with primary forest were viewed as an open access resource available for private exploitation. Homesteaders who occupied forested areas were able to establish a defensible claim to those lands simply by clearing them. This concept of property rights became embodied in a rural homesteading tradition and codified in a body of land law dating at least from the mid-19th century which recognizes the property rights of settlers.

Today, even though Costa Rica has no more unclaimed land and has established that homesteading inside government reserves is illegal, land clearing and settlement on public lands remains common. Strong vestiges of this frontier colonizing ethic remain in force. Much of the rural population regards primary forests as an open access resource, and considers hunting, collecting, and even homesteading to be their right. To some degree this ethic is embedded in Costa Rican land law, which on the one hand, prohibits squatting inside public reserves but on the other, recognizes occupants' right to be compensated for the "improvements" that they have made to the land. It also appears to be part of the fabric of bureaucratic culture where colonization is tacitly accepted as outside the purview of these institutions.

3. SUSTAINABLE AGRICULTURE

This chapter analyzes three main policy issues in sustainable agriculture: improper soil, water, and land management practices, misuse of agrochemicals, and inadequate agricultureal technology research and extension services.

3.1 Improper Soil, Water, and Land Management Practices

3.1.1 Issue Description

Soil and water are basic elements of life support systems. However, Costa Rica is exposing its resource base to long-term destructive processes in order to reach short-term production goals. Soil erosion, water contamination, forest destruction, and migration are consequences of a development process that is increasingly inefficient and destructive to resources at the farm level. The contrast between actual land use and land use capability in Costa Rica, described in Chapter 1, illustrates that development in Costa Rica is on a path of long-term destruction. Already Costa Rica has one of the highest soil degradation rates in the world: 680 metric tons per hectare of soils are lost per year through erosion in the Pacific watershed (Hartshorn et al., 1982). The country has also not been able to develop an institutional base that permits and supports integrated resource management activities such as research transfer and economic analyses.

Soil, water and land management practices and sustainable agricultural practices have not been a "tradition" in Costa Rica's agricultural technology. Instead, the emphasis during the last 20 years has been on unsustainable development practices supported by credit, physical capital, and subsidies for agrochemicals and other imported inputs.

Coffee cultivation provides an historical example of these practices. For generations coffee was grown in combination with other perennial crops and trees, notably bananas, plantains, citrus, and other fruit trees. Traditional coffee cultivation occurred in the shade of taller trees, mostly legumes. The shade trees provided nitrogen and humus to the soil, and their shade inhibited weed growth. The complex combination of plants formed an artificial community that closely approximated natural forest by holding soil against erosion, regulating water flow, maintaining nitrogen and organic matter in the soil, and drawing water and nutrients from all levels of the soil.

Since about 1970, a dramatic shift has taken place in coffee cultivation. Now much of the coffee is planted in large blocks of monoculture. This type of cultivation relies heavily on agrochemicals, including herbicides to control weeds, pesticides to prevent insect and disease damage, and fertilizer to provide nutrients. Yields and profits have increased without compromising the quality of the coffee. But ancillary environmental benefits of the traditional system of cultivation, like natural fertilization by leguminous trees, have disappeared. The new methods carry direct, negative environmental impacts as well, primarily water contamination from the agrochemicals.

3.1.2 Policy Framework

Land Management. Within the last few years, several documents and projects, including the Tropical Forestry Action Plan (TFAP), the Conservation Strategy for the Sustainable Development of Costa Rica (ECODES) and Neotropica's "Desarrollo Socioeconomico y el Ambiente Natural de Costa Rica" have defined strategies, issues, and policy on environmental protection and development processes and activities at the national and sectorial levels. These strategies mainly relate to zoning and land use, institutional coordination, and approval of the proposed Environmental Code.

One major policy issue in Costa Rica is to define and use a standard land use classification system. Until 1987, a major limitation to appropriate land use in was the lack of an official system for classifying land use capability.

Under an AID project entitled CORENA (Conservación de Recursos Naturales), the Ministry of Agriculture contracted the Tropical Science Center (TSC) to inventory and evaluate land-use capability classification methodologies, and adapt, modify, or develop, if necessary, one or a combination of these systems for use in Costa Rica. After a one-year investigation, TSC published a methodology based on the World Life Zone Classification System of L.R. Holdridge, actual land uses in Costa Rica, and factors derived from the synthesis of the methodologies in use ("Un Sistema para la Determinación de la Capacidad de Uso de la Tierra," 1985). Then in 1987, the Forestry Emergency Decree declared that all public institutions related to land use will adopt the TSC system as the official methodology for the classification of lands.

The TSC system has 10 land use capability classes, as determined by life zone, potential use (which will vary within each capability class depending on whether traditional, mechanized, or advanced technical practices are applied), and 12 other physical and climatological parameters. Recommendations for land-soil management technology are provided for each land use class defined in the system. These classes are as follows:

- Very high-yield cropping (class I) has no use limitations or restrictions and is suitable for the cultivation of all appropriate annual crops.

- High-yield cropping (class II) contemplates the same use as class I, but with some restrictions or limitations, such as some stoniness or slight slopes, that may affect the selection of certain crops or the use of certain cultivation practices.

- Moderate-yield cropping (class III) is essentially the same as class II, but with more severe restrictions that further limit the selection of crops or the time of year when they can be cultivated.

- Permanent or semi-permanent crops (class IV) includes sugarcane, coffee without shade, bananas, and black pepper.

- Intensive pasture (class V) includes pastures that support more than two head of beef cattle per hectare or around 1.8 head of dairy cattle or more per hectare, without need for supplementary feed, except minerals.

- Extensive pasture (class VI) are areas with a carrying capacity less than class V, with a minimum limit of 0.5 head per hectare for the two types of cattle, and without supplemental feed, except minerals.

- Tree crops (class VII) include cacao, coffee with shade, citrus, coconut, cashew, macadamia, and wood species.

- Intensive forestry production (class VIII) are areas that do not fulfill the requirements of the above classes, yet permit the intensive management of natural forest. Some of these lands can be reforested under favorable conditions.

- Extensive forestry production (class IX) are areas that do not fulfill the requirements of the above classes, yet permit the extensive and permanent management of natural forest. Timber must be harvested in a manner that minimizes impacts on soils, due to the high erosion risks in most of these areas. Reforestation should occur only in situations where the natural forest cover has been removed and cannot regenerate without assistance.

- Protection (class X) are those areas reserved mainly for environmental and natural resource protection.

However, not all institutions have abided by the Forestry Decree, and various land classification systems are currently in use in Costa Rica.

Soil and Water Management. In 1985 the Soil and Water National Conservation Service (SENACSA) was created within the Ministry of Agriculture and Livestock (MAG) to promote soil and water conservation. Recently, SENACSA proposed a new Soil Conservation Law as an effort to reform and update the legislation. Also at the national government level, a proposed new Environmental Code is being debated in order to integrate the activities of all institutions related to soil and water management.

The current major efforts of the National Irrigation, Underground Water and Drainage Service's (SENARA) consist of the Arenal-Tempisque irrigation project in Guanacaste, which should irrigate 70,000 hectares by the year 2000; the Itiquis irrigation project near Cartago; and various drainage projects in the atlantic coastal region and in the southwestern part of the country.

3.1.3 Institutional Framework

Land Management. A recently appointed commission is in charge of deciding on a land classification system that provides a framework for soil and water management practices and projects. This commission is formed by the National

125

University (UNA), the University of Costa Rica (UCR), TSC, IDA, the National Forest Service (DGF), SENACSA and SEPSA. A group of land use ecologists, soil scientists, and agronomists from the commission are evaluating the two most used systems (TSC and SEPSA) under an informal agreement and trying to develop or modify them to better suit the needs of the users (Bolaños, personal communications 1990). After a consensus is reached, an official mandate will require all responsible groups and institutions to use the land classification system.

Soil and Water Management. SENACSA, within MAG, provides services to promote the conservation of soils and water in various regions throughout the country. Its four main objectives are to: 1) create a stable service of soil and water conservation within MAG and strengthen existing technical knowledge; 2) promote legislation related to soil and water conservation; 3) promote good use and management of land and establish adequate and effective conservation practices for Costa Rica's conditions; and 4) evaluate soil degradation from water uses, using the watershed as the unit of measurement. Since 1985, SENACSA has expanded its activities by working with technicians from the Agrarian Development Institute (IDA) in settlement areas and establishing demonstration farms and plots to train SENACSA personnel and verify soil and water conservation practices for particular agroecological zones in Costa Rica.

The Agricultural Natural Resources Planning Sector (SEPSA) is composed of representative from MAG, the Ministry of National Planning and Economic Policy (MIDEPLAN), the Ministry of the Presidency, the National Council for Production, the Agrarian Development Institute, and representatives from the agriculture and livestock sector. Its main objectives include increasing and ensuring the supply of agriculture and livestock products and formulating policies for integrated national development. Under its mandate to implement policies formulated by MAG, SEPSA prepares the Annual Sector Operation Plan, the Institutional Operation Plan and the National Plan for Agriculture, Livestock and Renewable Resources, undertakes studies at the national level, and proposes agriculture, livestock and renewable natural resources policies.

The National Irrigation, Underground Water and Drainage Service (SENARA) is an autonomous institution with primary responsibility to develop and implement irrigation and agricultural drainage projects. SENARA is also responsible for underground water resources, especially in an agricultural and rural community development context.

3.1.4 Issue Analysis

What Works

TSC offers short courses on the practical use of its land classification system at the field level to the technical personnel of various institutions, including ICE and IDA. The DGF continues to require use of the TSC land classification system to determine land use capacity for lands to be reforested under the incentive system, or for those forested lands to be considered for harvesting.

126

A reference manual of methodologies and technical criteria in soil and water conservation has been written by SENACSA. SENACSA also has established a data bank on natural resources. In 1988, SENACSA provided technical assistance to 135 farmers in soil and water conservation practices, erosion control, drainage, flooding, recuperation of gullies, and maintenance and management of vegetation covering. Activities were conducted on 366 hectares of land in Orotina, San Carlos, Cartago, and the Golfito.

Regional and local soil conservation projects and activities, such as those at Puriscal, Hojancha, and Osa Peninsula, promote long-term soil conservation practices and farming systems. These projects show how short-term gains can be achieved with a long-term outlook and community participation by incorporating soil conservation and reforestation activities in community agendas. Positive soil management examples related to dairy production are also found in the northern part of Cartago Province where soil conservation practices started by the former STICA (Interamerican Institute for Agriculture Cooperation) are still in place.

SENARA has been successful in the construction of irrigation and drainage infrastructure and the delivery of irrigation water. Its efforts have increased productivity and limited crop failures from inconsistent precipitation during the rainy season in sugar cane and rice production.

GTZ, CARE, and the New Alchemists Association (ANAI) have been developing reforestation, agroforestry, and pesticide management projects with communities and Centros Agricolas Cantonales (CACs). These projects include specific soil and water conservation practices based on farmer's resources and needs, and they sometimes provide credit and incentives that permit the development of long-range actions.

From the conceptual side, projects such as A.I.D.'s FORESTA, BOSCOSA, and the recently designed Community Watershed Management Project are directed toward long-range solutions with community participation. Other projects propose long-range activities focused on better land use at the farm level, such as the MADELENA project of the Tropical Agronomy Teaching and Research Center (CATIE) and AID's Regional Office for Central American Programs (ROCAP), which incorporates multiple-use trees into farm production systems. These projects show how long-term planning is more successful than subsidized credit or protective tariffs in protecting the environment.

What Does Not Work

Until the 1970s, very little attempt was made to classify the capability of lands in Costa Rica. Most activities in the field were little more than localized soil inventories or soil sampling for investigative purposes, and institutions responsible for agriculture and agricultural investigation made little effort to coordinate their activities (Duisberg and Newton, 1978). Early soil maps were assembled piecemeal and extrapolated data from these sources to cover large areas of the country, with little or no field checking (Ibid.). As of the mid-1980s, Costa Rica had 10 land use capability classification systems in use by 22 institutions, of which only five methodologies were taught in the universities ("Sistema para la Determinacion de la Capacidad de Uso de las

127

Tierras de Costa Rica," 1985). Moreover, the IDA Law and its influence on the design and development of settlements contributes to this pattern of random planning and development behavior conducive to environmental destruction or degradation.

Even though the TSC land classification system was approved on September 18, 1987, recent forestry, agroforestry, and agricultural development projects have not considered its zoning or land use recommendations. For instance, IDA does not consider zoning and land use when defining the size of the plots and the characteristics of the settlement. Likewise, SEPSA continues to use a modified U.S. Department of Agriculture classification system to determine the land use capacity of the Costa Rican territory. The new Forestry Law states that the designation of an official system for determining the forestry capacity of lands will be at the discretion of DGF.

Recent IDA settlements assign settlers a five-hectare plot on wet tropical soils that generally have been deforested. Without technical assistance on soil management or crop choice, these actions are creating a minifundio-type of development, which together with credit and subsidies, does not encourage ecologically sustainable soil and water management practices.

Under the Law for the Promotion of Agriculture and Livestock Development (FODEA), Law 7064 of May 1987, extension services and technology transfer activities are executed at the field level and in some cases at IDA's settlements. However, soil management is not a credit-financed activity mandated by this law, and settlements do not receive technical assistance tailored to their ecological characteristics.

Too few professionals are trained in soil classification and analysis. Traditional emphasis in soils investigations has been on soil-crop relations and chemical analysis. There is no active soil inventory/classification program in Costa Rica and few university instructors are trained or have experience in this area (Divney, personal communications 1990). There are no laws requiring soil inventory for Environmental Impact Assessments or other activities. Also, it is expensive to do the required field work in comparison to photo interpretation and broad, office-based land classification (Duisberg and Nelson, 1978).

A shortcoming in SENARA's efforts is the lack of technical assistance when the emphasis is on nontraditional export crops. SENARA's extension agents have little experience in irrigated agriculture, and probably less in nontraditional crops. Additionally, these techniques are very input-intensive, requiring large and frequent applications of pesticides and fertilizer, which are not affordable for small farmers who benefit from the irrigation projects. The Arenal-Tempisque irrigation project illustrates this problem. Small farmers in the irrigation district banded together in 1987 and refused to pay the tariffs charged for the irrigation services. They argued that production had not increased sufficiently to justify an increase in the tariff, especially if SENARA was not providing the technology and access to markets for the crops that it was promoting.

Part of SENARA's problem in transferring the appropriate technology has been the emphasis on the engineering and maintenance portions of their projects. Until 1987, SENARA's general manager was a civil engineer, with no prior

-128

agricultural experience. As of early 1989, only five full-time agronomists were assigned to extension work in the Arenal Tempisque district, with over 25,000 hectares and 180 farmers to serve.

Institutions at the field level lack the coordination needed to solve specific soil and water management problems. The National Service for Ground Water, Irrigation and Drainage (SENARA), SENACSA, and MAG have different objectives. Because soil capability and land use recommendations are not consistent across institutions, a farmer can receive conflicting information on how to plan the development and protection of his land. Moreover, institutional coordination with the communities and with community organizations to enforce environmental protection or resource management is not mandatory, and effective incentives are not directed to community groups in charge of resource management.

3.1.5 Policy Gaps, Alternatives, and A Policy Research Agenda

Economic incentives for farmers on fragile lands must be analyzed and defined so that long-term production and protection become part of farm management. Credit policies do not consider long-term management of the environmental resource base. Farmers on fragile lands need the incentive of subsidized interest rates and long-term credit. With respect to non-traditional crops, credit and production incentives are needed for export-oriented and reforestation projects that follow zoning and land use recommendations. This is especially important for irrigated crops on the Nicoya Peninsula and macadamia, orange, and pepper production projects on wet tropical soils in the Atlantic and Northern zones. Credit and other incentives for sustainable management practices such as integrated pest management (including weed management) and agroforestry systems that promote trees, soil, and water protection practices, and soil cover should be introduced.

The proposed Soil Conservation Law should be approved in order to define SENACSA's role in soil and water conservation. The new Soil Conservation Law based on the TSC land classification system should consider zoning based on land use; propose credit and other incentives for sustainable agriculture practices; integrate institutions and management practices at the watershed level; and consider community participation in watersheds and resources management.

Financing is needed to enable Non-Governmental Organizations (NGOs) and private enterprises to promote sustainable soil/water/forest management activities. Projects such as the CARE-funded watershed management projects at Rio Banano and Rio Quebradas also require clarification of soil-water conservation practices.

The watershed should be defined as the logical operational management unit for soil and water resources and the community should participate in the management process. The Costa Rican Institute of Electricity (ICE), MAG, the Ministry of Natural Resources, Energy and Mines (MIRENEM), and SENARA all have mandates on watershed management that give them responsibility for soil and water protection and management. However, they must define concrete actions to manage specific resources and coordinate institutional actions at specific geographic areas at the community level. For instance, the Community Watershed Management Project, recently funded by A.I.D., could provide a framework at the watershed

129

level for project activities and community participation. One of the most important items now under consideration by the National Legislative Assembly is the new Water Law that considers the watershed as a logical management unit and provides definite guidelines for institutional integration and coordination.

Planning for production and environmental protection should be done on a long-term basis. Even though the ECODES and TFAP strategies increase awareness, management recommendations need to be executed and strategies need to be implemented. Perhaps the most important element at this time is the application and transference of soil and water management techniques to the farm level, based on a standard land use classification system such as the one TSC developed. Zoning and policy development based on land use is a priority in Costa Rica both for short- and long-range planning for projects and activities such as:

- Irrigation systems and crop mixes and their impacts on the dry Pacific and coastal areas;
- Drainage in former banana plantations;
- Hillside grazing areas exposed to rain;
- IDA's settlement areas; and
- Reforestation projects on underutilized agricultural lands.

3.2 Misuse of Agrochemicals

3.2.1 Issue Description

The issue of misuse of agrochemicals covers worker safety, contamination of soil and water, and off-site contamination. Much of the misuse of pesticides and other agrochemicals in Costa Rica stems from carelessness and ignorance. Women in the field are usually in charge of mixing the pesticides, which are applied by young people who do not understand that agrochemicals can be dangerous. Since some of the agrochemicals are carcinogenic or cause sterility, the danger to younger people and women is particularly high. The adverse consequences of this misuse abound. In the late 1970s, banana workers suffered sterility after applying DBCP, a fungicide. The workers claim that they were not advised to wear protective equipment. Other workers do not wear protective equipment because it is uncomfortable in Costa Rica's climate. The lack of proper gear for mixing and applying agrochemicals led to the death of a 15-year-old worker on a sugar plantation in June 1988.

Contamination problems occur both on- and off-site. Copper buildup in the soils from fungus control products used for more than a decade on banana plantations along the Southern Pacific Coast are now affecting production to the extent that these plantations cannot be converted to other agricultural uses. Aerial spraying and the proximity of houses, rivers, and roads to the sites where agrochemicals are applied by hand also adversely affect the human population. Air applications can drift up to 10 kilometers beyond the target.

130

3.2.2 Policy Framework

The most important law regarding pesticide use, Health Law 5395 of 1974 Title III, Chapter 7, states that it is the responsibility of the Minister of Health to enact, in conjunction with the Minister of Agriculture, protective measures against the dangers to persons and domestic animals and against environmental contamination derived from the use of toxic or dangerous agricultural chemicals (Article 345, Item 8). Article 452, Item 10, states that the Minister of Health will determine, together with the Minister of Labor, technical regulations for on-the-job safety. The Organic Law of the Ministry of Agriculture and Livestock, Title III, Chapter 5, Article 56, mandates the Agronomist Association to coordinate with the Direccion de Sanidad Vegetal under the Ministry of Agriculture and Livestock in registering and controlling agrochemical distributors.

These laws and regulations constitute the framework for regulating pesticides in Costa Rica. Registration of pesticides is required, and the policy is to follow U.S. Environmental Protection Agency (EPA) standards. The Ministry of Agriculture also offers Integrated Pest Management programs.

The Environmental Code and the ECODES strategy are two broad based environmental policies, currently under consideration by the Government, which have provisions on pesticide regulation. The Environmental Code, which has been presented to the Legislative Assembly for consideration, integrates the decrees and laws of various institutions in order to present a comprehensive framework for all environmental protection activities. The ECODES strategy proposes to place one institution in charge of creating a national policy that integrates environmental quality and management and a national environmental planning system (SINAPA) to oversee environmental quality and territorial zoning. ECODES also proposes to create a data base on environmental contamination and to study environmental problems created by agrochemicals in aquifers and potable water systems, as well as chemical residues in agricultural products and water.

3.2.3 Institutional Framework

The health laws declare the Ministry of Health to be the institution in charge of supervision and safety standards on agrochemical use. The Ministry of Agriculture is responsible for regulating and enforcing recommendations of the Ministry of Health. The Ministry of Labor, the Ministry of Education, and the National Insurance Company (INS) also have responsibilities for worker protection, education, and labor-related accidents.

The Pesticide Registration Department and the Agronomist Association Advisory Group in the Vegetable Sanitation Department of the Ministry of Agriculture are in charge of the registration of all chemicals used in pest or disease control.

Pesticide importer groups also participate in controlling agrochemical distribution and provide general information on use and application through the Chamber of Pesticide Importers.

Many institutions are involved in pesticide research, development, and residue analyses: the Faculty of Agronomy Advisory Group and CICA (Centro de Investigacion de Contaminacion Ambiental) of the University of Costa Rica; the Pesticide Research and Development Group of the National University; Costa Rican Institute for Training and Research in Health and Nutrition (INCIENSA), which probably has the best facilities for residual analysis in the country but lacks trained technicians and operating resources; CATIE/ROCAP, which implements an Integrated Pest Management Project (IPM), a major effort in research and training for protection of four traditional vegetable crops (tomatoes, chili, cabbage, and corn) for all of Central America; and GTZ and the University of Florida, which are involved in specific pesticide management projects with the Ministry of Agriculture and the Chamber of Pesticide Importers.

3.2.4 Issue Analysis

What Works

Costa Rica has extensive marketing infrastructure for the distribution of agrochemicals, including 300 sales outlets for agrochemicals throughout the country and inspectors in each of the eight regions who visit the outlets monthly to ensure that all products are registered.

Recently, the Ministry of Agriculture and GTZ agreed to develop an educational program for farmers on the safe use of pesticides, which will be executed at the farm level and in rural schools. MAG and the University of Florida have also agreed to define a pesticide management control system, which includes a component to transfer technology to the farm level.

Over the last eight years, the Pesticides, Development, Health and the Environment Program of the National University has monitored pesticide imports and uses and environmental and human health problems, including the adverse consequences of pesticide misuse such as the destruction of beehives and honey production and the death of cattle from misuse of veterinary medicines.

The USAID Northern Zone Consolidation Project (PCZN) requires an Environmental Impact Statement (EIS) and a Pesticide Use Assessment before its technical assistance components can be contracted. PCZN is also one of the few development projects in Latin America for which an environmental protection specialist has been appointed.

What Does Not Work

Production inputs are introduced at the farm level without considering long-term environmental or socio-economic effects, such as contamination and other health dangers. MAG recommends the use of pesticides in 95 percent of situations that require insect control, and recent analyses show that 80 percent of farmers in the Central Valley use pesticides as their exclusive means of pest control ("Desarrollo Socioeconomico y el Ambiente Natural de Costa Rica," 1988).

MAG is promoting IPM only for sugar cane, sorghum and potatoes. Applying IPM to crops, such as tomatoes, corn, rice, beans and sorghum, is difficult in Costa Rica. For example, there are 39 different fungi that attack both black and

red beans (Vasquez, personal communications 1990).

Contraband in agrochemicals comes mainly from Panama. Extension education service to train farmers in the field on the application of chemicals and required protective gear is ineffective. Thus, in practice, the use of agrochemicals at the farm level is not well controlled. Farmers often overuse or misuse agrochemicals, obtain restricted pesticides without the required professional receipts from the Agronomists Association, apply agrochemicals freely despite legal restrictions, and fail to take the required precautions to protect workers and the environment. The precise extent of these problems has not been measured.

The Government does little residue testing. Flores Costa Rica International S.A. claims that the Ministry of Agriculture has never inspected its flowers and that the Customs Agency issues the company's health certifications without conducting inspections ("Toxic Pesticides Routinely Misused in C.R." Tico Times, July 20, 1990).

Over the last several years, international and domestic agencies have approved development projects without a complete EIA or Pesticide Use Assessment. Generally, the EIAs conducted have consisted of inventories rather than analyses of the environmental impact of pesticide uses and practices of the proposed project.

3.2.5 Policy Gaps, Alternatives, and A Policy Research Agenda

Information Dissemination and Technology Transfer. The most important policy gap is the lack of an effective information and technology transfer organization to provide technical assistance to pesticide users. For example, the CATIE IPM project has no official technology transfer component to pass on the technical information the project generates directly to farmers. Although 32 institutions received IPM publications in 1988, there is no formal mechanism to transfer this information to the farm level. Demonstration plots and intensive technology transfer and education programs at the farm level could encourage reduced reliance on pesticides through adoption of other types of IPM practices. The programs could also demonstrate proper use of pesticides in those situations for which they provide the best pest management option. Other policies, such as subsidized credit for organic farming or for integrated pest management practices that include biological control, could provide further incentives.

ECODES' recommendation to create an agricultural information center specializing in environmental issues should be considered, along with the creation of an up-to-date data base that supports extension and environmental education projects. The data base should include recommended pesticides according to crop and stages of pest attack in accordance with an integrated pest management system.

International Institutional Coordination. With respect to import regulations for agrochemicals, a more direct information channel is needed between EPA in the U.S. and the Ministry of Agriculture in Costa Rica in order to avoid dumping of EPA-banned products. ECODES recommends a legislative review

on import regulations and applications of agrochemicals and the establishment of maximum levels for toxic residues for specific crops in accordance with international standards.

Water Contamination Monitoring and Control. The main adverse effects of pesticide use on water resources are contamination of aquifers and eutrophication (nitrogen contamination) in open bodies of water. However, there are no policies under the Fisheries Law or technical assistance from SENARA on irrigation projects, such as the Arenal and Tempisque projects, to monitor or prevent these effects. Nor has Costa Rica established water quality standards that state maximum allowable levels of pesticides in water. Training is also needed for field level technicians who could provide simple water analysis and monitor contamination and misuse of agrochemicals. For example, SENARA has not defined an agrochemical management system for the Arenal-Tempisque Irrigation Project.

Integrated Pest Management. IPM consists of restrained use of pesticides (i.e. using as little as possible and timing the application based on weather conditions) and use of other pest control methods, such as resistant varieties, crop rotation, intercropping, and seasonal selections, as much as possible. Adoption of IPM technologies will require farm level access to appropriate information, effective extension, control of dangerous chemicals, and possibly some type of subsidy as an incentive for farmers to use alternatives to pesticides.

3.3 Inadequate Agricultural Technology Research and Extension Services

3.3.1 Issue Description

A technology transfer system requires specific support services and activities, such as extension agencies, field offices, community groups, and research mechanisms, as well as land tenure, credit, and marketing incentives. As described in Chapter 2, technology transfer and research have not been important components of Costa Rica's development process. Choices of agricultural technology and management techniques have not been based on soil production potential. Agricultural production has become a credit-dependent activity. As pesticides and fertilizers increasingly contaminate the environment and destroy soil and water resources, the economic feasibility of agriculture depends more on credit. This is particularly true for nontraditional crop production on tropical soils which require land clearing, irrigation, and high amounts of more dangerous pesticides and fertilizers. The principal environmental impacts occur in the Guanacaste area, which has pesticide pollution and a shortage of irrigation water; in water bodies, such as the Nicoya Gulf and estuaries in the Pacific; in the bayous and canals in the Atlantic region; and in recent IDA settlements on hillsides and fragile soils in tropical wet areas which suffer erosion, loss of forest, and downstream siltation. This effects are causing contamination and growing socio-economical problems of poverty, malnutrition, urban migration, and unemployment, particularly in the Northern Zone and Guanacaste regions.

134

3.3.2 Policy Framework

MIRENEM and the ECODES and TFAP strategy papers promote the consolidation of the natural resource technology transfer system in order to avoid duplication of effort and competition for scarce resources among institutions. Components of these strategies that deserve consideration in relation to technology transfer and training are described below.

ECODES (1989) proposes: 1) the promotion of basic research to obtain higher yields of the main crops, improvement of living conditions of small farmers, and increase in long-term production options; 2) the improvement of agricultural services, both government and private, on aspects such as land tenure, zoning, irrigation and drainage, credit, crop insurance, and technical assistance, according to soil/land capabilities; 3) the establishment of a specialized technical office on soil conservation within MAG; 4) the definition and promotion of research and technology transfer programs on soil and water conservation, as well as irrigation practices; and 5) the strengthening of agricultural research units in the private and public sectors and universities. The coordination of these research units could be assigned to the National Science and Technology Council (CONICIT).

The most important aspect of technology transfer and training is the participation of institutions created at the community level such as the Centros Agricolas Cantonales (CACs). These centers are conceived as operational structures and links in a technology transfer network, which is supported by universities and internationally funded technical assistance. They can integrate services and incentives and more efficiently transfer funds, contracting technical assistance and coordinating resource management activities in the community.

3.3.3 Institutional Framework

FODEA's Law 7064, Title II, creates the Agriculture and Renewable Natural Resources Sector. Title III (MAG Organic Law) Chapter 1, Article 48, mandates MAG to promote agricultural development based on research and extension according to socioeconomic objectives and the needs of the agricultural and livestock producers. In Article 48 b, the law mandates MAG to support the design and implementation of a rural development policy and to coordinate with other agricultural and renewable natural resource sector institutions.

At the regional level, Central America has a network of institutions undertaking scientific research in sustainable agriculture such as CATIE, the Central American Institute for Research and Technolgoy (ICAITI) and the Organization for Tropical Studies (OTS).

International groups, such as IDB and USAID, have historically provided funding for technology transfer projects and have focused on institution building or specific crop production projects. Universities and research-oriented externally funded groups, such as TSC, CATIE, and OTS, are involved in sustainable agriculture and resource management activities. These universities and research centers, through interinstitutional agreements and projects, develop and transfer research findings to ministries and technicians in charge of

135

technical assistance activities.

Private enterprise and producer groups, which are also part of the technology transfer and training system, carry out important functions. These organizations are well developed and influential in Costa Rica. A key channel to improve technology development and transfer is to convert these groups from being sources of environmental problems to actively participating in the search for solutions. The Costa Rican Coalition of Development Incentives/Livestock and Agroindustrial Private Coalition (CINDE/CAAP), privately administered and USAID supported, integrates several export market-oriented organizations and chambers that represent interests of specific unions or production groups. CINDE/CAAP provides technical assistance, training, and marketing information to the coalition associates.

Finally, some institutions administer education programs. For example, the Improvement of Science Teaching Center has developed and now administers an environmental education program for schools, teachers, and other groups. The State Correspondence University (UNED) also implements the Environmental Education Program (PEA) which provides training and publications.

3.3.4 Issue Analysis

What Works

Research in Technology. International research centers have conducted investigations on acid soil management techniques specifically designed for the humid tropics. CATIE/ROCAP research projects on fast growing tree species, IPM, and cropping systems are the main source of technological information and training of technicians in reforestation, species, ecological zones, and pest management for Central America. In addition, North Carolina State University, with USAID funding, has developed a technological package that includes crops, soil treatments, and incorporation of legumes in the traditional slash and burn systems. Each hectare under this type of management has the potential to save four hectares of forest from deforestation (Sanchez, 1988).

The private enterprise research and technology transfer systems, focused on specific economic activities such as coffee, sugar cane, cacao, and milk production, have been instrumental in making Costa Rica one of the most efficient producers of these traditional crops. Some of the most important producer associations are ICAFE for coffee, LAICA for sugar cane, and ASBANA for bananas, black pepper, and guanabana. For instance, ICAFE integrates coffee producers, processors, and exporters, and provides them with technical assistance on coffee production, market information, and credit.

Technology Transfer. Agreements among MAG, the Chamber of Pesticides Importers, the University of Florida, and GTZ related to pesticide use and education contain technical transference components for the local community and the farm level.

SENACSA's effort in soil conservation is providing experience in applying technology at the watershed level for Rio Banano in Limon and Rio Quebradas in San Isidro. SENACSA also publishes technical pamphlets and bulletins and offers

136

courses, demonstrations, and training in soil and water management.

ANAI, CATIE, and IUCN in Talamanca are providing information on non-traditional uses of the forest that permit sustainable management of buffer zones. Community participation and tree nurseries are important channels for the transfer of agroforestry systems technology.

In the Northern Zone, a recently appointed environmental protection advisor provides technical assistance to the agriculture, road construction, and IDA settlement components of PCZN.

NGOs, community organizations, and foundations also provide an operational structure that allows technical assistance, incentives, and credit to reach the farmer. NGO efforts in Hojancha, ANAI in Talamanca, and BOSCOSA in the Osa Peninsula are some examples.

UNED and the Neotropica and Parks Foundations develop and provide environmental education activities and materials for elementary and high school teachers to use in rural schools.

What Does Not Work

Not all research and development and technology transfer activities related to sustainable agriculture are not part of the Agricultural Extension System under MAG. For example, MAG is promoting IPM for only three crops: sugar cane, sorghum and potatoes.

Research conducted by regional or international institutions such as CATIE and OTS do not reach technicians and farmers at the field level, and formal university training is not directed to solving soil and water management problems. Until recently, little research conducted by regional and international institutions like CATIE and OTS was driven by farmers' problems in soil and water management, nor were the results of the research made available to farmers. This situation appears to be improving, however. For example, CATIE's IPM program has trained four people at the doctoral level, 15 at the masters level, 15 at the general professional level, and 11 at the technician level in its first two years of operation.

There are no provisions to provide trained technicians in soil management, agroforestry, or non-traditional production alternatives. Not until recently did CINDE/CAAP develop a training program for private enterprise technicians and organizations in charge of the production and export of non-traditional crops. Technology transfer activities and informal education at the field level often lack human and logistical resources due to poor institutional coordination and isolated field efforts.

3.3.5 Policy Gaps, Alternatives, and a Policy Research Agenda

Both MIRENEM and MAG have a mandate to protect and preserve renewable natural resources, but institutional responsibilities are not clearly defined at the field level. As a result, there is no national policy to develop a

137

technology transfer system that integrates the efforts of organizations such as TSC, OTS, and CATIE and focuses on community and field level project needs. International donors also have not promoted a specific natural resource management technology transfer system even though numerous institutions and NGOs are involved in sustainable agriculture and natural resource management. Consequently, many NGOs are doing active at the field level without guidelines needed to provide technical assistance to participating communities and farmers, resulting in a waste of scarce resources.

Farmers and technicians also need informal field level training on the TSC land classification system and on field analyses and diagnosis of agroecological variables. Moreover, data collection and monitoring activities based on land use capability should be incorporated in field level projects in order to validate technology recommendations. Validation would ensure that recommendations are directed to farmer and farm agro-ecological characteristics. Trained soil and water and crop technicians should work at the field level to provide farmers with valid recommendations.

4. MANAGEMENT OF WATER RESOURCES

This chapter analyzes three water resource policy issues: water pollution, competition for water resources, and watershed management. Because these three issues are highly interconnected, the chapter concludes with a presentation of research and policy alternatives that address the relationships between the three issues.

4.1 Water Pollution

4.1.1 Issue Description

Urban, industrial, agricultural, and mining activities are contaminating water to some degree in most of the country's watersheds. As a result, operation and maintenance costs are high in the hydroelectric and potable water treatment plants. In addition, the middle and lower watershed regions of several watersheds are facing population health risks and ecological deterioration (Losilla, 1989).

Some of the main problems of controlling water quality are the high costs of industrial modifications, such as the installation of machinery that uses biodegradable detergents, the high public sector investment needed in sewage treatment, inappropriate education and training of rural community groups in how to prevent water contamination, the lack of institutional coordination, and the dearth of statistics on the economic and environmental impact of water deterioration.

The government has traditionally provided subsidies to the lower classes, including a subsidy on domestic water. Thus, the current price of water, which does not reflect the actual social costs, produces insufficient revenue to pay for sewage water treatment, which has had a lower priority than development of the potable water system. Moreover, the cost of water treatment is relatively high due to inappropriate land use policies resulting in deforestation, and watershed deterioration producing water turbidity and siltation of stream beds, lakes, and dams.

As a result of political and public health objectives and pressure from national and international financial institutions, short-term profits and revenues have been emphasized disproportionately. Natural resource conservation and long-term economic projects receive low priority. Examples of the short-term projects include the Arenal Hydroelectric Project watershed that produces reservoir siltation because it has no watershed conservation component and the Arenal-Tempisque Irrigation Project which does not include the cost of water quality monitoring and control in the irrigation tariff.

Moreover, water pollution has negative economic and social effects on downstream activities such as:

- The polluted water from the River Grande de Tarcoles has damaged tourism in the area of the City of Puntarenas (Carlos Villalobos, personal communications 1990).

139

- The Tempisque River has been transporting agrochemicals and sediments from surface runoff to the Gulf of Nicoya. This has caused eutrophication or rapid loss of marine biodiversity throughout the Gulf ("Conservation and Development of the Arenal-Tempisque Irrigation Project," 1986).

- The Colima and Barva aquifer that provides potable water for over 650,000 people in the Virilla River Watershed is beginning to show evidence of industrial, agricultural, and urban contamination ("Hydrogeological Investigations in the Valle Central Final Report," 1988).

- The Barranca and Moin aquifers that supply a large portion of the potable water for the cities of Puntarenas and Limon, respectively, are seriously contaminated by urban and industrial activities and will have to undergo intensive treatment or be replaced in the near future (Losilla, personal communications 1990).

4.1.2 The Policy and Institutional Framework

The Ministry of Health, through its Environmental Sanitation Division (DSA), is in charge of water quality control for the country under Law 5412 (1974), which created the Ministry of Health, and the General Law of Health (1974). The DSA regulates effluent contamination due to human activities, as well as all matters concerning solid waste and its treatment. A non-official program, the National Environmental Health Program (PRONASA), which the DSA established in 1982, sets effluent standards according to a water use classification system (e.g. public supply, recreation, aesthetics, conservation of flora and fauna, agriculture, and residual water dilution).

DSA shares responsibility with other institutions that have legal mandates for water conservation. The main institutions are the rural health centers, the Costa Rican Institute for Water and Sewer System (AyA), and the Ground Water, Irrigation and Drainage National Service (SENARA).

The Ministry of Health employs more than 100 sanitation technicians who work with some 350 rural health centers (ECODES, 1990). They monitor water contamination caused by residential, industrial, commercial, and some agricultural activities. The technicians evaluate, make decisions, and enforce the law in simple cases such as the dumping of raw industrial and domestic wastes into rivers. In more difficult cases, such as the impact of treated effluents or location of landfills on water quality, they consult the health center personnel or DSA in San Jose.

AyA's legal mandate (Law 2726 enacted in 1961 and its reforms in Law 5951 of 1976) covers the collection and disposal of sewage and industrial liquid residues, regulation of pluvial drainage in urban areas, and advice and coordination with other government institutions in the control of water resource contamination. DSA and AyA share responsibility for approving and regulating industrial sewage and pluvial effluents and regulating and setting norms to prohibit contamination in all potable water systems.

140

SENARA's objectives, stated in Law 6877 of 1983, are to establish irrigation and drainage systems, establish flood protection, and ensure a fair and optimal use of superficial and underground water resources for agricultural and livestock uses. Under this mandate, SENARA should promote and direct collaboration with other institutions on preventing contamination and eliminating all types of contaminants from the waters of irrigation districts.

To a lesser extent and more indirectly, the Costa Rican Institute of Electricity (ICE), Municipalities and the Municipal Advisory and Development Institute (IFAM), the National Forest Service (DGF) and the Geology, Mines and Hydrocarbon Division (DGMH) within the Ministry of Natural Resources, Energy and Mines (MIRENEM), and the Soil and Water National Conservation Secretariat (SENACSA) within the Ministry of Agriculture and Livestock (MAG), are involved in water contamination control. ICE is mandated to preserve and protect natural water resources, including watersheds, riverbeds, and currents. The municipalities, with technical assistance from IFAM, manage their own potable water systems. The DGF, under the Forestry Law, is mandated to protect the borders of mountain water sources and riverbanks. SENACSA-MAG is mandated under Decree 18564-MAG to advise the public and the private sector concerning water conservation programs of the agricultural and livestock sector. The Governmental Commission for Evaluation and Control of the Environmental Impact Studies under DGMH-MIRENEM reviews Environmental Impact Assessments (EIAs), which are required by the Mining Code for all metallic and non-metallic mining activities.

A Forestry Law regulation mandates the Forest Service to protect a strip of land 200 meters on either side of mountain water sources, or 100 meters if the waters originate in the plains. A 50-meter band is protected along borders with steep embankments and a 10-meter band along flatter riverbanks.

4.1.3 Issue Analysis

What Works

AyA monitors and controls the water quality of its 125 potable water systems, using the Panamerican Health Organization (OPS) standards. Aya's potable water systems that supply more than half of the population.

The sanitation technicians who work under the jurisdiction of the rural health centers are also taking some preventive and corrective measures (Incer, personal communications 1990). DSA is eliminating or controlling some focal contamination points and exerting pressure on industries and agricultural activities to treat their wastes to some extent before they are dumped or washed into rivers or percolated into groundwater. The rural health centers are also consulted for advice on new industries and agricultural and livestock activities that may affect public health.

As a result of pressure from the Ministry of Health, public agencies, and some foreign organizations, such as the Panamerican Health Organization (OPS), some private industries and mines are treating and controlling their liquid wastes to some degree. Some communities are concerned about protecting their potable water systems and have taken legal action when deforestation or herbicide application occur close to their water sources (PID for Community Watershed

Management Project, 1990).

Costa Rica has some capacity for and conducts some laboratory water quality analysis and sampling, although some sophisticated analyses, such as microorganic compound for agrochemicals and hydrocarbon by-products, have to be sent to specialized laboratories outside the country. Some laboratory installations exist at AyA, the University of Costa Rica (UCR), the National University (UNA), the Costa Rican Institute for Training and Research in Nutrition and Health (INCIENSA), the Ministry of Health, ICE, MAG, and several private bacteriological laboratories, but only AyA systematically conducts potable water quality analysis for its own systems.

What Does Not Work

The Government has not emphasized the control and maintenance of water quality in the tributary watersheds of potable water systems or the control of wastewater quality or disposal.

Despite their legal mandate, DSA and AyA have not set official quality norms for potable water or contaminating effluents. DSA's PRONASA program, which sets effluent standards according to a water use classification system is not official and has only the Tarcoles River watershed waters have been classified. Moreover, the standards are not applied to most of the Tarcoles water bodies. Municipal potable water systems in rural areas outside of AyA's jurisdiction have little or no water quality control.

Because the water quality standards for different water uses, as set forth in the General Law of Health, are incomplete and have not been legally ratified, the court cannot fully and objectively enforce the law. As a result, court experience and clear proceedings for enforcing the contamination control law are limited.

The regulation protecting riverbanks is not enforced on private lands. The Government is required to provide relocation compensation to landowners who are displaced from land that has been developed. Although some landowners located in environmentally critical areas have been compensated, the government generally does not enforce this policy.

The General Law of Health declares water to be a public benefit and prohibits its contamination. However, informal and unwritten government policies have permitted industrial contamination to minimize production costs. For example, the commission to perform EIAs for mining activities has inadequate authority and resources to oversee and control the necessary work. The MOPT and municipalities do some open pit mining of non-metallic materials for road construction, but they do not conduct EIAs. In general, open pit mining does not respect the 10- to 50-meter protected fringe along the rivers. Also non-metallic material is often washed into the rivers, producing great quantities of sediment.

Policies and programs are not coordinated among the institutions with legal responsibility for water conservation. For example, the DSA of the Ministry of Health has been seeking financial resources for several years to implement bacteriological analysis in rural water supply systems, using its regional

142

offices (Incer, personal communications 1990). Meanwhile, AyA is planning to install two regional laboratories for chemical and bacteriological analysis also in the rural water supply systems (Mova, personal communications 1990). The two agencies should work together on those projects. Also, DSA and AyA do not coordinate and have no joint policy to control fecal contamination in river or aquifer waters.

Some institutions with legal authority for contamination control, like AyA and SENARA, contaminate rivers (the Virilla and the Tarcoles) with untreated sewage, drainage channels with agrochemicals, and groundwater with excessive percolation on over-irrigated lands (Arenal-Tempisque Project).

4.1.4 Policy Gaps and Alternatives

There is no official water quality standard nor any single institution that has the capacity to implement standards. The task of establishing official standards should be given high priority on the Government's natural resource policy agenda.

Moreover, there is no national integrated strategy for long-term water quality control or restoration of water quality. Similarly, no executive office coordinates institutional responsibilities for water quality control, oversees the national situation, nor categorizes water bodies according to their main uses. A policy alternative currently under congressional review is the New Water Law Project, which proposes concepts for watershed management such as formation of watershed leader institutions and the Executive Secretariat of Water Resources (SERH), allocation of a percentage of the water user institution's annual budget to internalize watershed management costs, organization of watershed committees, water quality categorization of the nation's water bodies according to actual and potential uses, and a scaled tax on the use of water as a vehicle for the dilution of contaminants.

No national program monitors water quality or keeps statistics on water quality evolution. However, it is possible to implement a national coordinating program for water quality monitoring in Costa Rica using the existing laboratory capacity of governmental, university, and private facilities. With a national program on water quality monitoring, statistics could be kept on the evolution of water quality and watershed deterioration or improvement. A central information system could be created to record the evolution of bacteriological and chemical water quality in key water quality stations.

An appropriate, simple technology for community/municipality groups to use in monitoring water quality in their supply watersheds has not been developed for Costa Rica. If this technology were available, such local groups could be trained and organized to monitor and control water contamination in their water supply watershed. These groups could supervise and take measures to correct negative land use practices that are producing sediments, waste disposal in water, agrochemicals in sensitive recharge areas, and surface runoff on road slopes and drainages. They could also make some simple water quality tests using field laboratory kits, periodically send samples to regional labs, and keep local statistics on water quality.

4.2 Competition for Water Resources

4.2.1 Issue Description

Lack of water resource evaluation and long-run water use planning is causing overexploitation and competition among various water uses, including hydroelectricity, irrigation, domestic consumption, waste dilution, transportation, recreation, and navigation.

As mentioned in Chapter 1, the country has enormous water potential. However, the past two decades of increasing demands for water, marked dry and rainy seasons, geographical concentration of both the population and water activities, and the lack of water use planning is beginning to cause competition for water resources. Some examples of water competition and over-exploitation include the following:

- Watershed of the River Grande de Tarcoles: The lowering of groundwater levels for potable water uses by AyA, the Public Service Company of Heredia (ESPH), the municipalities and the private agricultural and industrial sectors is affecting the Virilla River base flow, especially in the dry season (Losilla and Ramirez, 1989). This is decreasing hydroelectric generation capacity and river effluent dilution and transportation. Untreated sewage sediments and solid wastes are also increasing potable water treatment costs and reducing the life span of some machinery in the hydroelectric infrastructure (Losilla, 1989).

- The Watershed of the River Reventazon: Increasing potable water demands in the San Jose metropolitan area during the 1980s forced ICE to share part of its original water flow and storage capacity with AyA for the Orosi Aqueduct Project. ICE has had to substitute other energy sources such as burning imported fuel in thermal power plants.

- Pacuare River: ICE's proposed Pacuare Hydroelectric Project dam and reservoir conflict with uses of the river for recreation and tourist activities such as whitewater rafting.

- Watersheds of Tempisque and Bebedero Rivers: The Arenal, Corobici, and Sandillal hydroelectric ICE projects compete with the SENARA Arenal-Tempisque Irrigation Project for use of Arenal Reservoir water during the dry season, even though only 10 percent of the SENARA project is completed.

- The Barranca Aquifer: The extraction of groundwater for the Puntarenas Potable Water System has caused moderate sea water intrusion in the aquifer (Rojas, 1979). Aquifer sea water intrusion in other Pacific coastal aquifers may affect potable water availability for future domestic and tourism developments.

The 2.67 annual rate of population growth (National Census, 1984) and the

unregulated economic development are expected to seriously aggravate this competition in the next few decades.

4.2.2 Policy and Institutional Framework

Three main national institutions, SENARA, AyA, and ICE, and approximately 1,400 community/municipal organizations, including local governments, administrative boards, Rural Aquaducts Administration Committees (CAARs), Users Societies (SUs), and private enterprises, mostly in the recreation business, use the country's water resources. SENARA is the technical institution in charge of groundwater investigation and irrigation and drainage development.

AyA uses, manages, and/or supervises all public domain waters that are indispensable for carrying out its legal obligations (Law 2726 of 1961 and its reforms, Law 5951 of 1976) to administer and supervise potable water systems, urban and industrial sewage systems, and pluvial drainage. AyA can declare Water Reserve Zones to ensure future public supply or to prevent over-exploitation. In these zones, no water exploitation can legally take place without AyA's permission.

ICE develops and administers hydroelectric projects. In addition to ICE, a few administration boards and public service companies administer hydroelectric projects, such as the Electric Service Administration Board of Cartago (JASEC) and the Light and Force National Company (CNFL). Forty-four of the eighty-one municipalities manage their own potable water supply systems. CAARs and some companies, such as ESPH, also administer potable water systems. SUs administer irrigation projects.

The National Electricity Service's (SNE) major activity under Law 258 of 1941, is to regulate tariffs on public services, such as electric energy and potable water supply. The Water Department in SNE is in charge of granting permits and concessions to all water users except for the public water supply which has priority over other uses and is under AyA's jurisdiction.

To prevent water use conflicts, the Water Law and its regulations mandate SNE to keep a registry of institutional and private concessions. SNE requires the installation of regulatory devices to control the yield authorized in the concessions. In the process of granting a concession, SNE consults AyA and neighbors who might be opposed to it and publishes the request for the concession.

In granting these concessions, SNE first issues an exploration permit after consulting AyA and SENARA. SNE requires both a pumping test and collection of technical and hydrogeological information from the drilling company or interested party, which is supervised by a registered hydrogeologist. If the water supply is sufficient to meet the requests in the concession and there is no apparent conflict with other users, then the concession is granted.

SNE and SENARA regulate groundwater exploitation in the coastal zone to prevent sea water intrusion in the aquifer. This regulation prohibits groundwater extraction from drilling wells within one kilometer of the coastline, unless hydrogeological studies show no potential for sea water intrusion.

145

4.2.3 Issue Analysis

What Works

Institutional cooperation. For some new water concessions, SNE consults AyA, SENARA and other users to avoid the risk of future water conflicts. Institutions, such as ICE, SENARA, and AyA, have negotiated water use schedules and have shared the water resources in a manner that satisfies each institution's needs to the extent possible,

The principal institutions of the water resources sector, MIRENEM, ICE, AyA, SENARA, DGF, MAG and SNE, signed the Interinstitutional Agreement for Integral Watershed Management in 1987 in order to improve institutional coordination for watershed management efforts and water resource prioritization and planning.

Reserve zones. AyA has designated some reserve zones, including the Colima Aquifer Reserve Zone for the metropolitan area, the Barranca Aquifer Reserve Zone for the prevention of sea water intrusion, and the Banana River and Moin Reserve Zones for the City of Limon water supply. For the most part, these zones have helped to preserve the water availability for future public supply but occasionally public or private political pressures led to some illegal exploitation or concessions. For example, although no water is extracted from the Moin Reserve Zone, the Moin Springs discharge has been reduced because of reduction of recharge from the effects of urbanization including land covering and domestic effluent contamination.

ICE has a good network of limnographs, which are instruments used to measure the height of rivers and estimate hydroelectric potential.

What Does Not Work

Granting concessions. Only a small proportion of SNE resources are allocated to its Water Department. The department has approximately 10 employees, including professionals, technicians, and support staff, and receives some 1,000 water concession requests per year. Fifteen percent of these concessions are for groundwater and the remainder are for surface water. However, the Water Department lacks the resources and capacity for technical water studies, water use management and planning, and field control of water use. Thus, although SNE has the legal authority to administer and regulate water use, it plays a very passive role in water resource management.

In granting a concession, SNE relies on studies conducted by the interested party but also considers its own plans. Concessions are granted to ICE for power generation projects and to SENARA for irrigation projects based on unilateral institutional studies and political factors rather than national technical planning criteria.

SNE lacks the capacity to forecast possible direct or indirect conflicts with other users. Unless another affected institution or a private party identifies a problem and opposes the project, SNE takes no interinstitutional cooperative action. This unwritten policy often fails, and water competition

146

among both private and public sector interests is beginning to be a serious problem in some national watersheds.

Integrated resource evaluation and planning. There are no integrated planning groups for water resource management at the national, regional, or local levels to systematically solve institutional and private water use conflicts.

Because there is no central planning office nor clear national policy for water resource development, each institution plans its activities and development without consulting the others. Institutional projects are generally implemented under political pressure and lack adequate interinstitutional technical analysis. This situation is beginning to cause serious institutional competition for and over-exploitation of water resources.

Real cost of water and alternative economic activities comparison. The institutional practice of conducting cost-benefit studies only to solve a specific water use problem and not to compare the project to alternative water or land use projects, may be causing long-term social and economic losses such as colonization of marginal lands, deforestation, dam siltation, and unsustainable agriculture. This marginal economic and social cost should be included in the net project cost and public service tariffs.

The socio-economic problem created by not protecting the Arenal Hydroelectric Project Watershed exemplifies the potential problems of failing to include impact in the project cost. Approximately 300 landowners have properties in the Areal Watershed, which has been seriously deforested to provide for extensive cattle grazing. This activity is annually causing about 105 tons per hectare of sediment to be deposited in the water reservoir. ICE and SENARA, the water users, do include in the electric and irrigation tariffs the cost of indemnization to the landowners, which has been calculated to be approximately $4.7 million (Arias, personal communications 1990).

The incompatibility between a potable water intake for Puntarenas and the mining activity in the Barranca watershed is another example of the lack of integrated and long-term planning. A relatively low branch of the Barrenca River was chosen as the site for a potable water intake for Puntarenas because of the initial low cost of installment, maintenance, and operation. However, upstream gold mining and land clearing for cattle grazing will adversely affect this intake in the future. Putarenas' potable water system will incur high long-run costs as a result of pollution and sediment production and the resulting need for water treatment. A more appropriate location on a branch of the Barranca River which is protected from gold mining and land clearing was overlooked due to the failure to consider these long-run costs.

Water quantity monitoring. Although SNE requires and ensures the installation of regulatory devices to control the yield specified in a concession, it does not periodically check if the device remains in place.

Water quantity fluctuation is not monitored for potable water and irrigation systems. None of the existing 1,300 rural aqueducts and few of the municipal aqueducts keep water fluctuation records or test water for human consumption (PID for Community Watershed Management Project, 1990). Few of the

147

irrigation projects control channel flow for better and more efficient water use. This lack of information constrains adequate regional and local water resource planning and the design of new water projects. For example, most rural potable water system designs are technically based on a limited number of water flow measures. However, without periodic measurements, it is impossible to evaluate the natural and artificial changes in a water regime which are needed to design a system that is effective in the long run.

Water priorities. Article 27 of the 1941 Water Law sets the following priorities (listed in order from highest to lowest) for water uses, reflecting the status of the country's development at that time:

- Town aqueducts,
- Town water supply, domestic services, cattle drinking troughs, dairies, and bathing,
- Railroad and transport means supply,
- Hydraulic forces or hydroelectricity for public services,
- Hydraulic forces, hydroelectric for public services, coffee mills, sugar mills, milk and other factories,
- Irrigation,
- Hydraulic forces or hydroelectricity for private users,
- Navigation channels, and
- Water ponds for nurseries and fishponds.

Conditions have changed, however, and these priorities are no longer appropriate.

4.2.4 Policy Gaps and Alternatives

A national water resource management policy should include the following:

- Regional long-term planning and prioritization.
- Definition of the real cost of water, including conservation and alternative project costs.
- Delineation of institutional and community responsibility, authority, and management actions.
- Integrated water resource information system with data concerning water fluctuations, users, tariffs, demands, costs, and degree of efficiency for domestic, irrigation, and other uses.

148

- Environmental impact assessment of hydraulic projects.

- Provision of funds and authority to carry out the previous recommendations and other water resource management actions.

An amendment to the 1941 Water Law or a new water law project is needed to address the following needs:

- A central or regional technical planning staff to regulate and study water use priorities and alternative uses.

- An update on the above priorities that are fixed by law but are no longer appropriate.

- Financial resources for water resource management.

- Clear responsibility to the institutions, community organizations, and private users for water resource management.

- A mandate for EIAs on water projects.

Institutional networking. Individually, institutions such as ICE, SENARA AyA, and universities have valuable studies and basic data files that could be used for future institutionally integrated water projects. ICE's water monitoring network should be expanded to other monitoring stations so that information concerning potable water systems and irrigation projects can be shared.

Local water community organizations. Community and private organizations that operate and maintain water infrastructure such as potable water systems, irrigation systems, and hydroelectric projects, should be empowered to manage their water resources.

4.3 Watershed Deterioration

4.3.1 Issue Description

Watershed management is defined as "the orderly and planned activity that man develops inside a geographic area known as watershed, in order to use the natural resources in sustainable and optimal production that improves human social and economic welfare" (Losilla and Blair, 1987). In Costa Rica, watershed management is a means to control activities of people and institutions in order to preserve water resources and their hydraulic infrastructure for public services and productive activities such as potable water systems, hydroelectricity, irrigation and drainage, and recreation.

Inappropriate land use practices, unsustainable natural resource exploitation, and poor institutional coordination adversely affect the watershed

149

recharge areas. Water contamination and reduction of water infiltration resulting in surface runoff are serious problems causing soil erosion, sediment load, and reduction of stream base flows and groundwater levels.

As discussed in Chapter 1, the economic development of the country over the last century has been based on the irrational use of natural resources. Short-term rapid economic growth has dominated the development process. The public sector has given priority to natural resource uses that generate short-term profits or solve temporary problems without an integrated vision of natural resource development. This socio-political behavior toward natural resources combined with the ecological fragility of most of the national territory has provoked severe deterioration of most of the country's watersheds.

Soil erosion and water resource deterioration are the most obvious indications of the problem:

- Over 50 percent of the country is experiencing soil erosion that adversely affects sustainable production in agriculture, livestock, and forestry (Hartshorn, et al., 1982).

- Sediment flow into streams and then lakes, reservoirs, bays, and estuaries has a significant negative economic impact on the environment.

- Reduction of water infiltration, due to soil degradation, soil compaction, and watershed deforestation, and the disposal of untreated liquid and solid wastes from industry, agriculture, and urban development, are seriously undermining the quantity, quality, and distribution of national water resources.

One area where watershed land use practices and uncoordinated natural resource exploitation are having a severe adverse effect on water resources is the Virilla River watershed. This upper watershed of the Rio Grande de Tarcoles is home to approximately half of the country's human population. Many factors affect the environmental condition of the watershed, including urban expansion, deforestation, and cattle grazing practices that are reducing the permeability of recharge areas (Losilla, personal communications 1990); agricultural, industrial, and urban solid and liquid wastes and extensive use of agrochemicals are contaminating the river and groundwaters. Urban and road construction practices and quarrying are depositing high sediment loads in the water bodies. Because of the high levels of contamination, water treatment for hydroelectricity and some potable water systems is becoming extremely expensive. Reduction of groundwater levels and river base flow is diminishing water availability (Losilla and Ramirez, 1989). Excessive surface runoff from poor infiltration is causing floods in some areas.

The Barrance Watershed and its aquifer recharge areas is a very deforested and eroded area of about 510 km2. The Barranca shallow aquifer is one of two main water supply systems for the city of Puntarenas and surrounding areas. Its problems include sea water intrusion stemming from overexploitation and the expansion of cities and industries producing contamination and preventing recharge of the aquifer. The other source of water is intake from the lower

Barranca River. As discussed in Section 4.2, this intake carries a high load of sediments, agrochemicals, and domestic and landfill effluents from the upper watershed. There is also some open pit gold mining activity, which could, if expanded, become a serious public health risk, because the mercury and cyanide used to extract gold are toxic substances. Sediment load is also affecting a hydroelectric project in the middle watershed.

The Arenal Watershed, an area of 452 km2, supplies water to the Arenal-Corobici and Sandillal hydroelectric projects and has the capacity to generate 330 mw of power. The Arenal-Corobici project supplies water to an irrigated area of 6,100 ha, and will serve an additional 12,167 ha over the next five years (Castillo, personal communications 1990). The Arenal project reservoir receives enormous sediment loads from a partially deforested watershed where sustainable land use is not practiced in agricultural, livestock, or mining activities. The watershed management costs are not included in the hydroelectric and irrigation projects.

The Tempisque Watershed, part of the Arenal and Tapanti Irrigation District is 3,400 km2 in size with more than 100,000 ha of potentially irrigated land from surface and groundwaters. This watershed has been severely deforested, and agricultural and livestock practices are compacting the soil, provoking excessive surface runoff and preventing groundwater recharge. This situation is causing agrochemical and sediment contamination in three strictly protected areas and the Nicoya Gulf, and flooding in some agricultural and urban areas. Groundwater availability for present and future irrigation is expected to diminish over time.

The South Pacific Region Watershed, of about 8,800 ha, has several potable water systems for cities and farms as well as enormous potential for hydroelectric and irrigation projects. The region has been severely deforested and inappropriate agricultural, livestock, and road construction practices have provoked excessive surface runoff, causing soil erosion and river sedimentation. During rainstorms, landslides and floods are common.

Other watersheds, such as Reventazon River, Banano River, and Moin Aquifer, have natural resource base degradation and socio-economic problems similar to the cases mentioned above.

4.3.2 Policy and Institutional Framework

The ICE division of the country into 34 watersheds varying in area between 207.2 km2 and 5,079.7 km2 (Map 2) is officially recognized by international and government institutions. These 34 watersheds are grouped into six geographical regions by climatic characteristics.

National institutions have selected 10 priority macro watersheds for urgent management actions to protect national investments as well as social welfare. Priority was given to watersheds with relatively heavy public investment for hydroelectric projects, potable water systems and irrigation infrastructure, and areas with high forest and agriculture productivity and significant soil deterioration. The total area of these priority watersheds is about 18,490 km2, representing 36 percent of the national territory. The extent of action has been minimal so far, however, considering the magnitude of the problem. ("Cuencas

151

Prioritarias," 1988).

At the community and municipal level, some 1,400 micro watersheds are being used for potable water systems and local irrigation activities. Their total area has been estimated at 39 percent of the national territory by a random field trip inventory and interviews at 12 sites with a mean area of 1,500 ha in approximately 20,000 km2 (PID for Community Watershed Management Project, 1990). Much of this area overlaps the priority macro watersheds of the national institutions.

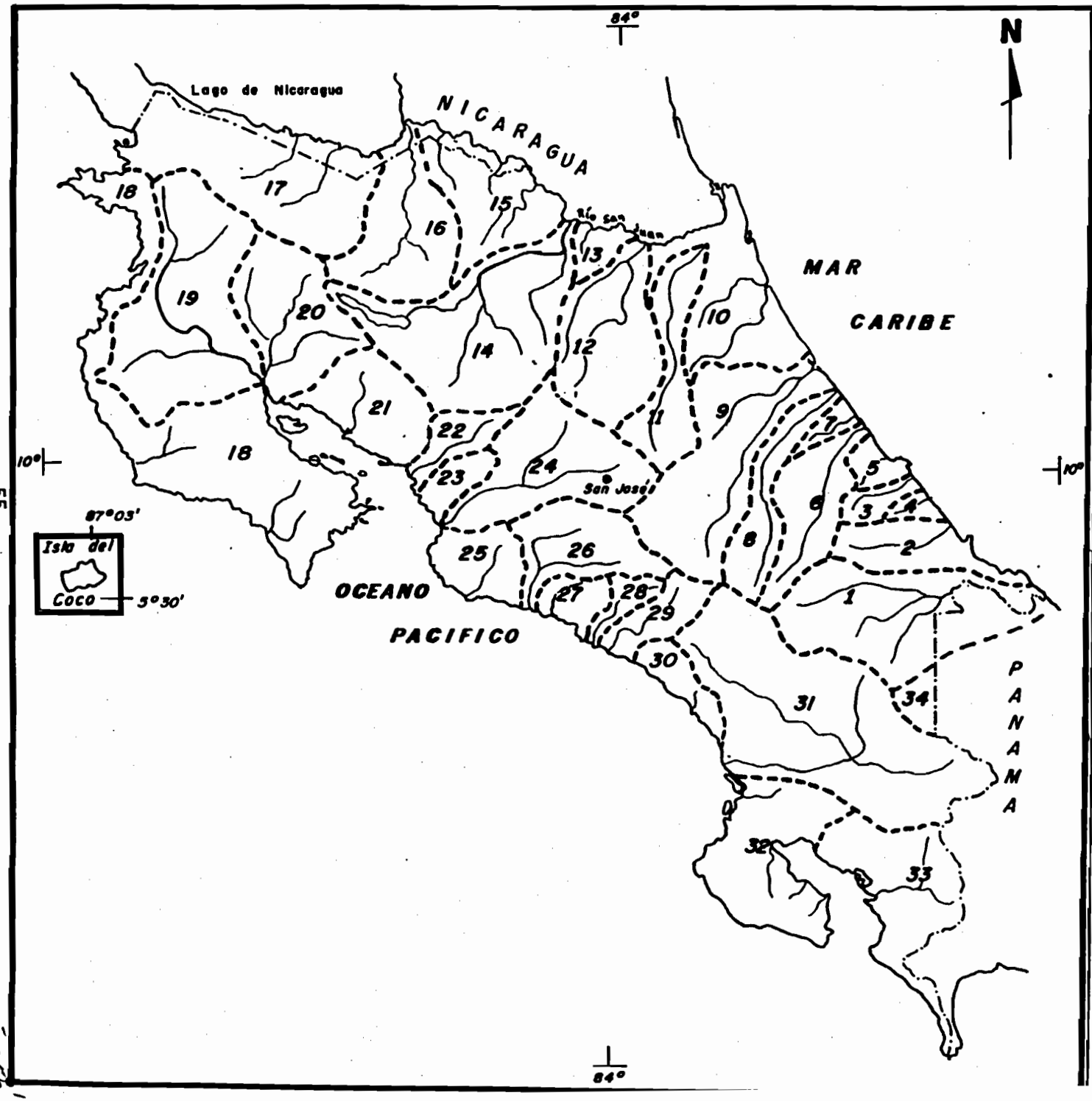
The Government's philosophy has been that each economic sector, including urban, industrial, mining, and agricultural, should be responsible for its impacts on natural resources. Consequently, a large number of institutions are considered responsible for watershed conditions.

Urban sector. Conditions of effluent disposal and treatment, domestic waste disposal, construction techniques, surface runoff disposal, and urbanization have an important impact on the watersheds. Institutions with legal responsibilities for regulating and controlling urban activity include the Ministry of Housing, National Institute for Housing and Urbanization (INVU), Environmental Sanitation Division (DSA), Costa Rican Institute for Aqueducts and Sewage (AyA), municipal governments, and the Federal College of Engineers and Architects.

Industrial sector. Industry activities that significantly affect watershed conditions are the location of plants; disposal of solid, liquid, and gaseous wastes; and treatment and processing. Institutions with responsibility for regulating these activities include the Ministry of Economy, Industry and Commerce (MEIC), Ministry of Housing, Ministry of Health, INVU, DSA, AyA, and municipal governments.

Mining sector. Quarrying and other open pit mining generally significantly affects watersheds through deforestation; soil removal; sediment production; manipulation of toxic substances; and water, soil and biological deterioration. Institutions that regulate and control mining activity include the Geology, Mining and Hydrocarbon Direction (DGMH) within MIRENEM, DSA within the Ministry of Health, AyA, and municipal governments.

152



MAP 2:
Costa Rica's Watersheds

CUENCAS

1 Río Sixaola.
2 Río La Estrella.
3 Río Banano.
4 Río Bananito.
5 Río Moín.
6 Río Matina.
7 Río Madre de Dios.
8 Río Pacuare.
9 Río Reventazón Parismina.
10 Río Tortuguero.
11 Río Chirripó.
12 Río Sarapiquí.
13 Río Cureña.
14 Río San Carlos.
15 Río Poco Sol.
16 Río Frío.
17 Río Zapote.
18 Ríos Pen. Nicoya y Costa Norte.
19 Río Tempisque.
20 Río Bebedero.
21 Río Abangares.
22 Río Barranca.
23 Río Jesús María.
24 Río Grande de Tárcoles.
25 Río Tusubres.
26 Río Parrita.
27 Río Damas
28 Río Naranjo.
29 Río Savegre.
30 Río Barú.
31 Río Grande de Terraba.
32 Ríos Pen. de Osa.
33 Río Esquinas.
34 Río Changuinola.

Agriculture sector. Inappropriate agricultural and livestock practices affect watersheds by causing deforestation, soil erosion and compaction, wastes, and agrochemical water contamination. Public institutions that provide policy incentives, technical assistance, and regulations for this sector include MAG, SENACSA, the Agrarian Development Institute (IDA), DGF, and DSA.

Transport sector. Poor road construction and unsuitable road conservation practices produce great quantities of sediment that runs into surface waters in some areas. The Ministry of Public Infrastructure and Transport (MOPT) and DGF are the institutions that regulate and control road construction to some extent.

Water users. AyA, ICE, and SENARA, the main water user institutions, also have some legal control over watershed management and water conservation. Their main legal responsibilities are described in Section 4.2. These institutions attempt to coordinate watershed management activity with some of the institutions that regulate land use planning and practices. The Interinstitutional Agreement for Integral Watershed Management signed in 1987, created the Executive Group for Watershed Management (GEC) to make political decisions and formulate watershed policies. The Technical Secretariat for Watershed Management (STC) provides technical advisors and coordinators for GEC.

4.3.3 Issue Analysis

What Works

Interinstitutional Agreement for Integrated Watershed Management. Although GEC and STC are not yet consolidated enough to coordinate sound institutional watershed actions, they have been elaborating and formulating policies, strategies, and projects for institutional and community participation in watershed management. They have promoted the following policy actions in coordination with other institutions:

- Official prioritization of 10 national watersheds ("Cuencas Prioritarias," 1988).
- Formulation of the New Water Law Project, which is under congressional review ("Anteprojecto Ley de Aguas," 1988).
- Successful promotion of watershed policy dialogue with the newly elected Government to continue institutional watershed actions.
- Proposal of a watershed management strategy based on institutional responsibility for the 10 national priority watersheds, with municipal and community participation.

Watershed diagnostics and studies. Several institutions have undertaken diagnoses and studies to identify watershed management actions, as follows:

- IFAM-DGF, through an interinstitutional agreement and with the initial collaboration of the Tropical Agronomy Teaching and Research Center's (CATIE) Watershed Management Regional Project (PRMC), has

completed watershed diagnoses for about 24 municipal potable water systems watersheds in the country.

- Municipal seminars have been sponsored to disseminate information and raise consciousness on local watershed problems (PID for Community Watershed Management Project, 1990).

- The Ministry of Planning and Economic Policy Formulation (MIDEPLAN), with the help of STC, has taken the lead in coordinating a diagnostic and management plan for the Barranca River Watershed. The management plan is currently being developed.

GEC, STC, and PRMC-CATIE have coordinated with over 12 institutions and community organizations to develop a watershed management plan for the upper Virilla River watershed, which had been declared a national pilot priority watershed. STC intends to publish a preliminary draft of the management plan (STC, Guillermo Arias,personal communications, 1990).

ICE is undertaking other watershed diagnoses and management plans for the Boruca River Hydroelectric Project watershed and AyA is doing so in some of their water supply system watersheds (STC, Guillermo Arias, personal communications, 1990).

Municipal community participation and concern. Some municipalities and CAARs, unilaterally or with other institutional support (i.e. IFAM-DGF agreement), have formed watershed and natural resource groups. These groups are taking protective actions in their water supply watersheds, such as reforestation in recharge zones, and denunciations of deforestation and agrochemical, quarrying, or livestock pollution of watersheds (PID for Community Watershed Management Project, 1990)

Donor agency actions. Recently, donor agencies have included watershed management components in their natural resource projects:

- The USAID/ROCAP RENARM Project, through CATIE, could provide technical assistance, development of capacity, and investigations of watershed management techniques.

- The FORESTA and BOSCOSA projects of USAID/Costa Rica are planning to work with community groups in their water supply watersheds as part of the buffer zone management.

- The proposed community watershed project of USAID/Costa Rica has a very decentralized structure. Community and municipal groups that oversee water supply administration, will be empowered to initiate action on watershed management.

- The RAIN project of CARE, AyA, and STC in the Quebrada and Banano river watersheds, initiated in 1990, will work at the community level to implement some watershed management projects.

Road construction policies. MOPT's general specifications for road

155

construction include environmental protection guidelines. MOPT's Manual for Road Construction calls on the private contractor to conserve and restore private and public properties and the surrounding scenery affected by the road construction activities. The contractor must take precautions to ensure minimal damage to the environment from soil erosion, river sedimentation, and other threats to running water, irrigation systems, and water bodies. Every effort must be made to minimize the aesthetic damage to the environment. If damage occurs, the contractor must make reparations. Discarding untreated wastes in water bodies is also prohibited. The engineer of the project is responsible for knowing and following the requirements specified in the contract to control contamination and erosion. If the land is under DGF or MAG jurisdiction, the engineer is responsible for knowing and following their regulations. For large road construction projects, the international funding institution usually requires an EIA.

What Does Not Work

Costs of watershed management actions. Although there is some institutional and private capacity for developing watershed management plans, there are no institutional mechanisms to provide human or financial resources to implement them. This lack of support reflects the low value that traditionally has been assigned to the natural resource base and the misconception that Costa Rica's natural resources can be exploited forever without taking conservation and management actions.

Watershed biophysical evolution and monitoring. At the watershed level, there is no systematic monitoring of the deterioration or improvement of natural resources. The lack of an appropriate methodology to monitor infiltration capacity, fertility, erosion, and water quality and quantity makes it difficult to keep statistical records of the watersheds needed to justify the cost of watershed management actions.

Institutional coordination. Institutions that use, control, and administer natural resources in the watersheds work in isolation, with minimal coordination, following no medium- or long-term integral management plan to respond to the needs of future generations. Following are two examples:

- The several institutions that deal with urban regulation lack resources, coordinate poorly with each other, and permit politics to interfere in the technical decision making process, resulting in poor planning and uncontrolled urban expansion.

- For economic and political reasons, the regulations for industrial activity have not been properly enforced by the institutions with the legal responsibility.

Other institutions have direct responsibility for regulating and controlling economic activities that could affect the natural water resources, but generally they lack the resources to carry out their duties. For example, Aya, SENARA, and ICE had a combined budget of 6 billion colones in 1986; however only 0.25 percent of these resources were allocated to watershed management (Reyes, 1986).

156

Private property rights. The constitutional right to private property often overrides public environmental welfare laws, such as the General Law of Health, DGF, AyA, and the Water Laws, impeding government efforts to regulate watershed management. The exception is when the state uses its powers to expropriate land.

Road construction. Because of economic costs, most of the private and public roads are constructed without appropriate conservation infrastructure, such as installing gabions and surface runoff control devices, and practices, such as planting vegetation cover.

For small construction projects, the private contractor is responsible for following MOPT regulations. However, the Government does not enforce the policies, and typically the contractor does not adhere to the environmental regulations.

Most of the quarrying for road construction is conducted without the required permit from MIRENEM.

Environmental Impact Assessments. Although EIAs are required for mining activities, they are done by the interested party and thus prone to bias. These studies primarily consist of an inventory and description of natural resources in the area, rather than a concrete analysis and economic compromise for specific control, conservation, and recuperation. The company typically makes a vague "sworn statement" to do its best to reduce the environmental impact in the region, but the real cost of environmental management is not seriously considered in the cost-benefit analysis. Moreover, the public institution's control over mining activities is limited due to insufficient resources and personnel.

4.3.4 Policy Gaps and Alternatives

New Water Law. The proposed new water law provides a national organizational structure for watershed management and conservation. Other potential provisions include:

- Internalizing watershed management costs for different uses and public services.
- Identifying lead watershed institutions that will have responsibility for planning and coordinating management of watersheds that already have high capital investments.
- Creating local watershed committees to implement watershed management practices.
- Developing and implementing an integrated policy and appropriate methodology to monitor the biophysical evolution of the institutional and community watersheds.

Watershed management costs. The natural resource base is undervalued, because in the past the supply of soil, wood, and water was more than adequate relative to population and demand. The current competition for natural resources

and farmland is causing the watersheds to deteriorate. Institutions and communities need to develop mechanisms to manage the watersheds and finance their costs.

Responsibilities for watershed management and conservation. Although several public institutions have legal responsibilities for watershed management, their professional staff lack the academic background and the experience and resources for watershed planning and management. Moreover, because economic power and political decision making have been centralized, local governments and community organizations lack resources and experience for watershed planning and management. STC should be strengthened and institutionalized to foster the interinstitutional coordination needed for watershed management and to develop policies and mechanisms for community and individual participation in the local watersheds. Furthermore, a process should be designed to enable local water organizations (CAARs) and agricultural organizations (CACs) to participate in watershed planning and management on behalf of their communities. Municipalities and local organizations should be empowered to manage their water supply watersheds.

National Constitution reforms. The National Constitution should be amended as follows:

- To grant more economic and political power to the municipal governments for territorial planning and watershed management in their cantons.
- To state that citizens have the right to enjoy the environment as well as the obligation to protect natural resources for future generations.

4.4 Policy Research Agenda and Policy Alternatives

4.4.1 Water Law Reforms

A new water law project is being reviewed in Congress. Designed by the Interinstitutional Commission for the Water Law Preliminary Project (CIALA), and coordinated by STC, this proposed project provides a new organizational structure and modern concepts for water resource and watershed management. Some of these new concepts or proposed policies are as follows:

- To incorporate the watershed concept into the water use project system to account for watershed maintenance and operation costs.
- To internalize watershed management costs in public service water projects.
- To create the National Council of Water Resources (CNRH) and the Executive Secretariat of Water Resources (SERH). These groups will integrate planning and foster institutional coordination according to each watershed's socioeconomic and biophysical condition and issue water resource regulations and policies.

158

- To categorize the national water bodies according to water quality as well as actual and potential uses.

- To create a scaled tariff for the use of water for transport and dilution of contaminants.

- To identify "watershed leader institutions" that will have responsibility for planning and coordinating management actions in the watershed with high capital investments for water uses.

- To create local watershed committees that could propose and implement watershed management practices.

4.4.2 National Water Plan

A dynamic process must be created in which national water use and management practices are prioritized in 15-year regional and national plans according to land use potential, integral water resource evaluation and inventory, and socioeconomic characteristics.

4.4.3 Watershed Management Secretariat (STC)

The present STC should be strengthened and institutionalized to carry out the interinstitutional coordination needed for watershed management and to act as the possible precursor to the technical group (SERH) proposed in the New Water Law Project.

4.4.4 Water Monitoring Program

The national water monitoring network (ICE permanent stations) should be expanded to include the monitoring of water resources of national, regional, and local water use projects that could be implemented at regional or local levels. The monitoring should include parameters for assessing the quantity, quality, and deterioration of watersheds. This water information should be kept in a geographical information system (GIS) to be readily available for regional or national centers to use in comparing and correlating data for technical decisions. Some installed capacity for water quantity and quality monitoring is already available (public institutions, universities, and private laboratories and offices) that could be coordinated to create a systematic national water monitoring system. The municipal and community groups can also be trained to take local measures and samples.

4.4.5 Water Management Strategies and Concepts

STC and the water user institutions should promote alternative strategies and techniques for water use and watershed management that permit the sharing of responsibility for water management and watershed conservation with community and private groups. Possible activities include:

- Small private and community hydroelectric project developments,

- Agricultural and urban waste recycling or transformation to energy and fertilizers,

- Integrated multiple use water projects,

- Water recirculation for some industry and agricultural processes,

- Artificial groundwater recharge and sea water intrusion control, and

- Public information dissemination and community participation and education in water resource use and conservation.

Moreover, the community and municipal groups related to local water use administration, such as CAARs, municipal committees, and user societies (SU); and agricultural organizations, such as Canton Agricultural Centers (CACs) and some cooperatives, should be empowered to participate on behalf of communities in watershed planning and management. Governmental institutions and STC should also define a process for local water organizations to gradually take over their watershed management obligations.

4.4.6 National Constitutional Reforms

The National Constitution should be amended to:

- Give more economic and political power to municipal governments to conduct territorial planning and to implement land use regulations and watershed management actions in their communities.

- State the right of every citizen to enjoy an adequate environment and the public and institutional obligation to protect the natural resources for future generations.

5. PRODUCTION FROM FORESTS

This chapter discusses four policy issues in forestry: deforestation, inappropriate reforestation practices, inadequate forest management, and inefficient use of forest resources.

5.1 Deforestation

5.1.1 Issue Description

During the last few decades rapidly accelerating deforestation has transformed Costa Rica from a country of abundant forest cover to one that faces a scarcity of forestland. Deforestation has occurred everywhere in the country except in the most inaccessible parts of the major mountain ranges.

Some deforestation has occurred over many years as the first step in the process of putting productive land to agricultural or pastoral use. Today, essentially all the land in Costa Rica with genuine potential for agriculture or animal husbandry has been cleared. Deforestation is now occurring almost entirely on lands whose only sustainable long-term uses are forest production or protection. Similarly, much of the already deforested land lacks the capacity for anything other than forest uses.

Deforestation of areas whose topographic or edaphic conditions require maintaining the forest cover almost always causes degradation of the land, usually through soil erosion. Obviously, it also represents loss of the forest resource itself, often followed by conditions that reduce the quality of subsequent natural forest or forest plantations. A third consequence of deforestation, especially when it occurs on a massive scale as in Costa Rica, is loss of biodiversity through the disappearance or even extinction of certain species.

Deforestation also contributes to the other urgent issues associated with natural forest management in Costa Rica. There would be little need to reforest had there not been so much indiscriminate removal of forests. Forest industries have, within a very few years, passed from having an abundance of raw materials that inhibited investment in improved technology because log prices were low, to facing a future timber scarcity that might inhibit investment. The same situation has hampered forest management. At first there was so much forest that management efforts seemed superfluous; now there is so little forest that management efforts seem hopeless.

5.1.2 Policy Framework

For over 20 years Costa Rica has had comprehensive forestry legislation which has established a national forestry agency, a national system of forest reserves, and the procedures and regulations for forest management.

Forestry Law. The current forestry law was enacted in 1990 to replace the law of 1986 which was declared void by the Constitutional Chamber of the Supreme Court because of a procedural flaw in its enactment. That law, in turn, replaced

Previous Page Missing

161

earlier legislation enacted in 1969.

The current law establishes the National Forest Service (DGF) within the Ministry of Natural Resources, Energy and Mines. It describes its powers and duties, which relate to economic development and harvesting of forests as well as to their conservation and protection. The law declares the State Forest Patrimony which includes all public lands in reserves, parks, and protected areas. The law also authorizes DGF to administer forest reserves for wood production and to collect transport taxes on logs.

Forestry Emergency Decree. The Forestry Emergency Decree of September 1987 reacted to national deforestation, stating that it has affected 60 percent of all forestland in the country. The decree directed DGF to determine how much forest remained and to take steps to control and protect it. It also ordered DGF to reduce the number of concessions and permits authorized for tree cutting.

The decree banned credit for agricultural and livestock activities that entailed removal of forest, ordered IDA to set aside 10 percent of the area of all parcels under its jurisdiction for forestry development, and banned exports of unfinished forest products.

No supplemental budget was appropriated to implement the decree, so the Ministry of Natural Resources, Energy and Mines (MIRENEM) and DGF had to try to implement it by internal reallocation of effort.

Forestry Action Plan. The Forestry Action Plan for Costa Rica, completed by MIRENEM in 1990 with assistance from the Dutch Government, establishes priorities for national and international investment in forestry in Costa Rica. It approximates the levels of investment needed and allocates them among 31 projects and programs. With regard to controlling deforestation, the plan recommends actions to directly protect wild areas, a massive reforestation effort, management of several watersheds, and management of natural forests throughout the country.

National Strategy for Conservation and Sustainable Development (ECODES). ECODES was published early in 1990 as the result of an intensive three-year effort that involved nearly 200 Costa Rican professionals. The Strategy highlights development choices in 19 sectors that Costa Rica needs to address. The discussion of forestry centers on deforestation and how to control it.

National Parks Law. The National Parks Law, which the National Legislative Assembly is currently considering revising, establishes the National Park Service and sets out its mandate to administer and protect Costa Rica's national parks.

Land Colonization Laws. These laws establish the Institute for Agrarian Development (IDA) and grant it jurisdiction to dispose of certain public lands to private owners and to purchase and redistribute certain private lands.

5.1.3 Institutional Framework

Ministry of Natural Resources (MIRENEM). MIRENEM was formed in 1986 by

162

combining subdivisions of the Ministry of Agriculture (MAG), notably the National Forest Service and the National Park Service, into a unit under MIRENEM. The idea behind the reorganization was to place under one ministry most governmental functions dealing with natural resources and environment.

SNP administers the national park system and has a history of not tolerating trespassing inside the parks. A few years ago there was a confrontation between the SNP and gold miners who were mining inside Corcovado National Park in the Osa Peninsula. The SPN, with the support of public opinion, forced miners to leave the park and prevented their return.

DGF administers the National Forestry Law. The agency is currently undergoing internal restructuring. Its most recent organigram indicates it has seven departments, as follows: forest management and harvesting, reforestation, industrial development, rural development, wildlife, research, and law.

DGF is fairly decentralized, with eight regional offices which employed a permanent staff of 270 from a total permanent agency staff of 459 in 1989. For the next fiscal year, which begins in October 1990, DGF has decided to focus on reforestation and control of deforestation.

MIRENEM is still in the process of consolidating its several institutional mandates. The National Park Service and the National Forest Service have no history of collaboration or even of coordination. They have parallel functions, however, and often administer contiguous tracts of land. Between them, the two agencies oversee most of the land in Costa Rica that still has undisturbed forest cover. One of MIRENEM's chief objectives is to halt deforestation within each of the eight areas and to bring under sustainable management those lands within the units that are available for production.

The Technical Secretariat for Forestry, along with several other similar secretariats, was established within MIRENEM by the current Government. The secretariat has taken over the planning functions formerly assigned to DGF and has principal responsibility for follow up on the national Forestry Action Plan. It operates with a small permanent staff and has no responsibility for implementation, as that function remains with DGF.

Institute for Agrarian Development (IDA). IDA has an express mandate to dispose of large blocks of state land and blocks of land purchased from private owners by redistributing the land as small farms.

National Commission for Indian Affairs (CONAI). CONAI oversees administration of Costa Rica's Indigenous Reserves, although they theoretically operate under autonomous management of the indigenous people who live on them. Most of the indigenous reserves contain substantial amounts of forest which some indigenous communities protect and manage well and some do not.

Costa Rican Electricity Institute (ICE). ICE has responsibility for providing electricity throughout Costa Rica. It operates the country's hydroelectric plants, several of which are suffering from the effects of poor watershed management, notably deforestation, in their catchments. ICE has not become directly involved in watershed management, control of deforestation, or

reforestation of watersheds, nor has it been successful in coordinating such actions through other agencies whose mandates relate more directly to land management.

Municipalities. Costa Rica's municipalities have the responsibility to supply drinking water. They have the capacity to establish water supply protection areas but often lack the managerial capacity to control deforestation in the protected areas.

Private Sector Organizations. Several conservation Non-Governmental Organizations (NGOs) have taken up the challenge of preventing deforestation. A few have become directly involved in reforestation projects and community level forest management. Others participated in ECODES or work in public education. The timber industry also has associations representing it which decry deforestation and the effects of loss of forest on the industry. In fact, forest industries, including forestry corporations and cooperatives, occupy three of the 10 seats on the National Forestry Council.

5.1.4 Issue Analysis

What Works

Direct public ownership of national parks and strict policy of prohibiting settlement and tree cutting in parks. The state owns and administers national parks for the purpose of the perpetual protection of the country's natural patrimony. National parkland is not available for consumptive uses and cannot be sold. Private individuals cannot establish claims to parkland by occupation and pursuit of productive activities. Strict rules prevent the expansion of the few private holdings in parks. The public supports the vigorous protection of parks, which probably explains the Government's success at controlling deforestation inside them.

Discontinuation of policies that promoted cattle raising on lands not suited for it. After years of criticism from national and international sources that connected high deforestation rates to national policies encouraging cattle raising, the Government discontinued the subsidies, partly through the forestry emergency decree. The Government has discontinued preferential credit for land clearing for the cattle industry. The withdrawal of subsidies, combined with low cattle prices and low yields on marginal lands for grazing, have stimulated reduction of the national herd by 600,000 head since the mid-1980s. This, in turn, has reduced forest clearing for cattle and has led to abandonment of poor cattle lands which have been allowed to revert to brush and second-growth forest.

Rules that allow DGF to keep better track of log sources. One mechanism employed to combat illegal logging is control points on highways, used to ascertain if taxes had been paid on transported logs. A DGF official together with Rural Guard personnel generally staffs these control points. Logs without the appropriate papers and DGF inspector approvals are confiscated. Under the emergency decree, DGF also declared the nighttime transport of logs illegal. This action was taken because of the ease of transporting logs undetected at night and because the civil service law prohibits most government employees from being scheduled for work after hours.

What Does Not Work

Policies which indirectly promote invasion of forest reserves and settlement inside them. Forest reserves have been expressly established for extractive uses as well as for protection. In accordance with the forestry law, the state owns land within forest reserves and manages it for the production of goods and services for public benefit. The law prohibits private ownership of lands in forest reserves unless the ownership predates establishment of the reserve or it is a new claim of ownership based on actual agricultural use of land with agricultural potential.

In practice, these exceptions to the rule of public ownership operate to encourage trespassing in forest reserves. People enter the reserves, clear a small piece of land, erect a rustic shelter, and petition DGF to recognize their claim of ownership. This forces DGF to take one of three unpleasant actions: grant title, buy out the claim, or evict the occupants. Typically, DGF responds by informally acknowledging the occupants' presence and makes no effort to dislodge them. The settlers then continue to clear forest as they attempt to make a living from the land or to improve it for resale. Moreover, hunting and fishing regulations are not well enough enforced inside forest reserves to afford adequate protection to certain species. All these activities directly contravene the purposes of the reserves and directly conflict with their intended uses, thereby reducing the capacity of the reserves to serve their functions and placing pressure on resources outside the reserves to fulfill these functions.

Policies that promote forest clearing on lands that lack the capacity for sustained agriculture or livestock production. Traditionally, Costa Rican law has recognized rights to land based on property improvement by the person claiming the right. Forest management was not recognized as an improvement, whereas forest clearing was considered as such, even on lands with no sustainable capacity for uses more intensive than forestry. Parallel to the rules on improvements were rules that did not acknowledge forested land or trees as appropriate collateral for credit. The emergency forestry decree expressly authorizes the acceptance of standing trees as collateral. The general rules remain in place, however, and the public still generally believes that forest indicates unused land.

Policy of placing forestland under IDA's jurisdiction. Some land under IDA ownership is located in forest reserves, which complicates reserve management for long-term forest uses. Other IDA land, though not located in forest reserves, contains forest and has no capacity to sustain agriculture or livestock. The redistribution to small farmers of IDA lands which have genuine agricultural potential works satisfactorily, at least from the point of view of land use. But problems arise when the IDA land lacks agricultural potential. Thus far, IDA has not recognized forest management as appropriate use of such lands by smallholders, nor has it developed forestry credit and technology packages for its clients similar to those it has developed for agriculture.

Current system of harvesting concessions in forest reserves and harvesting permits on private lands. All harvesting concessions and permits which DGF authorizes require preparation of a forest management plan by the concession or permit holder and DSG's approval of the plan. DGF does not make adequate field

inspections before approving the plans nor periodic inspections during the logging operation. The absence of a DGF field presence makes possible the use of harvest practices, including overcutting and felling techniques, that damage other trees, in some cases disturbing natural forest so much that it amounts to virtual deforestation.

Control Point Inspection of Logging Trucks. Control point inspection of logging trucks is effective in stopping only a small portion of the transportation of illegally harvested logs, and nighttime transport of logs continues. Checkpoints are unsuccessful for many other reasons, including bribery of officials. High officials have announced their intended actions in advance, ostensibly for political purposes. On one occasion, a leading newspaper carried an article that mentioned dates, times, and the area of the highway where checkpoints would be set up to deter transport of logs after dark.

Policies and practices that assign low monetary value to standing timber. Traditional stumpage prices in Costa Rica have valued standing timber in the forest at only about 3 percent of the value of timber in logs at the mill site. These very low values have contributed to deforestation by substantiating the view that forests and their trees are worthless.

5.1.5 Policy Gaps, Alternatives, and a Policy Research Agenda

Long-range, multiple resource use management plans for forest reserves must be developed. Although Costa Rica has set aside forested lands in reserves for the general purpose of providing a permanent supply of wood products, it has not attempted to make long-term plans or projections for how those reserves fit into the whole picture of national land use and supply of renewable natural resources. The national Forestry Action Plan is a step in this direction but it has not yet resulted in definitive policy statements or strategies. Several questions merit investigation:

- How should the government establish effective control in the forest reserves to ensure that all lands within them that have forest production capacity remain forested and benefit from sustained yield forest management?

- What should be the long-term rights to specific areas of forest reserve allocated to individual forest operators?

- Should colonization of IDA lands have the express intent of using the lands for sustained forest production and not for agriculture or livestock?

- What changes in policy would promote genuine forest management on privately owned lands with forest production capacity?

- What types of policies such as disincentives for deforestation should be implemented?

166

5.2 Inappropriate Reforestation Practices

5.2.1 Issue Description

National reforestation efforts for commercial production suffer from use of inappropriate species, inadequate silvicultural management of plantations, failure to define future products and markets, and poorly conceived and applied incentives.

Costa Rica's total national reforestation effort for commercial production has amounted to some 40,210 ha over the last 11 years: 36,110 ha reforested using fiscal incentives, 1,400 ha using bank credit, and 2,700 ha through private initiative ("Plan de Accion Forestal," 1990). As of 1988, almost 78 percent of the reforestation was concentrated among five species: laurel (*Cordia alliodora*), pochote (*Bombacopsis quinatum*), jaul (*Alnus acuminata*), cipres (*Cupressus lusitanica*), and pino (*Pinus caribaea*) ("Evaluacion de la Conservacion de los Recursos Biologico," 1988).

More than half of the reforestation has occurred within the last two years due to more availability of incentives, especially to small farmers. Incentives are more available because of an infusion of funding from the conversion of external debt by the Dutch government, earmarked specifically for forestry projects.

Reforestation rates have remained low despite the various incentives developed to stimulate this activity since 1979. These efforts have suffered from poor definition of strategies and objectives, little regional and national coordination, both within and among government agencies and the private and industrial sectors, badly conceived and applied fiscal incentives, and an overall lack of technical knowledge on the establishment and management of plantations and the collection and management of appropriate genetic material (Hartshorn, et al., 1982; "Evaluacion de la Conservacion de los Recursos Biologico," 1988; "Plan de Accion Forestal," 1990). The complex array of regulations governing implementation of reforestation projects aggravates this situation (Reglamentos a la Ley Forestal, 1986).

5.2.2 Policy Framework

Forestry Law. The Forestry Law of 1990 and the previous law of 1986 provide various incentives for reforestation. These include exemption from property taxes for lands registered for reforestation or forest management; exemption from import duties on machinery brought into the country for reforestation purposes, as indicated in the respective management plan and approved by DGF; and exoneration from income taxes on wood harvested from plantations by the owner, a recent reform with enactment of the new law. The law also guarantees that lands committed to reforestation or forest management are protected against invasion by squatters.

The most important are the direct fiscal incentives to be paid over a five-year period during the initial stages of plantation establishment. From 1979 until 1986, these incentives were deducted directly from a reforester's income

tax over a five-year period. After 1986, the incentives took the form of transferable bonds (Certificado de Abono Forestal or CAF), which could be used to pay taxes, or sold at slightly less than face value. The CAFs are also issued to cover the costs of combating insect pests or diseases, if DGF is informed in a timely manner and the attacks do not result from negligence or poor silvicultural practices.

To obtain the incentives for reforestation, various prerequisites have to be fulfilled. Aside from registering the property as forest cover, a forest management plan must be presented that includes a physical and ecological description of the area, species and methods to be used to establish the plantation, description and location of infrastructure, an economic analysis of the project costs and expected profits, and a cartographic survey of each plantation, among other information. A description of future silvicultural treatments, including the timing of implementation, must be included. DGF must be advised of any changes in the management plan, which are then subject to DGF approval.

According to the regulations of the Forestry Law (1986), reforestation projects are eligible for incentives if the activity occurs on lands whose use capability is less than or equal to use under permanent cover crops (class IV) of the Tropical Science Center (TSC) land use capability classification system. In other words, if the land is capable of supporting only permanent or semi-permanent crop systems (e.g. sugar cane, coffee) or less intensive uses, then it is eligible for reforestation with government incentives, all other requisites being met.

Desarrollo Campesino Program. The 1986 modification of the incentive structure from direct tax deduction to issuance of transferable bonds made incentives available to small farmers, most of whom pay no income taxes. Moreover, the Desarrollo Campesino Program was developed in order to direct some of these incentives to small farmers. However, the program was funded as a subdivision of the incentive program, so in reality, only a small portion of the incentives was reaching small farmers.

The four criteria for participation in the Desarrollo Campesino Program, prior to October 1988 were: 1) the farmer must belong to a registered organization, such as a community development association, a cooperative, or a farmers association, which would submit the required reforestation plan to DGF, administer the incentives, and provide technical assistance; 2) the farmer must live on the farm which must be the primary source of income; 3) the yearly gross income from the farmer must be less than 900,000 colones; and 4) the farmer must have title to the property.

Under this program, a farmer must reforest from one to five hectares per year over the five years. After participating in the program, a farmer is ineligible to receive incentives again through Desarrollo Campesino (Canet, personal communications 1990).

After October 1988, a debt conversion agreement was reached between the governments of the Netherlands and Costa Rica. The exchange financed the creation of the Fondo Desarrollo Forestal (FDF), which provided economic resources to

Desarrollo Campesino Program.

The criteria for receiving the FDF-financed incentives, administered by Desarrollo Campesino, are essentially the same as the pre-October 1988 criteria, except for the following: 1) the maximum size of a qualifying farm is determined from a sliding scale based on the region of the country, areal extent of the farm, and the farmer's annual income; 2) farmers without titles but with a recognized right of possession are usually eligible; 3) while the CAF provided incentives to cover both materials and labor, the FDF finances only the materials and the farmer must provide the labor.

Desarrollo Campesino uses the FDF funding to establish a rotating fund with the participating organizations. In turn, the organization must have on its staff a full-time promoter and at least a half-time forester. In addition, the organization must have transportation, office space, and enough economic resources available for gasoline and per diem for the forestry team. All accounting and administrative services for the projects are provided by the participating organization.

All funding designated for the administration and technical assistance provided by the participating organization, are negotiated separately with the FDF and the Dutch government. These areas currently account for 40 percent of the total program funding. The objective of financing projects through the organizations is, aside from institution building, to develop a source of funding for future reforestation through a rotating fund.

Policies for reforestation on public lands. There are essentially no policies for reforestation on public lands, or by public agencies. The only reforestation that occurs is on a very small scale is by the Ministerio de Obras Publicas y Transporte (MOPT), and by the Instituto Costarricense de Electricidad. MOPT has some minor reforestation projects alongside major highways. ICE is bound by their constitution to foment reforestation to protect the watersheds pertaining to their hydroelectrical projects (Ley de ICE). ICE fulfills this mission by reforesting a very small belt around the reservoirs created by hydroelectric projects. In neither case can the amount of reforestation be considered having commercial potential.

Tropical Forestry Action Plan. The Forestry Action Plan (TFAP) was a multi-sector effort, initiated by MIRENEM, and funded by the Dutch government. At this point in time, little has been done to implement many of the strategies, proposed projects, or suggested policies; however, MIRENEM has adopted the intent of the TFAP and has created the Forestry Technical Secretariat as a separate department in order to follow-up on the TFAP. The secretariat is composed of the former national staff of the TFAP (J. Sagas, personal communications 1990).

Under the section of forestry industry development, the plan discusses past efforts in reforestation, and proposes various short-term (five year) and long-term (20 year) goals and strategies. The TFAP outlines 29 specific projects to be developed over five years. Of these, 11 contain reforestation as a major component, either in the form of plantations, natural regeneration, or the development of agroforestry systems, or a combination of the three ("Plan de Accion Forestal," 1990). Many other proposed projects have components that in some way affect reforestation.

5.2.3 Institutional Framework

The National Forest Service (DGF). Under the Forestry Law, DGF is responsible for managing reforestation efforts as well as authorize and supervise forest management and forest industry activities (Ley Forestal, 1990).

As a requisite for eligibility for the reforestation incentive program, DGF must approve forest plantation management plans for the establishment of plantations. A typical management plan includes, aside from a physical-geographical-ecological description of the project area, a silvicultural description of the species to be used, an outline of the silvicultural practices to be employed, an economic analysis of the project, and a description of all the infrastructure to be built, and machinery employed, during the course of the project. The use of species and machinery must be justified with respect to the needs of the project, and has to be modified according to the recommendations of DGF technical personnel.

Reforestation efforts are managed by the Reforestation and Forestry Protection Department of DGF. This department approves projects based on their management plan and the inspection of the project site, and continues monitoring the projects through the tri-mestral inspection reports submitted by project foresters. This department also conducts field inspections of any projects that are not being appropriately managed, or in which there will be substantial deviation from the management plan (Reglamentos de la Ley Forestal, 1986).

DGF also administers the Desarrollo Campesino program, and the related Forestry Development Fund (FDF) created by the Dutch government debt exchange ("Plan Annual de Trabajo," MIRENEM, 1990).

Private sector institutions. Private sector reforestation began with the establishment of the reforestation fiscal incentives in 1979. Until that time, the principal reforestation activity was for investigative, rather than commercial purposes. Most of the activity took place at the Center for Research and Training in Tropical Agronomy (CATIE), although some private reforestation took place on Standard Fruit lands on the southern Pacific coast.

By and large, the largest extensions of plantations were established by the "reforestation companies". Most of these companies were created using the tax deductions as start-up capital; their owners are professionals in fields other than forestry.

Other private reforestation companies have developed reforestation projects not based on the fiscal incentives. These companies sell shares in plantations of high-value species, such as teak (*Tectonis grandis*), using the future market value of these species as an selling point to investors. Probably the most well known of these groups is Bosques Puerto Carillo, S.A., a company reforesting in the Nicoya Peninsula.

The largest private reforestation efforts have probably been the teak plantations of Standard Fruit, and the recently initiated efforts of Stone Container Corporation, of Savannah, Georgia, in the southwestern part of the country. Stone proposes to reforest 30,000 hectares in the next six years,

170

growing melina (Gmelina arborea) with a five-year rotation for chips to export to the United States, Panama, or southeast Asia.

Many larger reforesters and reforestation companies have formed the National Chamber of Forestry Businessmen (CANEFOR). This organization acts as a lobby for the interests of those involved in the business of reforestation. CANEFOR is also active in the development of industries and markets for products derived from plantations.

Cantonal Agricultural Centers (CAC). The Desarrollo Campesino Program is administered by DGF through community organizations, in particular the Cantonal Agricultural Centers (CACs). The CACs act as local administrators of the program, and are in charge of submitting the management plans and distributing the incentives among the soliciting farmers, as well as providing technical assistance.

Conservation and Development NGOs. The TFAP identifies 17 international organizations and 14 NGOs involved in the area of forestry in Costa Rica ("Plan de Accion Forestal," 1990). Many of these are directly involved with reforestation. Among the most active are The New Alchemists (ANAI), Arbolfilia, CARE, the Fundacion Neotropica with funding from the World Wildlife Foundation (BOSCOSA Project), and the GTZ. Most of these organizations are promoting reforestation by small farmers by providing access to materials, credit, and technical assistance.

There are also many small local associations and organizations that are involved, directly or indirectly, in promoting reforestation and agroforestry. Many are at the grassroots level, such as community women's groups. Others may be professional or union-type organizations, such as Coopemadereros, a logger and log transport cooperative that operates a forestry nursery, a small reforestation and forest management program, and sawmill in San Isidro del General.

Universities and institutions involved in forestry research. Research in the area of reforestation has concentrated on nursery and establishment techniques, mensuration (volume growth rates) during the initial stages of plantation development, and species for reforestation. In the last few years there has been increased emphasis in silvicultural treatment of plantations, and the collection and storage of genetic materials (seeds).

The main institutions involved in reforestation research in Costa Rica are the Institute of Technology of Costa Rica (ITCR), CATIE, the Organization for Tropical Studies (OTS), and DGF. There exists a minor amount of investigative work on the part of some of the private reforesters, but this has not been available for dissemination to the public.

DGF has concentrated primarily on mensuration and the development of a data base of plantation growth statistics, and the collection and storage of seeds from tree species. Some of their work includes the establishment of seed orchards on a small scale basis. They also dedicate a small amount of time to the investigation of insect pests and diseases that affect plantations.

171

The ITCR has produced a great deal of research in recent years in the area of reforestation. This work has involved investigations of silvicultural treatment of plantations, especially in the area of intermediate interventions or thinnings, and studies of reforestation species for different ecological zones of the country, but with emphasis on the higher elevations (Ortiz, 1989). The ITCR seems to incline towards reforestation, not only in research, but in their curriculum (Alpizar, personal communications 1990).

For many years, CATIE was the leader in reforestation research in Costa Rica, especially under the auspices of the MADELENA project. This project has a large component for the investigation of multipurpose fuelwood species, and generated a great deal of information regarding growth rates, plantation establishment techniques, management of plants in the nursery, response to fertilization, selection and management of genetic material, site indices, and economic factors in plantation establishment and management (CATIE, 1989). Most of this information pertains to the 14 species CATIE defined as priority multiple-use species for reforestation in Central America.

5.2.4 Issue Analysis

What Works

Providing incentives to the private sector for appropriate types of reforestation on lands suited for forestry which do not have adequate forest cover. Until 1979, there was virtually no reforestation through private initiatives. Since that time, when the fiscal incentives were first made available, 40,210 hectares have been reforested, 36,110 of which have enjoyed the incentives provided by the Costa Rican government ("Evaluacion de la Conservacion de los Recursos Biologico," 1988; "Plan de Accion Forestal," 1990). In light of these statistics, one would have to say that reforestation incentives do work if properly applied. Unfortunately, there has been no evaluation published, or other documentation, to say why the reforestation incentive system does or does not work, or to what extent (Solorzano, personal communications 1990).

For some investors in reforestation, the incentives offered by the government that do not include the CAFs, such as property tax exemptions, exoneration from import duties on machinery used for plantation establishment and management, and tax exemption status for profits generated from the harvest of forest products from plantations, are attractive enough, especially when tied to the potential value of the wood in the future. A case in point is the intensive reforestation efforts by Stone Container Corporation, which does not enjoy the benefits of the CAFs, yet does partake of the other incentives (Koberg, personal communications 1990). Other examples are the reforestation investment projects involving high value tropical woods, such as Bosques Puerto Carrillo, S.A., which sells shares in teak plantations based on expected market values after a 25 to 30 year rotation.

Whatever the objective for reforestation, the tax breaks and import duty exemption status for equipment (which includes vehicles or other machinery, if justified in the management plan and approved by DGF) are often enough of an incentive for investors in large-scale projects.

Increased availability of fiscal incentives for reforestation, in the form of CAFs or funds from the Forestry Development Fund, to small farmers through the Desarrollo Campesino program. As of 1989, 28 groups, representing over 1000 farmers, were involved in reforestation activities with CAF and FDF incentives through Desarrollo Campesino, and 2,800 hectares have been reforested (Canet, personal communications 1990). Obviously, this is not a large proportion of the total area reforested to date, but the objective is more consciousness raising. It is felt that a large percentage of farmers that have participated in the program, and are no longer eligible to participate, continue reforesting or managing their lands in a more integrated fashion using agroforestry systems and appropriate land use practices (Ibid.).

What Does Not Work

Applying reforestation incentives to forest lands which support adequate forest cover prior to reforestation. Probably the most negative aspect about the initial reforestation incentives in Costa Rica was that they permitted, in effect, the removal of forest cover in order to reforest (Hartshorn, et al., 1982; Gonzalez, et al., 1987). Countless areas of "secondary forest" were removed in order to establish plantations under the one-time tax deduction incentive afforded to reforesters. The prevalent thinking was that the replacement plantation would produce more wood volume, at a faster rate, and be easier to manage, than natural forest. This concept was not only evident in Costa Rica, but a predominant viewpoint within the forestry profession worldwide (Donovan, personal communications 1990; Duerr, 1988).

Under these incentives, in effect until 1986, the removal of low-grade, secondary or residual forest was de facto permitted for establishing plantations. DGF was not well organized and lacked sufficient personnel to inspect and supervise reforestation projects. Moreover, the decree did not establish the reforestation incentives state that the removal of cover was, or was not, a legitimate pre-establishment activity for site preparation. Likewise, there was no clear interpretation of the physical requirements, as mentioned in the decree and subsequent regulations, for approving proposals for reforestation projects (Solorzano, personal communications 1990).

The 1986 regulations to the Forestry Law, particularly article 103, stated that if the parties interested in reforestation proposed in the reforestation plan, the removal of brush, secondary forest, or forest, for the purposes of reforestation, that the site be inspected jointly with DGF personnel, in order to determine if the elimination of the vegetation, and subsequent reforestation, could be done in stages (Reglamentos a la Ley Forestal, 1986). In most cases, DGF personnel agree with the reforesters that tropical forest are too difficult to manage, and once the valuable species are removed, they are not worth managing (Koberg, personal communications 1990; Solorzano, personal communications 1990).

What these regulations did, in effect, was open the door for timber harvesting, without a management plan, with the authorization of DGF. For many reforestation projects, the profits gained from the harvest of the timber more than paid for the cost of the land to be reforested, with something remaining to buy and reforest more land. In many cases the same reforesters were the ones who removed the valuable timber, leaving, at that time, a high-graded residual forest

of poorly-formed, low value trees. With the approval of DGF personnel, the fomenters of the project could then remove the rest of the valuable timber, and, as was often the case, fell and burn the lesser value trees.

Applying reforestation incentives to lands with productive potential for agriculture or intensive livestock grazing. Prior to 1986, when the incentives were in the form of income tax deductions, they were an attractive means to reduce taxes of other businesses. Wealthier individuals and corporations often bought and reforested agricultural quality lands, particularly in the Central Valley, just to obtain the incentives. Many of these plantations suffered for lack of silvicultural treatment and proper maintenance. Moreover, the TSC system was not yet designated as the official system, so there were no guidelines to establish what lands should, or should not be reforested.

After 1986, projects that reforest lands with a use capacity of permanent or semi-permanent crops (class I-III), or less intensive uses (class IV-IX) are eligible to receive fiscal incentives (Reglamentos de la Ley Forestal, 1986).[1] Preference is given for reforestation of class IV-IX over classes I-III lands when granting fiscal incentives. In general, reforesters tend to establish plantations on better sites (classes I through VII) and avoid those areas that are best suited to forestry uses. Class I-VII lands areas tend to present the least amount of problems when reforesting and maintaining plantations, and do not carry the restrictions on harvesting that are inherent on class VIII and IX lands (Koberg, personal communications 1990). Despite the stated preference to reforest class IV-IX lands, lack of on-site inspection by DGF officials and lack of training in the use of the land use capability classification system has led to the reforestation of class I-III lands under the incentive system.

Reforesting on better quality lands reduces risk of failure. Successful plantations are important because if the plantation fails because of negligence, the reforester must reimburse DGF for the incentives. Moreover, past history of reforestation projects is an indicator of a reforester's technical ability and can be used to obtain funds for future projects.

This situation is typified by the community of Hojancha in the Nicoya Peninsula, a leader in reforestation in the country. Interest in reforestation in that area began about 20 years ago, with increased water shortages owing to the degradation of watershed through deforestation and overgrazing. Since that time the area has enjoyed funds and technical assistance from several large natural resource projects, including CORENA (AID) and MADELENA (CATIE). The promotion of reforestation and the infusion of capital it brings to local organizations and landowners has promoted the reforestation of the best local agricultural lands. The majority of the upper watersheds are still denuded and overgrazed (Kauck, personal communications 1990).

Small Scale Reforestation through Desarrollo Campesino. Although there have been some reforestation gains under the Desarrollo Campesino program, it is questionable whether reforestation is occurring at a rapid enough pace to meet

---

[1] See Chapter 3, Section 3.2 for a detailed description of the land classification system.

174

national demand. Moreover, high administrative costs per project relative to the reforestation achieved sets an economically feasible minimum land size that can be reforested. For this reason, the program did not consider granting CAFs to new groups in 1989 (Canet, personal communications 1990).

Some other negative aspects of the program include: lack of clear title for many small farms (for CAFs), particularly in the Atlantic region (estimated at 80% of the farms); half-time technical assistance is often not enough; and the cost-benefit ratio for assistance to organizations becomes too large if there is less than 40 hectares to be reforested annually (Canet, personal communications 1990). One serious drawback is the overemphasis on institution building, which has caused some local organizations to form only to gain access to incentives. In other instances, local organizations promote reforestation on agricultural class lands in order to capture more incentives, and funds from other sources, based on the large areas they have reforested, and the high rates of plantation growth on these better sites (F. Rodriguez, personal communications 1990).

Reforestation incentives at preestablished quantities per hectare that cover all costs, thus promoting cost cutting by recipients. According to the Forestry Law (1986; 1990), DGF will conduct an annual evaluation of the costs involved in reforestation, in order to fix the amount of the CAFs, or the amount of incentive to be awarded per hectare. The CAFs are designed to cover the costs of plantation establishment in the first five years of their life. At this time, the amount of the CAFs is 90,000 colones per hectare, distributed over five years (DGF, 1990).

No proof of expenses or costs are needed to obtain the annual amount of the CAF, although continued authorization of the reforestation project is subject to the approval of DGF, based on their on site inspections, and the trimestral reports of the forester managing the project. This leaves a loophole whereby reforesters can cut establishment and maintenance costs and use the money from the CAF for other purposes.

Although DGF has been cognizant of this fact, and has intensified their inspection efforts, there is still the temptation to economize on plantation establishment and maintenance costs. In the end, these shortcuts are reflected in lower growth rates, increased susceptibility to disease and insect attacks, and higher mortality rates. The Reforestation Department of DGF estimates that only 60 percent of the total material produced by plantations will be converted to useful raw material. The rest will be lost due to lack of experience in plantation establishment, or inadequate plantation maintenance and management, or both ("Plan de Accion Forestal," 1990). These factors reflect the attractiveness of the incentives to nonforestry professionals and businessmen as a tax break or capital development device, and not as an incentive to a long-term investment that requires constant technical attention.

NGO Reforestation Efforts. NGO forest projects generally are a mix of forestry and agroforestry projects, the relative amount of reforestation that takes place is small. The BOSCOSA project, for example, has promoted the planting of 29 hectares in its two years of existence (Irvine, et. al., 1989). ANAI has been actively involved in promoting the planting of improved cacao stock in the Talamanca region, along with some agroforestry and wood species. Although

175

they have had up to 700 participants contributing time and labor to some 25 community nurseries, the exact amount of reforestation that has occurred is not known (F. Rodriguez, personal communications 1990).

5.2.5 Policy Gaps, and Alternatives and a Policy Research Agenda

Probably the biggest hole in the reforestation policy framework is the lack of a national reforestation objective or policy. Although there have been several estimates of Costa Rica's demand for forest products (Hartshorn, et al., 1982; Flores, 1985; "Plan de Accion Forestal," 1990), nowhere is it clearly stated what priority should be given to products from plantations. Will plantations supply all of the wood for Costa Rica's domestic consumption? Some of it? What types of products? Are the goals set forth in the TFAP realistic?

There are also no definitive policies on reforestation by government institutions. The only policies, those for ICE and MOPT, are so broadly described that essentially no reforestation has taken place. There needs to be well defined role, at least on the part of ICE, as to how much reforestation should be undertaken, where, and for what purposes.

There are no clear policy incentives for natural regeneration of forests. The Forestry Law mentions that the CAFs are applicable to natural regeneration. DGF evaluates each application individually and awards a CAF base on estimated investment costs. In most cases, initial establishment costs are less than the CAF, but long-term management and silvicultural maintenance costs are comparable to plantations (Rodriguez, 1985). Also, although plantations can be managed for short rotations, natural regeneration requires somewhat more time to yield the same amount of commercial products. Natural regeneration is most cost effective on denuded lands of extensive forestry production (class IX) and protected lands (class X). Yet, no specific incentives exist for class IX lands and class X lands do not legally qualify for the incentives.

Most reforestation has been the result of the actions of the reforestation companies or large landowners with no formal links to the forest products industry. Now, many lack markets for the intermediate products from thinnings. While the concept of forest and industry integration talks about forging alliances between forest land owners and industries, there has been no formal policies to provide incentives for this to take place. Likewise, there are no policies that motivate the industry to reforest, or promote natural regeneration, in order to establish a source of raw materials.

Several issues must be addressed to fill in these policy gaps. Costa Rica has really only recently begun to reforest to any significant degree, and there has been no real attempt to quantify the benefits of reforestation thus far. Still, an important area of policy research is to determine reforestation's economic importance in Costa Rica, especially in light of the dwindling natural forest resource.

More importantly, it has yet to be determined whether there are economic tradeoffs between reforestation and agricultural production. This is particularly important with respect to reforestation on lands whose most intensive use capacity is for permanent or semi-permanent crops, or pasture.

Since reforestation has been promoted by government incentives, is it really profitable without the incentives on lands suitable for coffee, sugarcane, or dairy cattle? This needs to be investigated on both a national level, and on a local or regional level, where true agricultural lands may be scarce.

One question that arises is the cost effectiveness of small-scale reforestation. The contribution to national reforestation from small initiatives is relatively minuscule and requires relatively large administrative costs to obtain positive results. Because many of these projects involve some institution building, there is also a tendency for local organizations to reforest only to build up there coffers and staff through the capture of funds and incentives. There is a need to determine if reforestation should be emphasized in these projects, or if they should be financed as social forestry and environmental education initiatives with a reforestation component.

The entire incentive program should be reviewed and restructured. It is currently often used as a method to avoid taxes, and to acquire and hold on to large extensions of land. Reforestation, if undertaken in a carefully planned, vertically-integrated manner, is financially attractive even without direct fiscal incentives, as demonstrated by the efforts of Stone Container and Bosques Puerto Carillo.

A restructuring of the incentive program should take into account the final objective of the reforestation, be it high-yield, forest product production, part of an integrated farm forestry project, or for soil conservation and watershed protection. There are currently no established incentives for this latter category. In cases where plantation harvesting is restricted due to slope or soil conditions, current incentives do not justify the investment in reforestation. These problems need to be evaluated, and several different incentive schemes should be developed.

One major problem with the CAFs is that they establish an amount per hectare for reforestation which is often well in excess of the costs. One possibility is to establish an incentives process similar to that of the Fondo de Desarrollo Forestal, administered by the Desarrollo Campesino program, which has stipulated that only 70 percent of the total value of the reforestation incentive goes to the farmer. That proportion is to be used only for expenses for which the individual can produce a receipt; the other 30 percent is retained by the Centro Agricola Cantonal or other local organization administering the project. The farmer must also supply all of the labor for the reforestation (Canet, personal communications 1990). While there is some doubt that this would work for large reforestation projects by the industrialists, the blank check policy for government reforestation incentives has continued to hamper reforestation efforts in the country.

5.3 Ineffective Forest Management

5.3.1 Issue Description

Ineffective forest management practices reduce the quantity and quality of available forest resources. Historically, tropical forests have been viewed as

unmanageable masses of timber standing in the way of development (Tosi and Holdridge, 1973). This attitude still prevails to a large degree and is reflected in the manner in which Costa Rica has managed its forests. Forest management, in the true sense of the word, is essentially nonexistent in Costa Rica.

Forest management is a combination of two disciplines: silviculture, or applied forest ecology, and administration (Davis, 1972). The former is the manipulation of the forest stand to achieve certain objectives, such as increased growth or changes in the composition of the forest. The latter is the manipulation of economic, human, and physical resources to produce forest products, preferably in a sustainable manner. Forestry professionals in Costa Rica tend to view forest management strictly in silvicultural terms, forgetting the importance of the physical management of the resource. Conversely, forest industrialists have traditionally viewed the forest only as a source of raw material to be selectively harvested for high-value products, failing to appreciate that a forest can be harvested in a sustainable manner. This has been reflected in the low value accorded to standing timber, which by some estimates accounts for only about 2.6 percent of the final cost of lumber (Flores, 1985).

In recent years, the Costa Rican Government has taken a series of well-intentioned actions to protect and promote the management of the remaining forest resource. Unfortunately, in many cases, they have exacerbated the deforestation problem by stimulating the circumvention of the forestry law to avoid bureaucratic delays and documentation (Sanchez, personal communications 1990).

Current estimates of remaining forests with production potential are well below the 400,000 hectares believed necessary to supply domestic needs. Likewise, few large, unbroken blocks of commercial forest exist outside protected areas; a typical round trip from forest to mill is now estimated at 200-300 kilometers (ECODES, 1990). These factors, plus the limited timber in remaining forests due to selective cutting; the scarcity of traditional, high-value species; and the increasing expansion of secondary forest emphasize the need for more intensive and careful natural forest management.

5.3.2 Policy Framework

Forestry Law. The Forestry Law defines forests, outlines the government's and the private sector's responsibilities in their management and protection, and sets forth the requirements for harvesting them. It also defines how governmental activities are financed in order to perform regulatory duties and investigations (Reglamentos a la Ley Forestal, 1986; Ley Forestal, 1990). Many of these components of the law indirectly and directly affect how natural forests are managed for production.

An individual or other entity can solicit the Government for a concession to harvest timber from state lands, particularly forest reserves and protection zones. Timber cannot be harvested timber without the approval of both DGF and the local community. Even small stands of scattered timber and individual trees must be approved, although the procedures in these instances are different. All harvesting of natural forest and the construction of roads for harvesting must be according to a forest management plan prepared for that project. These plans

are developed by a professional forester or a professional with demonstrated forestry experience, and must include information solicited by DGF in the regulations of the Forestry Law, which are currently under revision. The professional is required to inspect the harvesting operations periodically and is responsible for any infractions or inconsistency.

The Forestry Law also provides for the collection of taxes on inventoried standing timber to be harvested, based on 10 percent of its value, as determined by DGF. DGF operates on a budget funded largely by this timber tax on harvested logs. Current stumpage prices are between 2,300 and 3,700 colones per cubic meter, depending on the type of wood and the accessibility of the area. Eighty percent of the collected taxes are distributed to DGF through the Forestry Fund to finance operations of the agency. Ten percent of the taxes are channeled to the local municipality where the wood was harvested, and 10 percent to local cooperatives and corporations involved in reforestation or forest management. This tax must be paid in advance of timber harvesting, along with a deposit that acts as a guarantee of the recuperation of the harvested forest via natural regeneration, or its replacement in the case of plantations. The harvested timber is exempt from taxes if it is to be used for high priority development projects or for domestic use by a rural population. Concessions are granted for only for the quantity of timber for which a need is demonstrated.

The law establishes various incentives for forest management, including exemptions from property taxes and the uncultivated land tax for lands voluntarily committed to permanent forest cover. DGF and the Rural Guard guarantee protection of these lands from invasion by squatters. Other fiscal incentives are mentioned as applicable to forest management, but the details have yet to be defined.

Regulations for management plans specify how the forest inventory is to be performed and what equations should be used to calculate volumes. They also establish diameter limits for harvestable trees and regeneration, such as the current 60 cm minimum diameter limit for harvestable timber. The regulations require precise information on the extraction equipment to be used, cutting unit boundaries, and the scheduling of the cutting. DGF has to evaluate this information before approval of the plan; any subsequent changes must also be approved or harvesting operations can be shut down.

Forestry Emergency Decree. The Forestry Emergency Decree was issued to arrest the deterioration and stimulate the recuperation of forest resources. It defines the responsibilities of DGF and other agencies regarding the supervision and control of timber harvesting. The Tropical Science Center (TSC) Soil Classification of Land Use Capacity was designated as the official system for institutions related to land use. The Forest Emergency Decree also permits the redistribution of DGF personnel to areas of more intensive forestry activity and states that DGF should actively promote the integration of forest and industry, although the means and resources for doing so have never been defined.

Tropical Forestry Action Plan (TFAP). The TFAP proposes various strategies, plans of action, and projects relating to the forest industry sector. The most outstanding strategy is the integration of forest and industry, which includes the acquisition of forested lands by the industry, through outright

purchase or the purchase of stumpage rights, or the incorporation of forestland owners into the industry through the issuance of shares ("Plan de Accion Forestal," 1990).

Among the projects proposed, three are specifically aimed at the wood processing industry: Adaptation of the Primary Forest Industry, Rational Commercialization of Forest Products, and Plantation Harvesting with Integrated Utilization of Raw Materials (Ibid.). Within these projects, TFAP proposes the use of financial incentives for the forest-industry integration process, the development of quality and dimensional standards for lumber and roundwood, training of loggers in felling techniques and sawmill personnel in milling techniques, and the facilitating of financing for new sawmill machinery and equipment. The training of technicians and professionals in the industry is a component of other proposed projects.

TFAP also proposes one four-year project, with extensions up to 15 years, entitled the Implementation of Management and Integrated Harvesting in Natural Forest. The project contemplates the development of incentives for forest management, and the establishment of pilot projects for forest management and silviculture investigation and demonstration ("Plan de Accion Forestal," 1990).

5.3.3 Institutional Framework

National Forest Service (DGF). DGF is primarily responsible for the implementation and enforcement of the Forestry Law. It oversees the forest harvesting, processing, and reforestation operations sometimes by direct inspection, but more often by requiring that the entities involved submit plans, periodic reports, and statistics on forestry activities. DGF is also responsible for granting permission to harvest or clear forests, transport logs, or operate a sawmill.

DGF also has an investigation component. Work to date has concentrated on procuring, testing, and improving genetic material (seeds) and on managing certain ecological types of forest. The work on genetic material is hampered by lack of funding. The latter activity tends to focus on silvicultural treatments, and avoids the economic and administrative facets of forest management.

NGOs. Only a few of the estimated 177 conservation, development, and environmental NGOs in Costa Rica work in forest management. Perhaps only the Neotropica Foundation in its BOSCOSA project and the Tropical Science Center are managing forests. In both cases, the work is in its initial stage.

Private Sector. Almost all domestically produced wood for Costa Rica's consumption comes from privately held forests, which means that the private sector really controls forest management in Costa Rica. While DGF sets requirements and requests information to grant harvesting permits, it is the logging companies and individual loggers who perform the fieldwork and actually control the felling, extraction, and transport to the mills of wood from the forest. The quality of the harvest operation, the quantity of timber removed, and the condition in which the forest is left depend on the skills and initiatives of the loggers, almost none of whom have been trained in this area.

Universities and institutions involved in forestry research. Two universities (the National University and ITCR), CATIE, and OTS undertake most forest management research. The emphasis is primarily on silviculture and focuses little on the administrative or economic aspects of forest management. The ITCR is the only one of these institutions investigating harvesting systems to any degree. The OTS is putting most of its efforts into the investigation of native species for reforestation, and they have performed little or no work with respect to silviculture or management of native forests.

5.3.4 Issue Analysis

What Works

It is believed that the integration of forest and industry would motivate private companies to become better custodians of the forests, managing them sustainably for quality materials. The integration of forest and industry would grant forest product processing industries control the forests that produce the needed raw materials, either by outright purchase of the lands, by leasing, or by issuing shares in the company to forestland owners. No formal policies have been adopted on the integration of forest and industry, but the private sector has taken some action. Portico, S.A., probably the best example of these efforts, has an active campaign of purchasing or leasing forestland in the northeastern part of the country (Sanchez, personal communications 1990).

Portico states that it manages its forests based on the natural processes that occur in tropical forests (Sanchez, personal communications 1990). It selectively harvests only a few species, although only one is used in its product line, *Carapa guianensis* (caobilla), is used in its product line--to make doors for the export market. Portico's objective in forest management is to open the canopy to promote the growth of the selected species by removing low-value, poorly formed, or overmature timber.

Jorge Sanchez, director of Portico, states that proper forest management depends on a close link between industry and the forest (personal communications 1990). The integration needs to be a combined effort of the private sector, the landowners, and the Government. Sanchez cites Portico as a successful, financially sound operation with a future source of raw material. Although unconfirmed rumors indicate that Portico imports logs from Nicaragua and has been unable to purchase the lands it needs to maintain the desired levels of plant production, the forest cover on its lands is being managed sustainably.

What Does Not Work

Forest Management Plans as required by the Forestry Law. The forest management plans required by DGF are largely descriptive and require details that are meaningless for forest management (Sanchez, personal communications 1990; J. Sagas, personal communications 1990). These plans usually consist of three parts: a description of the area (e.g. location, tenure, soils, land use capacity); a description of the resources, including results of a forest inventory; and an extraction plan stating the amount to be harvested, machinery to be used, destination of the material, and timing for the next harvest in the area.

Most woods operators view the management plan as a requirement, rather than a tool for outlining management objectives. Thus, they tend to try to complete an inventory and plan with as little investment as possible. Typically, a forester is employed to inventory the forest, and the plan is written by someone else who often has no forestry experience. Many professionals use a boilerplate format for the first and second parts, providing numbers and descriptions where necessary. In other cases, the data are manufactured. A DGF official is supposed to inspect the inventory plots to determine if the data are authentic, but cases of negligence are common.

Although the regulations for the forest management plans require periodic follow-up inventories, little is done to incorporate these inventories into the management of the resource. Often, the inventories are performed by a forester other than the one who wrote the original management plan. In essence, the plan then becomes a description of the amount of wood to be extracted during the first cutting cycle and future harvesting plans are nothing more than speculation. Since there is no assurance that the same forester will continue supervising the project, continuity of the original objectives is a problem.

Forest Management as Regulated by DGF and the Forestry Law. Some harvesting regulations are inappropriate. For example, in other countries setting diameter limits for harvestable trees is usually left to the discretion of the professionals managing the forest, based on silvicultural and forest product objectives. The government's objective of imposing a limit is to guarantee that sufficient natural regeneration is left behind. What the limit actually does is promote the harvesting of the largest and best quality trees, leaving behind a mass of poorly formed, suppressed trees.

However, many forestry professionals consider the Forestry Law to be a generally satisfactory mechanism for conserving forest resources (Gonzalez, et al., 1987). The problem lies in its uneven and undirected application to forest management, which establishes requirements that hamper private management efforts. Essentially, the law and its regulations result in forest management through DGF on a regulatory, rather than silvicultural basis.

Most decisions regarding approval of management plans or infractions of the law are made locally. On the surface, this seems appropriate. Field professionals are more in touch with actual situations than office-bound foresters in San Jose. However, the decentralization of DGF has led to different requirements in different districts, and inconsistences in the interpretation of the regulations by different officials.

As a result, confusion arises among foresters writing management plans and soliciting harvesting permits, because none of the regional requirements are available at the central office or other regional offices. Foresters writing management plans are spending inordinate amounts of time traveling to regional offices to determine specific regional regulations that cannot be obtained at the central offices or by telephone. Moreover, much of the information required by the region is requested in order to facilitate or avoid field inspections or to validate forest inventory data or the logistical considerations of the management plan. Most of the regional requirements have no bearing on the actual management of the forest resource.

Enforcement of all the harvesting regulations have created an unrealistic workload for regional personnel and a difficult climate in which to manage private forest resources. It is common for a local DGF official to have to read, inspect, and consider for approval 100 or more forest management plans for his region in one year.

Concession system for harvesting in forest reserves.
In 1988, approximately 6,941 cubic meters of wood were authorized for harvest from forest reserves, over 83 percent of the total in the southwestern part of the country (Osa Forest Reserve). Since the timber is harvested under a management plan, many problems that affect management plans are also encountered in harvesting under concessions. As the timber is harvested under concession, the plan tends to emphasize harvesting rather than forest management.

The weakest point in the concession system is probably that timber is sold based on the stumpage established by DGF, and not through competitive bidding. This practice reinforces the notion that forests are cheap sources of raw material. As a result, concessionaires do not take care to prevent damage to residual trees, soils, and roads. Likewise, there is a tendency to overharvest, cutting more in a given area than permitted or cutting outside the permitted area. Lack of DGF inspections and supervision is a major problem.

Conflict between the forest management and the DGF tax collection function.
DGF arguably does not control stumpage prices, but by fixing a low tax on standing timber, it reinforces the concept of forests as a low-value resource. Since timber sale contracts between loggers and landowners are informal, DGF has no documents showing actual timber value on which to base their tax. Instead, it must establish a price for categories of wood and charge accordingly. For a landowner desiring to manage a small tract of timber, the advance payment of a forest tax is a disincentive to manage forest, especially when combined with the costs of producing a management plan and paying a deposit.

The DGF tax collection is also inefficient. Flores (1985) pointed out that if DGF had been able to tax 100 percent of the roundwood that arrived at the sawmills during the 1982-84 period, its tax receipts would have more than doubled. If it captured taxes on 100 percent of the wood cut, the receipts would have quadrupled. Moreover, the deposit requirement, enacted just in the last year, has motivated loggers to report less wood volume in order to pay a lower deposit.

Given these conditions, DGF is perennially short of human, economic, and physical resources, which limits the amount of on-site inspection of harvesting and forest management operations it can perform. Technical assistance to landowners is also not offered.

An additional conflict arises when the taxes are considered as a source of revenue for DGF. Does DGF not limit the number of harvesting permits it grants annually in order to maintain a source of funding for its operations? In 1988, the last year for which DGF has statistics on the forestry sector, six of the country's nine regions reported increases over the previous year of the volume of timber authorized for extraction. In total, a 27 percent increase in volume

was authorized for harvest (391,000 versus 309,000 cubic meters), although this represents a decrease of 16 percent from 1987 (Chacon and Gamboa, 1989). What is surprising is that this was for the first year of harvesting under the Forestry Emergency decree.

Employment of Forestry Professionals as a Requirement for Harvesting Permits. The recently passed Forestry Law stipulates that management plans must be authorized by a forester or other professionals with demonstrated forestry experience. Unfortunately, the law does not specify how to enforce this provision, although it mentions a possible sanction of the professional forester. While it places the responsibility squarely on the shoulders of the foresters, it gives them no leverage over the logger or landowner. Nowhere is it mentioned that the logger or landowner must retain a professional forester during harvesting operations. Thus, the current Forest Law is really placing the burden of inspection, formerly DGF's responsibility, on the professional forester, with no recourse for ensuring that the plan is followed.

5.3.5 Policy Gaps and Alternatives and a Policy Research Agenda

Aside from certain tax breaks, no other incentives in the Forestry Law stimulate and improve forest management ("Plan de Accion Forestal," 1990). The absence of incentives for forest management similar to those for reforestation inhibits efforts to improve silvicultural practices in Costa Rica (Gonzalez, et al., 1987; Sanchez, personal communications 1990).

Proper incentives for forest management have yet to be defined; it is obvious from the deforestation rates that the incentives in the Forestry Law are insufficient. The TFAP proposes that different incentives involving financing mechanisms and seed money for start-up capital be provided ("Plan de Accion Forestal," 1990). Jorge Sanchez, director of Portico, and Jose Luis Sagas, superior forestry director, both state that incentives should be similar to the CAFs for reforestation (personal communications 1990), but provide only a portion of management costs for the first 15-year cutting cycle, as the sharing of risk would induce the industry to manage forests more responsibly. Sanchez estimates that 60 percent of costs, which for Portico are calculated at 160,000 colones per hectare for the first cycle, would be a good starting figure for incentives.

In a similar vein, there is neither a concrete policy nor any incentives for integrating forests with industry. The Government and the forest product industries have taken no action on the recommendations of the Forestry Emergency Decree or TFAP; the majority of the industries are not prepared and have no desire to take part in the process (Flores, 1985; J. Sagas, personal communications 1990).

While integration is a viable alternative for conserving forest resources, it raises many questions, among them:

- What is the role of government (e.g. DGF, central banking system) in the process? Motivator? Expediter? Provider of economic support?

- What is Costa Rica's carrying capacity for sawmills? Since most are operating well below full capacity, should they all be eligible for any incentives for integration?

- To what degree should small, local, community- or cooperative-owned sawmills and processing plants be considered in any national plan for the sector? If these are integrated with local forest resources and offer finished products, they are possibly more cost-effective than a few large centrally located mills, as proposed by the FORESTA project.

- What are the social ramifications, especially locally, of extensive land and stumpage rights acquisitions resulting from an integration program?

Heading the list of needed research on forest management policy is DGF's role in managing Costa Rica's forests. Although the area of commercially exploitable forest and the volume of wood it contains is decreasing annually, DGF has developed no solid policy on rationing the wood to be harvested by limiting the number of harvesting permits granted. The number of permits granted and the area authorized for harvest have actually increased during the last two years (Chacon and Gamboa, 1989). J. Sagas (personal communications 1990) indicates that harvesting has returned to the intensity of the early 1970s, an era when deforestation rates were the highest. It may be that DGF is not the institution to make these decisions, since stumpage taxes generate a large part of its operating budget (Flores, 1985).

Moreover, forest management and control of illegal logging has not worked under DGF regulations and oversight. Forest management is normally the responsibility of the landowner, be it an individual or an industry, because the owner needs to sustain an income from his forest.

DGF definitely needs to focus on certain activities and leave the rest to the private sector. While much evidence indicates that the private sector has been largely responsible for the deforestation of Costa Rica, it can also be convincingly argued that specific government policies could have prevented or at least checked the process (Kauck and Tosi, 1989).

5.4 Inefficient Use of Forest Resources

5.4.1 Issue Description

Utilization of only a few forest species, combined with waste and inefficiency in transforming raw materials into finished products, conflicts with sustained production of forest products and forest conservation.

In the past Costa Rica has been a net exporter of wood products, and its forest industry has evolved around the processing of select raw materials from primary forests ("Plan de Accion Forestal," 1990). For years, very few of Costa Rica's more than 2,000 wood species have been utilized in the wood industry. Even today, DGF specifically lists only 147 tree species in three categories for

stumpage tax purposes (DGF, 1990). The perceived abundance of this now severely diminished natural resource has meant that industry has had no impetus to use it in a sustained, efficient manner.

In a landmark evaluation of the forest industry, José Flores Rodas (1985) determined that on average only about 54 percent of the 50.8 cubic meters of wood harvested per hectare made it to the sawmill. The sawmills managed to convert only 46.5 percent of this total to useable products, almost a 75 percent loss of material between forest and consumer. The Industrial Development Department of DGF currently estimates the mill conversion figure at 48.1 percent, which means that the industry still converts only 20-30 percent of the commercial volume of a tree to products (DGF, 1988).

Costa Rica has some 161 sawmills scattered throughout the country, down from the estimated 220 sawmills of 1980. The majority are concentrated in the Central Valley and the Northern Zone ("Plan de Accion Forestal," 1990). There are also three plywood and veneer plants, two wooden match plants, and a toothpick plant. Most of the sawmills, which account for almost 90 percent of the national consumption of roundwood, have limited capacity (only 14 can produce more that 20 cubic meters per day) and old and poorly maintained equipment (Flores, 1985; "Plan de Accion Forestal," 1990).

Flores (1985) lists a number of limitations of the wood transformation industry in his evaluation. Some of the more outstanding include:

- The poor location of mills with respect to the forest resource, a drawback that results in transportation costs accounting for more than 50 percent of the value of a log f.o.b. at the mill.

- Antiquated, obsolete, and poorly maintained sawmill equipment. Of particular importance is the inadequate nature of low-cost, national sawmill machinery.

- Lack of secondary processing equipment, especially simple resaws, in almost all the sawmills. This machinery would increase yields, cut processing costs, and add value to the final products.

- Poor conceptual design of almost all sawmills on a nationwide basis. Lack of consideration of even the most basic design concepts for the industry.

- Poor management of the log decks at the mills, resulting in the loss to rot or quality degradation of almost 10 percent of the volume stockpiled nationally.

- Lack of wood classification norms that would stimulate improvements in lumber quality and the use of kiln drying.

- Insufficient training of personnel in the sawmills, particularly those operating the primary processing machines.

186

- Insufficient training of management personnel in the concepts of forest industry management.

There is little documentation of the logging and extraction methods that account for the 46 percent loss of wood that occurs in the forest. Since few loggers are specifically trained in felling and bucking techniques, damage to logs and residual trees is common, resulting in the loss of damaged portions of the log (J. Sagas, personal communications 1990). Likewise, loggers often have no idea how to cut fallen trees to maximize for volume and quality. Since their pay usually is based on the volume cut and the value of the species, loggers have no incentive to carefully fell trees or select their cuts; they try only to maximize the amount of timber to be hauled each day.

Some waste can be attributed to the use of bulldozers as the sole piece of log extraction equipment during harvesting operations. Since they are also used for road construction and loading logs onto trucks, they are available to extract logs for less than 50 percent of their total operating time on average (Flores, 1985). This fact, coupled with the scarce use of "chokers" for multiple log extraction, means that a tractor operator can skid only high-value, large diameter logs in order to justify his time. Even though they have been felled and bucked, logs that are short, rotted, small in diameter, or from low-value species are left in the woods.

Flores (1985) cites two studies, one from the San Carlos region, the other from the Limón area, that calculated 19.4 and 21.3 cubic meters of wood left in the woods as logging residuals, respectively. Between the mills and logging operations, Costa Rica is reportedly wasting 1 million cubic meters of wood per year in the form of residuals (J. Sagas, personal communications 1990).

5.4.2 Policy Framework

Forestry Law. The Forestry Law (1990) states that DGF will try to foment the integrated development of the forest industry by rationing, reorganizing and relocating it. The law contemplates a series of actions by which DGF will regulate the industry. These include issuing operating permits to existing sawmills and new ones that have a permanent, adequate, source of raw material; the closing a plant or mill that is using logs not obtained under a harvesting permit; and denying approval of low-interest loans from the national banking system, originating in the Forestry Fund, if the entity has not duly registered its facilities or complied with DGF policies with respect to the source of its raw materials, its location, or the type of machinery to be used (Ley Forestal, 1990).

In accordance with policies promoted by DGF, the law also establishes incentives for industries that reorganize, relocate, or increase their efficiency, consisting of the following:

- Exemption from import duties on machinery, equipment, and tools;

- Accelerated depreciation of assets;

- Priority in the granting of credits;

- Exemption from the required contribution to the National Institute of Learning (INA) for businesses that invest in training programs for their employees; and

- Qualification for the existing tax credit certificates (CATs) that promote exports, where applicable.

The 1986 regulations of the law prohibited the export of certain woods, and the 1990 reform of the law explicitly prohibits the exportation of wood in the form of logs.

Emergency Decree. The Forestry Emergency Decree of 1987 established various strategies and short-term lines of action to be taken by DGF and other government agencies to stop the rampant deforestation. Several articles directly affect the wood industry by regulating, through DGF, the transport, processing, and commercialization of wood. These new directorates included:

- The prohibition of the export of certain forest products, including wood in log form, in cants, or simply in sawn form if thicker than 5 mm; railroad ties; unworked boards in any form; wood with a small amount of finished work, such as tongue-in-grooved or planed; and door and window frames without the doors or glass windows and fixtures;

- Approval of nontraditional wood products for export depends on previous study by DGF;

- The importation of wood will be controlled by DGF in conjunction with the Ministry of Economy and Commerce;

- Within three months of the issuance of the decree, a register of forest product truckers and loggers was to be established for the purpose of issuing licenses to practice these professions;

- Within one month of the decree, an inventory of the wood in the log yards of all sawmills in the country was to be taken.

Official Norms for the Commercialization of Wood in Logs and Green-Sawn Lumber. In 1980, the Ministry of the Economy, Industry and Commerce, decreed certain official norms in a partial attempt to standardize dimensions for sawn lumber. It decreed the adoption of the metric system in the wood industry, as well as declared the long-used "mecate" or string measurement system as the official method for determining the volume of wood in logs (Flores, 1985). More importantly, it established accepted tolerances for variations in the length, width, and thickness of green lumber.

188

5.4.3 Institutional Framework

National Forest Service (DGF). The Forestry Law designates DGF as the institution responsible for implementation of the law and regulation of the forest industry (Ley Forestal, 1986; 1990). Within DGF, the Department of Industrial Development is the entity that regulates the forest industry. The functions of this department consist of providing technical assistance to the industry; compilation and maintenance of statistical information regarding the industry; authorization of sawmill facilities; establishment of industry norms and standards; and periodic investigation of the national and export market for wood products.

Private Sector. Within the broad category of the private sector are individuals who own the forest resource, harvest and transport timber, and transform roundwood into wood products. While DGF's mission is to regulate the industry and its associated activities, the private sector is ultimately responsible for managing the forest and converting logs to lumber.

Various groups representing the different sectors of the wood processing industry, ie landowners, loggers, truckers and sawmill operators, have evolved over the years. The main objective of most of these groups is more active participation of their members in the sector planning process at the national level, especially with respect to influencing legislation, or the developing incentives targeted at the industry; in essence, these are lobbying groups.

Probably the best known of the groups are the Camara Nacional de Industrias Madereros (CANAIMA), which represents around 64 primary wood processing companies; the Camara de Industria de Costa Rica (CICR), a mixed industry group; and the Camara Nacional de Empresarios Forestales, which represents reforestation companies but is beginning to branch into industries due to the need to process materials from plantations. These organizations had representatives working on the TFAP, as well as on various commissions of the Forestry Emergency Commission established by the Emergency Decree (Artavia, personal communications 1990).

5.4.4 Issue Analysis

What Works

Regulation of Wood Exports. The prohibition of the export of wood from certain species and certain wood products, coupled with select approval for export of high value-added wood products, or products from under-utilized species, has effectively halted the exportation of wood in the form of logs or crudely finished products.

These policies, originating in the Forestry Law and the Forest Emergency Decree, have directed some forest industries toward the development of high-quality product lines, the use of nontraditional species, and a realization of the economic potential of wood product exports. This has been reinforced by the 33 percent rise in value per cubic meter of wood product exported during the 1986-88 period; 20 percent of this increase came in the year after the implementation of these policies ("Plan de Accion Forestal," 1990). The policies have been successful because they are enforceable simply by inspecting shipping

invoices and containers as they leave the country.

Incentives for Efficiency Improvements in the Wood Industry. Some incentives for the modernization of the wood processing industry have promoted some improvements in efficiency. Two incentives in particular, the exemption from import duties on machinery and tools and the accelerated depreciation of assets, seem to be the most attractive to national businesses (J. Sagas, personal communications 1990). The idea behind theses two policies has been to motivate sawmill owners to modernize their equipment. The few companies that have taken advantage of these incentives to modernize have felt it was worth the effort (Greub, personal communications 1990; Sanchez, personal communications 1990). These industries tend to be those that have secured a permanent, future source of raw materials and are actively exporting wood products that are highly finished or are made of under-utilized species.

What Does Not Work

Lack of Standards in the Wood Industry. Lumber in Costa Rica is typically cut from logs and sent directly to outlets for sale, with little or no drying or finishing. Although some partial standards or dimension tolerances have been decreed, they are not used or enforced (Flores, 1985). When some standards are used, it is due to client specifications and not to some national or trade criteria (Greub, personal communications 1990). Since there is no price differential between dried or green wood or quality grades of lumber, there is no incentive for the kiln drying or grading of lumber. Likewise, without applicable log and lumber grading standards with lumber priced accordingly, there is no incentive to saw logs for the highest yield of the best combination of quality and quantity (Flores, 1985; "Plan de Accion Forestal," 1990).

The traditional unit of wood measurement, the tico inch, also provides no incentive for efficient transformation of wood products. All wood is sold in tico inches in spite of a government decree stipulating the use of the metric system. Problems arise with the using the tico inch for measuring logs. Since the tico inch is a product measurement representing an idealized board it should not be used to measure a cylindrical object like a log, because it will overestimate the amount of wood. To get around this problem, industries use the "mecate" or string method for measuring logs, which tends to underestimate the cubic volume of a log by 32 percent on average. This figure is very high by standards of the forestry profession and tends to provide too much leeway in the transformation of logs to lumber. As a result, large amounts of material are wasted in the transformation process.

Weak Disincentives for Traditional Industry Practices. While the policies mentioned above stimulate modernization of the industry, few companies have taken advantage of them. The primary wood processing industry is seen in Costa Rica as a custom industry and operates as such, and not an industry that yields a standard product for processing by secondary industries. Again, the selective use of certain timbers, the lack of implementation of quality standards, the irregular dimensioning of lumber, and primary processing based on custom orders all reflect this attitude. Another major limitation is seen to be the uncertain future of the forest resource: There is little incentive to modernize if by 1995 no forest will remain outside of protected areas (J. Sagas, personal

communications 1990). This gives the advantage to industries with their own source of raw materials, and the impetus to industries and institutions that promote the integration of forest and industry.

Technical Assistance. The Department of Industrial Development of DGF has the responsibility to provide technical assistance to the industry (Reglamentos de la Ley Forestal, 1986). Nevertheless, its participation in the assistance process has been nil, due to the large number of sawmills and their diverse locations, and the myriad of other functions assigned to the department, many with higher political priorities. This is complicated by the relatively few staff members assigned to technical assistance. Only two of a technical staff of nine in the central DGF office specifically provide technical assistance to the industry (DGF, 1990).

5.4.5 Policy Gaps and Alternatives and a Policy Research Agenda

Costa Rica has no policies that provide disincentives for wasteful forest product transformation practices. As mentioned above, most policies promote modernization of the sawmill's physical plant through tax breaks and import duty exemptions on equipment. Many mills operate with obsolete, poorly maintained, and fully depreciated machinery, and their owners see no need to upgrade machinery or improve milling practices, especially in light of the rapidly disappearing industrial forest resource.

The lack of adequate training of loggers, tractor operators, and sawmill personnel in efficient industrial practices is a recognized limitation to the modernization and efficient operation of the industry. Nevertheless, there have never been programs to train workers in proper tree felling and bucking techniques, sawing for high grade and volume yields, proper log scaling techniques, proper machinery maintenance (including saw sharpening), and other important industry techniques. Poorly trained personnel will continue to be a limitation in the industry until policies are defined and actions taken to remedy the situation.

Although the Government has established some standards regarding lumber measurement and dimension tolerances, there have been no written policies promoting or recognizing the difference in lumber quality. No lumber grading system exists in Costa Rica, and consumer demand has not created the need for one. It is interesting to note that most U.S., Canadian, and European lumber and roundwood grading systems are industry standards, which were not developed or implemented by governments.

The importation of forest products has begun and will increase over the next decade ("Plan de Accion Forestal," 1990). Forest product import policy has not been defined in terms of amounts, specific products, and phasing (whether availability will be rationed or demand driven). Possibly, when the economic ramifications of importing forest products is calculated, the importance of efficient forest industry practices will be recognized.

A recent study calculated that the direct economic value of forest exploitation in Costa Rica is equivalent to about 3.6 percent of total agricultural production, not including the industrial transformation of the wood

("Plan de Accion Forestal," 1990); Flores (1985) mentions that industrial forestry production was valued at 3.9 billion colones in 1983 (41.4 colones to the dollar); however, there is no recent data on nor any evaluation of the industry's importance to the Costa Rican economy. It will continue to be difficult to make informed policy decisions regarding this sector, without updated information coming from periodic evaluations of the forest products industry. Under this same program, the types of wood products to be imported should be determined, and their phased importation should be regulated.

There is definitely a need for a log and lumber quality grading system for Costa Rica. Likewise, dimensional standards must be established. One alternative is to adapt standards from other countries, but it would be preferable to develop a Costa Rican system that conforms with international guidelines. Its implementation needs to be determined, since the industry lacks the will to regulate itself. One possibility is to tax lumber not meeting the guidelines, based on the amount of waste that the undimensioned and ungraded lumber is believed to have generated. Meanwhile, intensive consumer educational campaigns should be undertaken to promulgate the advantages of the lumber standards.

At this time, it may be better to consider stronger disincentives or even sanctions for industries whose conversion efficiency does not meet an established goal. At the same time, technical assistance to the industry should be more available, and loans with easy credit terms should be more accessible to industries who make the effort to meet efficiency goals. These policy alternatives require a strong will on the part of DGF, MIRENEM, and the legislature.

Flores (1985) identified poorly trained loggers and mill personnel as a major limitation to the industry. The limited on-the-job training of older mill and woods workers reinforces the same inappropriate techniques. A distinct policy for Costa Rica would be the promotion of training in these industries, possibly through the establishment of an industry technicians school to train sawyers, loggers, woods workers, and lumber graders.

192

6. MANAGEMENT OF WILDLANDS

This chapter discusses three policy issues concerning the management of wildlands in Costa Rica: inadequate conservation of biodiversity and consolidation of wildlands, inappropriate land uses in buffer zones, and inadequate long term planning for ecotourism activities.

6.1 Inadequate Conservation of Biodiversity and Consolidation of Wildlands

6.1.1 Issue Description

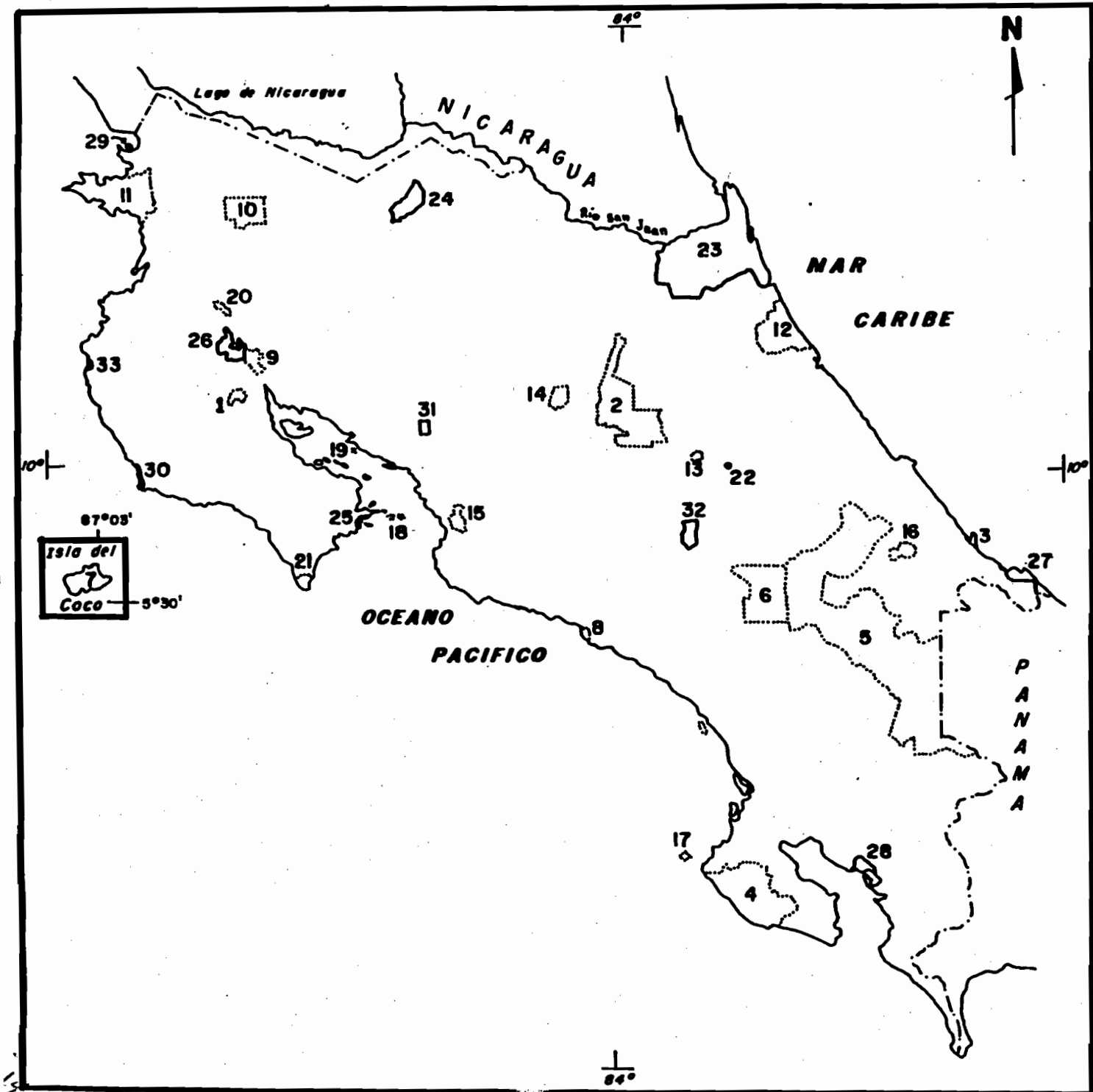
Chapter One of this Inventory makes reference to Costa Rica's enormous diversity of flora and fauna. Over the past few decades, Costa Rica has established a system of protected areas for the purpose of protecting the environment and conserving national biodiversity. How to attain this goal continues to be an important issue.

During the 1960s, conservation initiatives reflected national land use priorities and pressures by placing forested lands and ecosystems under protection, primarily in isolated, mountainous areas of the country. More accessible lands and ecosystems were available for settlement and were not protected under this policy. Since 1969, there has been a gradual consolidation of the protected areas and extension of their reach to include additional biological and cultural resources that had formerly been unprotected. Many new protected areas have been established and the legal framework that supports administration of the protected areas has been expanded and strengthened (Ugalde, 1989).

During this period, however, forested areas throughout the country have suffered intense pressure for clearing for settlement and cattle raising. This deforestation has greatly reduced the areas of most of Costa Rica's terrestrial habitats and this has reduced available living space for the nation's plants and animals. A few plant species, and a significant number of animals - especially the large predators like jaguars and eagles, and the large hebivores like tapirs - have declined dramatically because of habitat loss. Other species, mostly those prized for food, like sea turtles and monkeys, and those prized for commerce like parrots and wild felids, have declined from hunting and live capture.

Today, close to 25 percent of Costa Rica's national territory lies within one or another of the more than sixty public management land units that have been established across the country. These units range from areas of highly restricted use, such as national parks and biological reserves, through natural reserves, national monuments, wildlife refuges, and protective zones, to forest reserves in which a variety of uses are permitted and encouraged (Map 3 and Map 4). In actuality, under this system, about 12 percent of the country benefits effectively from strict protection.

193



MAP 3: Costa Rica's Wildlands under Strict Protection

PARQUES NACIONALES

1 Barra Honda.
2 Braulio Carrillo.
3 Cahuita.
4 Corcovado.
5 Cordillera de Talamanca.
6 Chirripó.
7 Isla del Coco.
8 Manuel Antonio.
9 Palo Verde.
10 Rincón de la Vieja.
11 Santa Rosa.
12 Tortuguero.
13 Volcán Irazú.
14 Volcán Poas.

RESERVAS BIOLOGICAS

15 Carara.
16 Hitoy Cerere.
17 Isla del Caño.
18 Islas Guayabo y Negritos
19 Isla de Pájaros.
20 Lomas Barbudal.

RESERVA NATURAL ABSOLUTA

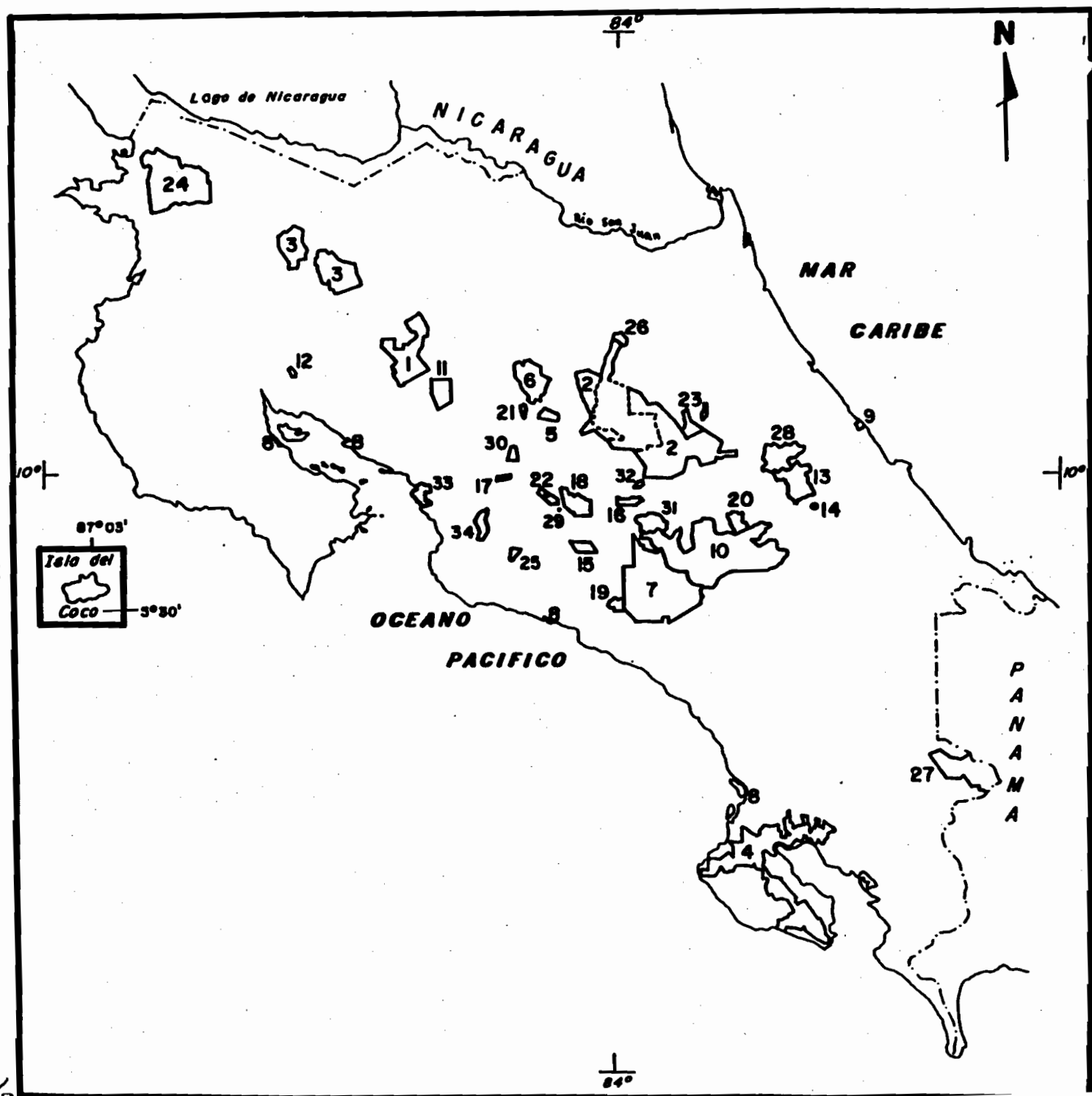
21 Cabo Blanco.

MONUMENTO NACIONAL

22 Guayabo.

REFUGIOS DE VIDA SILVESTRE

23 Barra del Colorado.
24 Caño Negro.
25 Curú.
26 Dr. Rafael Lucas Rodríguez C.
27 Gandoca y Manzanillo.
28 Golfito.
29 Isla Bolaños.
30 Ostional.
31 Peñas Blancas.
32 Tapantí
33 Tamarindo.



MAP 4: Costa Rica's Wildlands under Limited Protection

RESERVAS FORESTALES

1 Arenal.
2 Cordillera Volcánica Central.
3 Cordillera de Guanacaste.
4 Golfo Dulce.
5 Grecia.
6 Juan Castro Blanco.
7 Los Santos.
8 Manglar *
9 Matina.
10 Río Macho.
11 San Ramón.
12 Taboga.

ZONAS PROTECTORAS.

13 Barbilla.
14 Cabecar.
15 Caraigres.
16 Cerro La Carpintera.
17 Cerro Atenas.
18 Cerros de Escazú.
19 Cerro Nara.
20 Cuenca del Río Tuis.
21 El Chayote.
22 El Rodeo.
23 Acuíferos de Guácimo y Pococí.
24 Guanacaste.
25 La Cangreja.
26 La Selva.
27 Las Tablas.
28 Pacuare.
29 Quitirrisí.
30 Río Grande.
31 Río Sombrero-Río Navarro.
32 Río Tiribí.
33 Tivives.
34 Turrubares

* Se indica sólo la localización de algunos.

Forest reserves should serve multiple purposes of production and conservation. But they suffer environmental degradation and loss of biodiversity due to inefficient management, insufficient personnel, and lack of field control.

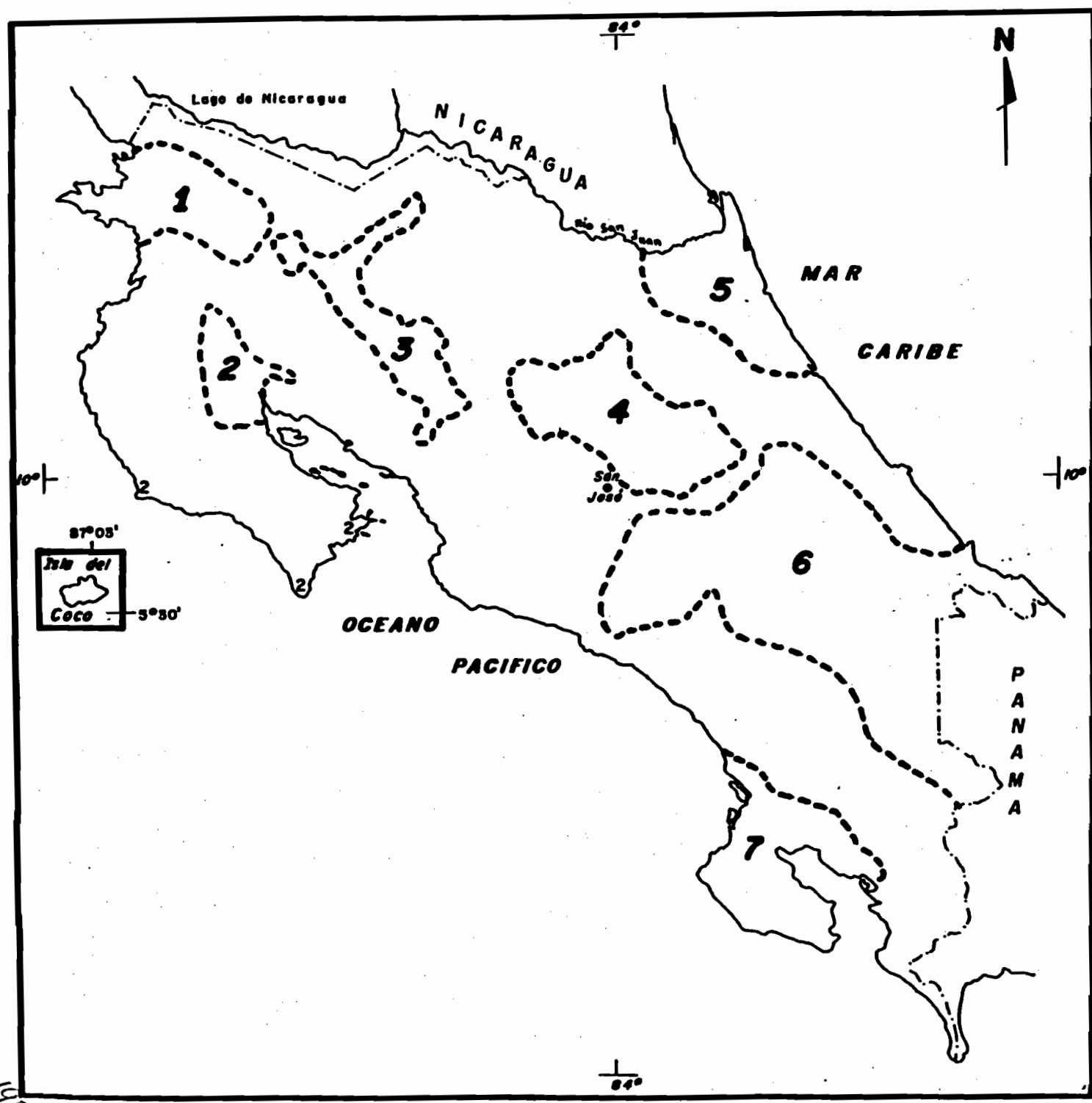
The current system of national parks and reserves furthers two general objectives: to preserve the biological diversity of plant and animal species and to promote sustainable production of goods and services to the populations living near the parks and reserves.

Costa Rica, then, currently faces the issue of how to fully protect and conserve biodiversity and simultaneously obtain economic benefits from its protected areas. In the course of dealing with this issue the concept of "conservation areas" has gradually evolved. Conservation areas consist of groupings of wildlands, contiguous to or close to each other, which are zoned for purposes of management, considering their ecological characteristics and the participation of neighboring citizens and communities. The areas have one or more core zones, reserved primarily for conservation of biodiversity, and surrounding zones allocated to sustainable development that supports a degree of land use which permits the movement of animal species from one core zone to another.

The conservation area concept flows from the belief that the only way to guarantee against the loss of biological diversity is to protect those areas that still retain natural ecosystems in relatively undisturbed condition. These areas must be large enough and sufficiently intact to ensure the continuity of their ecosystems by maintaining their capacity to reproduce and perpetuate themselves.

Costa Rica is considering the adoption of the concept of conservation areas as its official management system for protected areas ("Consolidacion de las Areas Silvestres del Pais," 1989). The government has identified eight conservation areas: Guanacaste, Tempisque, Cordillera Volcanica Central, Arenal-Monteverde, Tortuguero- Barra Colorado, Reserva Biosfera La Amistad, Peninsula de Osa, and Parques Marinos on Coco Island (Map 5) and has developed action plans for some of them. Each area includes a melange of national parks, other protected areas, forest reserves, and, in some cases, indigenous reserves. Interinstitutional management commissions for each conservation area, under the leadership of the National Park Service, would have representation from the other agencies in charge of the areas' constituent units and, often, from Non Governmental Organizations (NGOs). The commissions would define policies for each conservation area and make technical recommendations for their use and management.

Because the conservation area concept is unproven and its administration entails innovation, it remains uncertain whether it could truly conserve Costa Rica's biodiversity.



MAP 5:

Proposed National System of Conservation Areas

AREAS

1 Guanacaste.
2 Bajo Tempisque.
3 Arenal.
4 Cordillera Volcánica Central.
5 Llanuras del Tortuguero.
6 La Amistad.
7 Península de Osa.

6.1.2 Policy Framework

The most significant laws for protected areas and conserving national biodiversity are the National Parks Law, the Forestry Law and a series of wildlife laws. The National Parks Law, No. 6084 of 1977, establishes the National Park Service and confers responsibility upon it to manage and protect natural and cultural resources present inside national parks, biological reserves, and national monuments. Each such conservation unit is established by executive decree. The management objectives for each type of unit restrict activities that could produce adverse impacts on the resources under protection within the unit. The law authorizes the Park Service to define technical criteria that will safeguard conservation inside each unit under its management.

The Forestry Law, No. 7174 of 1990, establishes the National Forest Service (DGF) and sets out policy for managing Costa Rica's forest reserves. The forest reserves function as a source of forest products from public lands but also as reserves to conserve forest resources in their diversity and in their availability for future use.

A series of wildlife laws establish National Wildlife Refuges, and the Wildlife Division within the Ministry of Natural Resources. The Wildlife Division administers wildlife refuges for the protection and management of their flora and fauna. These laws prohibit hunting and capture of endangered animals and control hunting and fishing generally by establishing seasons, size limits, and other protective measures.

In addition to these laws, Costa Rica recently has supported two major studies on strategies for natural resource conservation. The Costa Rica Conservation Strategy for Sustainable Development (ECODES), published in 1989, was developed over a period of two years under the direction of the Ministry of Natural Resources, Energy and Mines (MIRENEM), with the participation of over 200 professionals from various public and private institutions. The strategy establishes guidelines for sustainable development and examines issues related to wildlife protection and conservation of biodiversity. The second study, The Tropical Forestry Action Plan (TFAP), was prepared by the Ministry of Natural Resources in 1989, with funding from FAO. TFAP establishes priorities for managing wildlands and seeks financial support from international development assistance agency to carry out those priorities.

For a number of years Costa Rica has had a defacto policy of supporting private sector involvement in conservation. Examples include the Tropical Science Center (TSC), which manages the Monteverde Cloud Forest Reserve and has overseen its expansion and protection, and the Organization for Tropical Studies (OTS), which manages a biological and ecological research station at La Selva and has been instrumental in advocating the establishment and expansion of Braulio Carillo National Park. Other private lands function for the multiple purposes of conservation, recreation, and ecotourism.

Debt for Nature Swaps have been one mechanism whereby the government has encouraged private sector involvement in conservation. In the past, Costa Rica actively encouraged purchase of public debt instruments by international conservation NGOs for conversion to local currency to apply to management of

conservation areas. However, the Central Bank has recently suspended public debt for nature swaps, including a $5.8 million swap for general conservation projects and a $5 million swap for La Amistad National Park ("Central Bank Delays 'Debt for Nature' Swaps." Tico Times, August 3, 1990).

Costa Rica has recently begun to experiment with innovative ways to accomplish conservation administration with national public funds. The government has authorized the establishment of "Patrimonial Funds" in which public monies appropriated for conservation are administered by national NGOs like Fundacion Neotropica under the direction of a board of directors composed of public officials and private persons. Patrimonial Funds have the legal capacity to accept money from private as well as public sources.

6.1.3 Institutional Framework

The Ministry of Natural Resources, Energy and Mines (MIRENEM) is the main public sector institution involved in managing and administering protected wildlands. In 1986, the public agencies charged with managing and administering protected wildlands - the National Park Service, DGF, and Division of Wildlife - were transferred to MIRENEM from the Ministry of Agriculture. The purpose of this reorganization was to provide a more solid and more farsighted institutional setting for conservation policy and administration. MIRENEM has instituted important changes in the organizational structure for administering wildlands, including the consolidation of several types of protected areas and reserves into the National System of Conservation Areas, SINAC. The Ministry has also integrated the administrative functions of the National Park Service and DGF in relation to conservation.

The National Park Service has principal responsibility for defining and carrying out wildlands conservation and management policies under the supervision of MIRENEM. Traditionally the park service has administered national parks, biological reserves, and archeological monuments. At present, expansion of the scope of the park service's authority, especially as regards administering conservation areas, is under discussion. During the 1980s the park service took on an increased administrative load as numerous new units were added to the national array of parks and protected areas but did not benefit from concomitant increases in budget and staff. Continuing overload of the agency partly explains the shift of some field management responsibility to NGOs.

Among its responsibilities, DGF is supposed to conserve forests inside national forest reserves and protective zones. With the inclusion of some forest reserves inside the newly designated conservation areas, the forest service will coordinate conservation in these reserves with the park service.

The Wildlife Division within MIRENEM is responsible for the administration and management of wildlife refuges.

In addition to MIRENEM, the National Commission on Indigenous Affairs has the responsibility of protecting natural and cultural resources inside Indigenous Reserves. Although it does not directly define the management policies for each reserve, the Commission does coordinate management with the indigenous Development Associations and local groups. Incipient coordination between the

Commission and MIRENEM should increase if the concept of conservation units gains ground.

There are several NGOs that are very active in the field of natural resource conservation. The most noteworthy Costa Rican NGOs are the National Biodiversity Institute (INBio), the National Parks Foundation (FPN), the Tropical Science Center (TSC) and the Organization for Tropical Studies (OTS).

INBio, established in 1988 with funds obtained through a debt for nature swap, has set out to prepare a national biological inventory, to form a scientific museum, to promote environmental education on the importance of biodiversity, and to train field personnel to work in wildlands. It also promotes applied research in sustainable development of biological resources.

FPN is dedicated to supporting programs and projects undertaken in wildlands areas. It is the body that administers debt conversion funds for wildlands and it also coordinates programs in field support for wildlands management.

TSC conducts research and field studies in areas of natural resource management and conservation. It also administers the Monteverde Cloud Forest Preserve, a privately owned reserve active in conservation and ecotourism.

OTS is an international organization of educational institutions engaging in biological research, training and education in wildlands areas of Costa Rica. Two conservation areas where OTS is involved are Braulio Carillo National Park and La Amistad National Park. OTS participates in the high level coordinating commission for conservation areas and also manages private wildlands areas, notably La Selva and Wilson Botanical Garden.

International conservation NGOs and public agencies also provide financial and technical assistance for Costa Rica's conservation areas. Their participation in the management of these areas has helped consolidate the national program. Among the many organizations involved, World Wildlife Fund (WWF), The Nature Conservancy, Conservation International, the International Union for the Conservation of Nature and Natural Resources (IUCN), and The United Nations Educational Scientific and Cultural Organization (UNESCO) merit special recognition.

6.1.4 Issue Analysis

What Works

A clear national position with respect to compliance with legislation on national parks and biological reserves. Popular support and respect for the protection of national parks and biological reserves is strong. Continuous presence of park service personnel in the frequently visited national parks like Poas and Irazu, as well as park service environmental education programs, have molded and reinforced these public attitudes. With this public support, Costa Rica has protected its national parks effectively from settlement and from incursion for logging, hunting, and other activities that are incompatible with strict protection. With respect to wildlife, flora and fauna that are inside

- 700

national parks receive satisfactory protection that assures their existence.

Convergence of public and private interests in conservation. Costa Rica has achieved consensus among public and private (NGO) interests to ensure the management and administration of protected wildlands. NGOs like WWF, OTS, TSC, and Fundacion Neotropica have responded to MIRENEM policy initiatives by providing technical and financial support.

Establishment and operation of InBio. The presence of InBio makes it possible, for the first time in Costa Rica, to consolidate most of the existing information on biodiversity and to expand this information base through basic and applied research. It also increases national capacity to provide scientific training on how to collect, organize, and process data on biodiversity.

Long-term financial support mechanisms. Long-term financial support mechanisms have the capacity to attract investment in both national and international currencies and apply it to Costa Rica's conservation priorities. Properly applied, they guarantee the conservation of biodiversity and promote sustainable development in designated conservation areas.

What Does Not Work

Technical and institutional conflicts over designation of conservation areas. Some proposed conservation areas do not have clearly defined legal or institutional support because of differences of opinion over where to establish their boundaries, what kinds of activities to undertake inside the areas, and which institutions should have jurisdiction over which functions of the areas. In most instances there is consensus, however, that the proposed conservation areas do exhibit high potential to conserve biodiversity. The La Amistad Biosphere Reserve provides an example of a large, physically diverse area composed of national parks, forest reserves, indigenous reserves and protective zones for municipal water supplies. The several institutions involved in administering the various protected areas agree in principle on comprehensive management of the whole biosphere reserve for a multiplicity of objectives. This agreement has not yet translated into precise assignment and acceptance of institutional responsibility, however, nor allocation of uses on the ground.

Absence of sound technical criteria for establishing and managing conservation areas. Several of the conservation units are not accomplishing the objectives for which they were established and hence are not conserving biodiversity as well as they should. For instance, many of Costa Rica's plants and animals are not inside the protected areas. For them, especially those that are rare or which require large territories, the situation is much more precarious. Their numbers, and in some cases, their survival are threatened from two causes: habitat destruction and direct exploitation.

In some cases, the criteria under which a protected area was established do not coincide with the actual conservation functions the area should perform. The Rio Macho Forest Reserve provides one example. The reason it was established was for watershed protection. But its designation as a forest reserve does not really allow it to fulfill that objective well. It probably should have been designated as a different type of protected area that would provide stricter

101

controls over land uses inside it. Similar situations obtain at the Barbilla and Las Tablas Protective Zones which should probably be included within a National Park.

The fact that changes in conservation category have been recommended for many of the existing protected areas underscores the fact that the technical criteria under which they were established were inadequate or improperly applied. This means that the national system for selecting protected areas requires more planning and definition.

Similar observations as those just made with regard to establishment of protected areas hold true for their management. Because biodiversity has not been fully studied, precise methodologies for managing natural areas to conserve biodiversity do not exist yet. This has created a vacuum with respect to how to really manage the resources inside declared conservation areas.

Lack of inter-institutional coordination in carrying out regional policies. Up to now, the several national agencies responsible for applying policy and managing natural resources have not concurred in regional goals or plans or coordinated their respective activities at the regional level. This has led to conflicts and ineffectiveness with regard to conserving biodiversity. It is important to formalize inter-sectoral, regional mechanisms that will reduce pressures that damage conservation areas.

Noncompliance with laws governing indigenous reserves. With regard to the management of indigenous reserves, although clear legislation exists on administrative procedures and governmental support to the people who live in the reserves, the law is not obeyed and the indigenous peoples do not have the benefit of sound management an conservation of the resources within the reserves.

6.1.5 Policy Gaps, Alternatives and a Policy Research Agenda

Absence of economic evaluations of wildlands in national plans. Costa Rica produces national development plans that set development goals based on economic evaluations. These evaluations do not consider the economic value of wildlands and thereby ignore the contribution wildlands can make toward economic development and the satisfaction of human needs. The national planning process should include economic evaluation of wildlands.

Lack of formal policy on private conservation areas. Although Costa Rica has benefitted from very favorable experiences in private conservation, these experiences occurred in the absence of any formal policy to support or encourage them. It would probably be advisable to formalize policy and to encourage establishment and management of more private conservation areas and to promote development projects within them.

Definition of clear policy to incorporate NGOs in management of conservation areas. Currently NGO involvement in managing conservation areas occurs on an ad hoc basis. A specific policy to include NGOs officially in conservation management would help unify technical and scientific criteria for

managing the areas and would improve financial and managerial efficiency.

Zone each conservation area to determine appropriate land and resource uses. Zoning the conservation areas would identify locations for appropriate uses of land and resources that would be consistent and compatible with the central conservation objectives of the conservation areas. Zoning would facilitate management planning for the areas and implementation of action plans for their development.

Establish biological corridors between conservation areas. In order to enhance the capacity of the conservation areas to conserve biodiversity, biological corridors should be established between them that would allow animals to move from one to another. This alternative relates closely to buffer zones as it refers to lands outside the conservation areas per se, the use of which affects the effectiveness of the conservation areas.

Desirability of special legislation for private policy and research institutions. InBio and organizations like it have been constituted under the law of associations which does not really envision private organizations with public policy or research functions. Costa Rica should explore the pros and cons of promulgating new legislation that would expressly authorize such organizations and provide for their establishment.

Desirability of transferring decision making to the regional level. Conservation areas might enjoy better management if more of the management decisions affecting them were made at the regional rather than national level. Dependence on the central offices of MIRENEM delays action and strains the system. If each conservation area had strong agency support in the regional offices, the central offices could become facilitators to define policy and provide technical support. MIRENEM should undertake a pilot program in regional decision making for some conservation areas.

6.2 Inappropriate Land Uses in Buffer Zones

6.2.1 Issue Description

The interrelation of geographic, physical, and climatic factors within a relatively small area has created a wide variety of environments in Costa Rica. Studies indicate that over half a million species, equivalent to seven percent of the known biodiversity of the planet, are found in Costa Rica. Based on the Holdridge classification system, Costa Rica has 12 distinct ecological life zones, each with impressive biodiversity. The ecologically diverse area supports a wide variety of organisms: 848 species of birds, 205 mammals, 218 reptiles, 160 amphibians, 130 freshwater fish, and about 9,000 plants. Eleven bird species and 16 mammal species are officially endangered.

Approximately 11 percent of Costa Rica's territory is under strict protection that prohibits any extraction of resources. Forest reserves and protective zones comprise another 10.2 percent of the national territory. Within these areas, extraction of resources is permitted under certain conditions.

Comparisons of the locations of biological resources with the sites of protected areas demonstrate that the protected areas are not optimally located to preserve the country's biodiversity. Studies indicate that 17 of the 53 vegetation types in Costa Rica are not represented inside strictly protected areas, and eight have absolutely no protection; 14 percent of strictly protected wildland is disturbed by some type of land use, most notably agriculture; of 760 records on the location of important species, only 24.7 percent occur in strictly protected areas.

Protected areas benefit from buffer zones which surround them and which enhance conservation within the protected areas through compatible land use practices in the buffer zones. At the conceptual level, the idea of buffer zones has gained widespread acceptance among conservationists in Costa Rica. But at the field level, buffer zones have not yet been incorporated into the management plans of the country's protected areas. Efforts to promote appropriate land use on private lands and in forest reserves adjacent to conservation areas have been inhibited by the absence of policy mechanisms to promote compatible uses that are economically viable and to restrict incompatible uses.

In the last few years, the traditional attitude toward protected areas, which considered them unavailable for direct economic uses other than recreation, has changed into a new concept that permits certain activities that provide more direct economic benefit to society. A change in official practices has accompanied the change in official attitude - the park service now directs some of its efforts toward interacting with people who live near the parks and reserves for both their benefit and that of the parks and reserves.

The change in attitude toward how to manage wildlands highlights the need to demarcate and manage buffer zones in conjunction with parks and reserves. So far, however, the buffer zone concept has not been transformed into functional policies and strategies to manage wildlands. Some newly proposed conservation projects, for example, the USAID FORESTA Project to develop Braulio Carrillo National Park and to institute natural forest management practices in the forest reserves that adjoin it, do include buffer zone management components. Also, several international conservation organizations are using debt-for-nature-swaps to finance the creation of buffer zones. But there is no general national policy on buffer zones in place to provide a framework for these actions.

6.2.2 Policy Framework

Although the buffer zone concept has no explicit source in formal policy in Costa Rica, several laws and policy statements impinge on the concept. Moreover, Costa Rica intends to apply the buffer zone concept de facto in several conservation areas, for example in Braulio Carillo National Park and surrounding lands and in the La Amistad Biosphere Reserve.

The national parks law, which establishes the national park service and empowers it to manage the national parks, applies directly to lands inside the boundaries of national parks. Implicitly, this law enables the park service to act outside of the boundaries of the parks to secure the protection of resources within them. If it can not act directly outside the parks, the park service can

certainly call on other agencies to take action, especially on lands under their jurisdiction - e.g. the forest service in forest reserves or the wildlife division in wildlife refuges.

The forestry law establishes the National Forest Service (DGF) and charges it with responsibility for managing forest reserves and regulating forest harvesting and tree cutting on private lands. Given this mandate, the forest service probably has more potential influence in buffer zones than any other agency because so much land that buffers core protection areas is either public or private forest land.

A series of laws establish National Wildlife Refuges, establish the Wildlife Division within the Ministry of Natural Resources, and set out provisions for managing and protecting certain species of animals and regulating hunting and freshwater fishing. The Wildlife Division administers wildlife refuges for the protection and management of their flora and fauna. Other agencies, notably the Rural Guard, enforce the fish and game laws. Both aspects of the wildlife laws relate to buffer zones.

The national strategy for conservation and development (ECODES) declares conservation of biodiversity to be one of its express goals. ECODES supports achievement of the goal both through establishment and management of formal protected areas and through appropriate land and resource use in buffer zones.

6.2.3 Institutional Framework

The Ministry of Natural Resources (MIRENEM), through its line agencies and through its interinstitutional secretariats, represents Costa Rica's principal institution for conserving biodiversity and for establishing and managing buffer zones.

The Ministry of Agriculture and Livestock (MAG) maintains a presence in actual and prospective buffer zones through several of its agencies, notably SEPSA, the national agricultural extension service. As technologies for buffer zone management become available, SEPSA could play an important role in facilitating their adoption. At the local level, County Agricultural Centers (CACs), serve to link agricultural producers to research and extension services as do local chapters of associations of private producers.

With respect to the private sector, several NGOs such as CARE, ANAI, Fundacion Neotropica and local community organizations promote sustainable agricultural and forestry practices at the grassroots level. They represent logical supporting entities for protection and economic production activities by the private sector in buffer zones.

6.2.4 Issue Description

What Works

Field demonstrations of sustainable land use practices. Several field projects currently under implementation in Costa Rica demonstrate that economically productive land use practices could serve as models for buffer

- 305

zones. The USAID Northern Zone Project centers around community development and sustainable agriculture. Another project at Gandoca, south of Limon, with assistance from ANAI, incorporates cultivation of non-traditional fruits into conventional agricultural production systems. The BOSCOSA project, in the buffer zone that adjoins Corcovado National Park on the Osa Peninsula, works with traditional and non-traditional tree crops - cacao, guanabana, and pejibaye - as well as subsistence food crops. The BOSCOSA project expects to move beyond the planning stage soon in its projected component in natural forest management.

What Does not Work

Development projects oriented toward overseas tourism that do not take local community participation into account. The USAID-financed Tortuguero project provides an example of attempted buffer zone management that did not fully achieve its objectives because it overlooked the local community as integral participants in the project. The project viewed the buffer zone around Tortuguero National Park essentially as additional scenery to enhance attractiveness to tourists and not as the source of livelihoods for people living near the park.

Conventional land use practices in buffer zones. Although the attention to buffer zones as extensions of the protected areas they surround is new, they have always been present adjacent to protected areas. Typically the lands in buffer zones in Costa Rica have limited productive capacity. These lands have suffered deterioration from deforestation and soil erosion that spring from nonsustainable land use practices. National policies related to soil conservation, forest management and watershed management all affect buffer zones. To the extent that these policies have not been effective to accomplish their direct purposes, they have likewise not been effective for enhancing protected areas through buffer zones. More effective policies to promote generally appropriate land use would also make buffer zones more effective for enhancing protected areas.

6.2.5 Policy Gaps and Alternatives and a Policy Research Agenda

Formalizing national policy on buffer zones. The concept of buffer zone management in conjunction with conserving biodiversity in formally declared protected areas has gained general acceptance in Costa Rica among professional conservationists. The buffer zone concept has not been formalized in natural resource and conservation policy, however, although Costa Rica does intend to apply the concept in several conservation areas currently under development. The country should evaluate and determine whether it wishes to declare formal policy on buffer zones or whether it will continue to apply the concept in an ad hoc fashion.

Prospective national policy on buffer zones would need to focus on two aspects of buffer zones: first, criteria for their designation; and, second, mechanisms for encouraging economically viable and conservation compatible land uses and discouraging incompatible land uses inside them. Such policy would address the questions of which protected areas would require buffer zones in order to conserve biodiversity adequately, the size of the buffer zones, their

306

locations, the types of land and land uses to include within them, and the set of economically viable activities feasible within a buffer zone.

Policy would promote economic and land use activities inside buffer zones that were sustainable and compatible with conservation and would disfavor those activities that were not. Some probable compatible and sustainable activities include natural forest management, agroforestry, well-managed livestock raising, and sustainable agriculture. Some probable incompatible or unsustainable activities include most types of mining, conventional timber extraction, extensive grazing, and agriculture that relies on high levels of chemical and mechanical inputs (Romero, personal communications 1990).

Policy implementation, if not the policy statements themselves, would also need to include public relations components. Even though the buffer zone concept might attain the protection of biodiversity in the short run, it could pose long-term risks to conservation if nearby communities and producers - farmers, cattlemen, loggers, and others - are not integrated into buffer zone protection and, more important, into compatible production activities in the buffer zones. Therefore, one aspect of buffer zone policy could center around the definition and demonstration of economically feasible production activities. These could include, for example, tourism, forest management for non-traditional products like orchids, medicinal plants, and spices, cultivation of tropical fruit trees, and sustainable agricultural practices related to soil cover, nitrogen fixation, weed control, and integrated pest management. Ideally, the design and implementation of these activities would entail active community participation.

Whether Costa Rica formalizes its policy on buffer zones or not, the additional measures noted below, focused on areas adjoining protected areas, would enhance the country's efforts to manage wildlands and protect biodiversity.

Strengthening mechanisms for community participation. In many instances in Costa Rica, people who live near protected areas do not have sufficient information about the areas to appreciate them. National policy to strengthen public participation in wildlands management should begin with increasing information about protected areas - everything from where the boundaries are, to what kinds of natural resources they contain, to their ecology, to what the rules are for using protected areas, to what economic value they might have for local people. Better information will support the more fundamental objectives of community participation: including local people in decision making about wildlands; and involving local people in managing them. In an ideal situation, conservation objectives will coincide with the economic objectives of the local population. Well informed, involved people will manage buffer zones well because that furthers their own economic interests.

Ancillary considerations for strengthening community participation include dealing with local and national NGOs and whether to provide incentives for land use practices in buffer zones that benefit conservation.

Strengthening mechanisms for coordination among institutions. Costa Rica has taken two important steps toward improved coordination among institutions that deal with buffer zones. It has consolidated natural resource management functions in the Ministry of Natural Resources and it has formed several

interinstitutional secretariats composed of agencies that manage natural resources. Having made the policy decisions to increase coordination, Costa Rica now needs to concentrate on making those decisions fully operational. Policy research in this area needs to focus on whether coordination really functions and how to make the coordinating mechanisms stronger and more effective.

Supporting research and demonstrations of buffer zone technologies. The incipient experience in Costa Rica in appropriate land use practices for buffer zones would benefit from formal financial and political support. Continuing research, probably best carried out in the field by NGOs and local communities, could entertain such questions as:

- Which activities in sustainable agriculture, natural forest management and ecotourism are economically viable and work best to "buffer" the protected areas; on what sites and under what physical and social conditions?
- How do these different activities relate to each other: spacially; temporally; socially; economically?
- What motivates communities and NGOs to participate; do they need incentives; know how; less government interference?
- What is the appropriate physical unit of buffer zone management, institutional integration, and community participation; is it the watershed; the municipality?
- How does one monitor and evaluate research and demonstrations in buffer zone management?

Improving information about buffer zones. In addition to the desirability noted above of more information about wildlands and buffer zones at the level of local communities, there is a need for such information in other sectors of Costa Rican society. National policy could support production of more information on wildlands and buffer zones and its dissemination, at appropriate levels of sophistication, in schools and universities, to the general public, to professional groups, and among policy makers.

6.3 Inadequate Long Term Planning for Ecotourism Activities

6.3.1 Issue Description

Tourism has become the third largest source of hard currency earnings to Costa Rica's economy. Costa Rica's natural and environmental attractions and its rich biodiversity, notably those which are protected under the national parks system, provide the country a comparative advantage in ecotourism. Although efforts are being made to develop well organized ecotourism in the country, in protected areas and on privately owned lands, lack of coordination and planning among public and private institutions reduces the effectiveness of these efforts.

Until recently, ecotourism was not a high priority issue on the policy agenda of the Costa Rican Tourism Institute (ICT). In 1988, the Organization for Tropical Studies (OTS) pointed out that: "Ecotourism in this country is represented by isolated private initiatives that don't follow national strategies, plans or policies." The situation with regard to nature tourism has begun to change, however. For instance, during the last five years, several private universities have begun to teach tourism as a career, with particular focus on ecotourism. Awareness of the demand for ecotourism has also intensified among entrepreneurs and local communities. Both government and businessmen have begun to think that tourism could become, in a few years, the most important source of hard currency for the country, surpassing coffee, the traditional hard currency generator. Ecotourism would account for a significant proportion of total tourism in Costa Rica. Yet, until now, the country has not promulgated any official policy to promote ecotourism nor to harmonize ecotourism activities with the ecological characteristics of the wildlands resources that would contribute to ecotourism.

ICT and the tourism industry consider two principal national environments that would support ecotourism: coastal areas, which provide sun, sea, and beach; and wildlands which would provide for a mix of scientific tourism, nature tourism, and adventure or sport tourism. Wildlands ecosystems, therefore, on both private and public lands, become important "raw material" for ecotourism which must be protected and managed in order to guarantee the sustainability of this hard currency generator.

ICT establishes the measures that it deems necessary to promote and regulate national tourism development. It is evident, however, that in planning for ecotourism development, ICT does not take into consideration certain crucial aspects necessary to guarantee the future of this activity. This deficiency results from lack of coordination with the major government agencies that manage wildlands, principally the National Park Service (SPN), and the National Forest Service (DGF). The several agencies need to determine together the appropriate relationships among themselves and between tourism and the national system of protected areas. They need to define priorities, models for designating which parts of protected areas are available for tourism, and how to harmonize tourism with the protection of biodiversity. Additionally, the agencies must determine how to incorporate the interests of local communities into ecotourism development. That way, ecotourism development could become an effective tool to guarantee the ecological and economic sustainability of the protected areas.

6.3.2 Policy Framework

Costa Rica has not promulgated any formal policy statements that refer directly to ecotourism. However, many of the laws that establish national natural resources agencies and policies for managing natural resources impinge on ecotourism.

The enabling act for the Costa Rican Tourism Institute, (Law #1917, 1955) authorizes ICT to carry out a series of activities for tourism promotion including encouraging visits from overseas tourists and promoting the construction and maintenance of tourism facilities. Several other laws and regulations come under the jurisdiction of ICT, notably the Tourism Law of 1960,

the Law for the Regulation of Travel Agencies of 1973, and the Law for Incentives for Tourism Development of 1985.

As the ICT has come to recognize the increasing significance of tourism, it has carried out several studies including preparation of a Master Plan for Tourism Development. So far the ICT effort has focused mainly on general tourism with emphasis on beaches and volcanos.

The Coastal Zone Law, Ley sobre la Zona Maritimo Terrestre, of 1977 regulates development and land use planning in coastal zones. Tourism is one of the law's focal points, especially with reference to scenic beaches. The law promotes collaboration between ICT and municipal governments, the National Housing Institute (INVU), the Ministry of Public Works, and banks. This law would influence ecotourism development of protected areas in coastal zones.

The National Parks Law, the Forestry Law, and the wildlife laws establish and set up the basic management of protected areas in Costa Rica, which provide much of the attraction for nature tourism to the country. The management of the areas could readily incorporate ecotourism objectives so long as these are consistent with the fundamental function of the protected areas to conserve the nation's biological and ecological diversity.

The National Parks Law, No. 6084 of 1977, establishes the National Park Service and authorizes it to develop and manage national parks and to preserve the national patrimony. The Law also explicitly calls for the park service to coordinate with other institutions that are associated with natural resources.

The Forestry Law, No. 7174 of 1990, establishes DGF and empowers it to regulate forestry activity in forest reserves and on private lands.

A series of wildlife laws establish National Wildlife Refuges, establish the Wildlife Division within the Ministry of Natural Resources, and set out provisions for managing and protecting certain species of animals and regulating hunting and freshwater fishing. The Wildlife Division administers wildlife refuges for the protection and management of their flora and fauna.

In addition to these laws, Costa Rica recently has supported two major studies on strategies for natural resource conservation. The Forestry Action Plan for Costa Rica formulates a series of policies on forestry and natural resources issues for the entire country for the next twenty years with particular emphasis on the next five years. The plan recommends a program in conservation of forest ecosystems which focuses on management of forest reserves, national parks, and biological reserves. It encourages ecotourism as one avenue toward attaining conservation of biodiversity. Second, The Costa Rica Conservation Strategy for Sustainable Development (ECODES), published in 1989, was developed over a two year period under the direction of MIRENEM, with the participation of more than 200 professionals from various public and private institutions. The strategy establishes guidelines for sustainable development and examines issues in wildlands protection, ecotourism and biodiversity. It proposes the consolidation of the ecotourism industry as an important factor in socio-economic development for the country. The strategy discusses a series of tourism-related actions that include education, promotion, regulation of construction and land

210

use zoning. Implementation of the strategy law would provide an excellent framework for the development of ecotourism.

The policy framework for ecotourism also includes many informal elements. Private sector efforts have made the development of this type of tourism possible in Costa Rica and, therefore, many of the actions taken represent decisions over which government has had little influence. Some protected areas, Monte Verde Cloud Forest Reserve and the La Selva Ecological Research Center, for example, are privately owned and operated by nonprofit organizations. Both support ecotourism and scientific research. Other private sector ecotourism sites and ecotourism activities operate for profit. It is hard to obtain information on the scope of private sector ecotourism, especially on plans for future expansion and innovation, because the ecotourism operators are reluctant to release information that could benefit their competitors. To some extent private sector investors have taken advantage of general government incentives for investment to invest in ecotourism.

6.3.3 Institutional Framework

The Costa Rica Tourism Institute (ICT), an autonomous public agency with an independent board of directors, is the principal institution in Costa Rica that deals with ecotourism. ICT promotes and regulates tourism. It establishes tourism guidelines and develops tourism plans in coordination with other agencies and private organizations. During the last few years, ICT has begun to take greater notice of ecotourism and has undertaken a series of basic studies to help in its development.

The Ministry of Natural Resources, MIRENEM, occupies an important place in the institutional framework for ecotourism. Although it has no specific functions with regard to tourism activities, the protection of flora and fauna and the management of wildlands and protected areas are among the Ministry's most important functions. To accomplish these functions, the Ministry relies primarily on three of its constituent agencies: the National Park Service, the National Forest Service, and the Wildlife Division. Each of these agencies has land management responsibilities for protected areas and also responsibilities for interagency coordination related to that management. Because Costa Rica's formal protected areas contain many of the nation's most important attractions for ecotourism, especially for international tourists, they should figure prominently in ecotourism development as should the agencies which manage them.

The private sector plays an important role in ecotourism. Two notable nonprofit organizations that manage lands for conservation, scientific study, and ecotourism are the Organization for Tropical Studies and the Tropical Science Center. National and regional chambers for tourism promote ecotourism among private sector tourism operators in collaboration with ICT.

6.3.4 Issue Analysis

What Works

Informal policy of supporting ecotourism development by nonprofit organizations. Nonprofit organizations have been instrumental in bringing the

311

richness of Costa Rica's biological resources to international attention. This has enabled them to undertake international ecotourism successfully. Informal government recognition and support of these efforts has facilitated their expansion and smooth operation. The success of these nonprofit ventures has reinforced profit-making private sector ecotourism and stimulated government interest in ecotourism as an important activity for national economic development.

Local community participation in ecotourism. The rise in demand for wildlands tourism has increased the interest of local businessmen and communities surrounding protected areas to promote and develop this activity. Local people are beginning to reap economic benefits from wildlands resources by operating small hotels and restaurants and by providing guide services and other services to tourists seeking experiences in ecotourism.

One of the reasons why small-scale private sector initiatives in ecotourism are attractive is that they do not require major capital investment. The fact that "ecotourists" want comfortable, but peaceful and natural accommodations, at a small scale and without luxuries, permits establishment of small tourism development projects around some of the protected zones. Another favorable aspect of ecotourism development is that it requires minimal public investment to improve infrastructure like roads and landing fields. Many people seeking "nature tourism" will go to attractive wildlands even if access is difficult.

Incentives for large scale investment in tourism. The incentives for the promotion of tourism established by Law have stimulated some large scale investment in construction of tourism infrastructure oriented toward ecotourism. These incentives consist of duty-free importation of machinery and equipment and exoneration from income taxes for the proceeds of the investments. These incentives are available for many types of investment; they have not been specifically tailored to ecotourism.

What does not Work

Ineffective coordination among institutions involved in ecotourism. Lack of coordination among institutions, partly due to the absence of formal policy statements on ecotourism, has inhibited ecotourism development. ICT and MIRENEM have signed a formal letter of intent to cooperate in the development of tourism in protected areas ("Carta de Entendimiento", Setiembre 1988), and the two institutions have set up a technical commission to perform the coordination. So far though, little collaboration specifically directed toward ecotourism has occurred and the few joint projects and agreements they have entered into have yielded poor results. The main problem appears to be that the objectives and priorities of the two institutions do not coincide and both of them operate on scant budgets. As an example, ICT and the national park service discussed the use of ICT funds to install tourism infrastructure in several national parks but ICT eventually applied the funds to other activities to which it accorded higher priority.

The two organizations should coordinate with regard to selecting ecotourism sites and defining models for sound ecotourism development. Such coordination

212

should eventually extend to include the private sector, both those investing in ecotourism ventures for profit and nonprofit NGOs with technical know-how in biodiversity conservation. Such multi-institutional coordination would enable allocating ecotourism investment to those sites that have both high ecotourism potential and high environmental capacity to sustain ecotourism.

Diluting the conservation function of national parks through inappropriate emphasis on ecotourism. The original objective for the establishment of the National Parks Service (SPN) and the national system of protected areas was for the absolute protection of natural resources. Over time, the organization's main objective has shifted to focus on management of the resources inside the parks for a spectrum of uses, of which protection of biodiversity is only one. Pressure is building to obtain economic advantage from the parks through ecotourism and also to share administration of the parks between the public and private sectors. As these changes gather momentum, it is important not to lose sight of strict conservation of biodiversity as a fundamental objective. Such development of the parks for ecotourism as does take place should fully recognize this fundamental objective and assure its attainment.

Incentives for small scale investment in tourism. Unfortunately, small-scale investments, especially in family operated hotels and accommodations, often do not qualify for incentives the government provides for tourism development. One factor that inhibits small operators from seeking the incentives is that ICT requires people to obtain construction permits and administrative approvals in order to qualify for them.

6.3.5 Policy Gaps and Alternatives and a Policy Research Agenda

Integration of ecotourism with other objectives of protected areas management. The Costa Rica Tourism Institute promotes tourism in general but has only recently begun to recognize ecotourism as an important subset of total tourism. Thus far, ecotourism development has occurred largely through private sector initiative and in the absence of a national policy framework for ecotourism. Increasingly, however, ecotourism developers will turn to the national system of protected areas to provide high quality sites. Consequently, a national effort is required to analyze all of the country's protected areas. This analysis should declare objectives and priorities for each unit in the system and determine the ecotourism potential of each. In this context, the planning and zoning studies ICT has already undertaken are a good first step.

In addition to identifying ecotourism sites and prospective facilities, the national analysis of ecotourism potential needs to examine several other factors. These include:

- how ecotourism can best promote the economic and social interests of local communities;
- how to share responsibility and authority for ecotourism development between the public and private sectors;
- how to establish appropriate levels of ecotourism that do not exceed

213

the tourism development capacity of particular sites;

- how to integrate ecotourism with other important objectives of protected areas, notably the fundamental objective of conserving biodiversity.

Eventually, the continuing analysis of ecotourism potential and ecotourism development should lead to regulations that protect ecotourism sites by providing for zoning of site uses, environmentally harmonious infrastructure, and waste disposal and pollution control.

Coordination among different actors. Analyzing national potential for ecotourism and putting the results of that analysis into practice will require coordination among all the actors involved in ecotourism. Coordination must include government agencies, NGOs, the private sector, and local communities and it must relate to both economic development and to natural resource conservation. General agreement exists in Costa Rica that such coordination is necessary and desirable. So far the mechanisms to attain it are not in place, however. Closer cooperation between MIRENEM and ICT, perhaps beginning with a more effective technical coordination commission, would be a good place to start.

Development of appropriate private sector incentives for ecotourism. Currently, few policies exist to encourage the private sector to invest in nature-oriented tourism. The incentives which do exist are not available across the whole private sector. As an example, businesses receive tax reduction incentives for developing a tourism site. But an NGO that establishes, protects and manages a reserve which generates tourism, does not qualify for these incentives. Given the prominence of national and international NGOs in Costa Rica's conservation movement, some incentives should apply to support NGO-based conservation.

Similarly, economic incentives should exist to promote ecotourism through the action of local communities. These incentives could operate through local tourism chambers like those which currently function at Monteverde and La Fortuna de San Carlos.

Properly structured incentives could affect placement of ecotourism infrastructure by promoting such infrastructure on appropriate sites. Incentives would not be available for inappropriate infrastructure or infrastructure in inappropriate locations. Criteria for site related incentives could support both community development objectives and biodiversity conservation objectives. An ancillary effect of such a policy could be a broader spread of benefits to various regions of the country.

Another aspect of ecotourism incentives could relate to the distribution of benefits from ecotourism. The incentives could be structured to favor investments that kept benefits in Costa Rica as opposed to allowing them to accrue to foreign investors.

214

7. MANAGEMENT OF COASTAL AND MARINE RESOURCES

This chapter analyzes two broad policy issues in the management of coastal and marine resources: lack of coastal zone management and unsustainable fishery yields.

7.1 Lack of Coastal Zone Management

7.1.1 Issue Description

Poor planning and the lack of effective controls combined with excessive exploitation is causing economic losses and environmental degradation in the coastal zones. Embayments and near-shore waters are badly contaminated with stream-borne agricultural chemicals, solid and liquid industrial and urban wastes, and mine and soil sediments originating inland. Nearly all mangroves and other coastal wetlands are degraded by continuous overcutting, while pollution, landfills, and agricultural draining destroy necessary habitat for wildlife, mollusks, and the reproductive cycle of commercial saltwater fish. Beaches and coral reefs suffer massive plastic waste deposits, illegal harvesting of turtle eggs and shellfish, contamination from the excrement of domestic livestock, and mining of mineralized sands and shells. Uncontrolled development for tourism and second homes, cattle ranching, and subsistence cultivation wreak havoc on the scenic value of shorelines, beach property, and rock promontories.

7.1.2 Policy Framework

Costa Rica is the only Central American country which has an official coastal area management program. While three other Latin American countries, Brazil, Columbia, and Ecuador, also have programs, Costa Rica is considered the most advanced (Sorensen and Brandani, 1987). The coastal area management program controls ownership and development on a narrow strip along the coast, favoring public access to beaches, stimulating tourism, and limiting private residential development. Less than one-half of the continental coastline is included in the area being managed under the program, which omits most mangroves and wetlands, rocky coast, coral reefs, coastal settlements, ports, and cities, as well as the oceanic component of the system in its entirety.

By far, the most important law for coastal management is the Law on the Marine and Terrestrial Zone (MTZ) of 1977. Government management strategies under this law incorporate sectoral planning, protected areas, environmental impact assessments, shoreline restrictions, and special area or regional plans. National and local agencies prepare development plans for MTZ and issue permits.

This law designates a 200-meter wide MTZ extending inland from the mean high tide line which is divided in two: the 50-meter public zone is devoted to public access with private ownership and development prohibited. The 150-meter restricted zone is regulated by a concession and permit system based on a detailed plan designed at the canton (county) level of local government.

The law sets the annual charge for a concession as a percentage of the value of the parcel, which is reassessed every five years. Concessions become commodities which may be privately negotiated. The cantons receive all revenues from the concessions and must allocate 20 percent to compensation for structures that have been demolished or relocated outside the MTZ and 40 percent to maintaining or improving infrastructure in the MTZ.

The Forestry Law of 1986 (revised in 1990) declares mangrove forests to be forest reserves. Freshwater swamp forests are not included automatically in this semi-protected category. As a policy issue, forest reserves require an approved management plan to be exploited.

The policies for protecting the marine sector in wildlife protected areas on the coast are very weak. The overall marine ecosystem is generally not considered in formulating policies.

Water policies have been developed specifically for the coastal areas. Regulations supporting the Water Law prohibit the drilling of wells for irrigated or potable water in a one-kilometer coastal zone to avoid saline intrusions. Permits are required for both exploration and exploitation of water. Under the Health Law, all tourist facilities, including those on the coast, must submit requests for building permits to the Ministry of Health, Department of Environmental Control, and the local municipal government. The requests must include a plan for soil and liquid waste disposal.

7.1.3 Institutional Framework

Only the national and local levels of government are involved in the management and development of coastal areas under the MTZ law. The Institute of Tourism and the National Urban Institute are the two central powers that manage the coastal areas and plan for development under the MTZ law. Local governments, for the 21 cantons (counties) and six cities located on the coast also participate in implementing and enforcing the law and national policies. Planners lack adequate training and experience in coastal zone and marine science and they fail to consider inter-sectoral issues.

The Junta de Administrativa Portuaria de Desarrollo Economico de la Vertiente Atlantica (JAPDEVA) administers a 10-kilometer wide coastal strip between Moin and Barra del Rio Colorado on the Atlantic Coast. However, it is not clear if the canals in this strip, which are used by banana plantations, are under the jurisdiction of JAPDEVA, created by Law 5337 in 1973, or the MTZ law. Although the MTZ law, written five years after Law 5337, states that the "principal canals" in the coastal strip administered by JAPDEVA are under the MTZ law, it does not explicitly define or set criteria for determining those canals.

Some directors of wildlife protected areas with a coastal boundary issue policies concerning the protection of marine resources on an ad hoc basis.

Mangrove forests, of which the country has some 30,000 ha with 99 percent on the Pacific coast, are nominally under the jurisdiction of the National Forest Service (DGF) and are administered as forest reserves by the pertinent regional offices. However, mangroves were heavily overcut in the past and are currently

216

valued principally for secondary products, such as tanbark, charcoalwood, space and fuel for saltworks, mariculture, and clamming. The appropriate municipality issues permits for these activities, but the respective authorities do not coordinate with each other.

The National Electricity Service (SNE) and the Ground Water, Irrigation and Drainage National Service (SENARA) are responsible for implementing regulations concerning the drilling of water wells in the coastal areas.

The Department of Environmental Control in the Ministry of Health enforces the regulations concerning the disposal of solid and liquid wastes in tourist facilities on the coast.

7.1.4 Issue Analysis

What Works

The Law on the MTZ applies to 78 percent of all beaches in Costa Rica defined as having value for tourism. Concessions refer to a development right on a specific parcel of land, for a specific land use and a fixed time. Policies of granting concessions are based on a detailed regulation plan designed by the local canton in collaboration with the Costa Rica Tourism Institute (ICT) and the National Institute for Housing and Urbanization (INVU).

The regulation plans are developed with the objective of encouraging and facilitating public recreational use of the beaches without degrading their environmental qualities. ICT and INVU implement unwritten policies to achieve this objective, such as the following:

- Priority is given to land uses that are tourism or recreation oriented.
- Thirty percent of the restricted zone is retained in open space designated for public use.
- Plans favor commercial hotel and tourism uses over private beachside residences.
- The total number of residential and hotel units permitted is determined by either the carrying capacity of the total beach and its water contact area or by the supply of potable water, whichever is more limiting.
- Campgrounds are located in native coastal forest and all areas of native coastal vegetation adjacent to beaches in the 200-meter strip are reserved to the extent possible.
- Streams have a five-meter buffer zone, and mangroves and wetlands, a 10-meter buffer zone on each bank.
- Hotels are dispersed rather than concentrated on a few beaches.

-211-

Institutional responsibility is clearly divided between the ICT and INVU. ICT is not subject to political whims and unstable funding because 90 percent of its revenue is generated directly from special taxes on airline tickets, hotels, and restaurants which are not required to pass through the national budget process in the legislature.

What Does Not Work

The Law on the MTZ does not apply to the 30 percent of coastal land which was privately owned and registered before October 1970 or to cities, national parks, and refuges located on the coast or in ports or wetlands and estuaries. Approximately 90 percent of the coastal wetlands are mangroves (Pacific) and 10 percent freshwater palm swamps (Caribbean).

Areas without national tourism value such as agricultural areas, mostly hilly lands bordering the sea, are under the jurisdiction of the MTZ law, but it does not address the planning of these areas. Furthermore, ICT gives little administrative and regulatory oversight to these often scenic areas. Regulation schemes, which are less detailed than the regulation plans for designated tourism areas, are prepared for areas perceived as having no direct tourist value. As of November 1989, only four regulation schemes for non-tourist areas had been developed.

As of November 1989, 34 regulations plans, which refer to 89 km of the coast with tourism value, had been completed and seven were being written. It is estimated that 141 regulation plans are be needed to cover the entire jurisdiction of the law. Thus, there is great pressure to develop the remainder of the areas without regulation plans.

Enforcement of the MTZ law at the canton level is weak. Canton inspectors often do not inform property owners of the prohibition against development without a regulation plan. They also often fail to respond to complaints about violations and they lose or delay paperwork and court decisions. Canton governments sometimes fail to carry out court orders for evacuation and demolition thereby allowing offenders to continue illegal development.

Only 30-40 percent of ICT claims of violations of conditions stipulated in a concession are upheld in court. Constant turnover in judges in rural areas, the lack of court experience in these matters, and the general hesitancy of the courts to get involved in local issues help explain the low success rate in prosecuting violators.

Approximately 16 demolition orders have been issued for development violations in tourism areas that have regulation plans. However, the violator is not responsible for damages. As of November 1989, 23 individuals had been sentenced to prison for violations of the MTZ law; however, all received suspended sentences as first-time offenders.

As a result, exploitation of the beach interface, as a declared public commons, is uncontrolled. Beaches are being culled by natives and tourists alike for just about any product available including turtles and turtle eggs (illegal), ornamental shells, and building materials (illegal). Airplanes land and cars

-218

drive on beaches while local ranchers often lose their livestock there. Marine mammals washed onto the beach often end up as hunter's trophies, since national laws do not cover pelagic creatures. Coastal reefs and offshore rocks are regularly and persistently exploited by both recreationists and commercial divers seeking lobster, conch, and oysters. Virtual anarchy reigns on the tidal interface despite the MTZ law and regulatory plans.

Protection of the marine resources along coastal boundaries of national parks is sporadic and weak. The lack of personnel is the most significant negative factor preventing the development and implementation of research, management, and control policies for the marine resources sector within the national parks. The legal mandate to protect the marine resources in these areas (i.e. the Servicio de Parques Nacionales prohibits fishing, extraction of any resources or subproducts such as shells or removal of sand) is not followed in most cases, and control of the marine sector in parks is not implemented as it should be. A pathetic example is the National Park Isla del Cocos and the protection of its coasts. Commercial fishermen pillage the areas despite the prohibition against it.

The mangrove forests, coastal swamp palm forests, and associated estuaries and canals are inadequately protected from human exploitation of nearly all their resources. When the vital link between the mangroves and the coastal oceanic fishery and the role of these ecosystems as filters for stream sediments and habitats for numerous species of birds and shellfish is considered, the fact that they are being altered or destroyed for various types of development indicates that current policy, institutional coordination, and management programs are defective or totally inappropriate. Salt production along the Pacific coast is a good example of lack of institutional coordination. The government, in line with its import substitution policy for salt production, authorized in 1980 the construction of 150 salt mines around the border of Golfito de Nicoya, causing a significant loss of 918 ha of mangroves. The annual surplus of 250 quintals of salt resulted in the abandonment or transformation of salt mines into shrimp farms, an activity not recommended for the Gulfo de Nicoya. An additional problem exists with cattle ranches that have mangroves on their properties. Contrary to the law, landowners extend their pastures to shorelines, cutting down mangroves. There is no mechanism to enforce the law prohibiting the extraction of mangroves from private lands.

Given the official desire to develop foreign exchange-earning tourism, regulatory plans have been designed to attract tourism from abroad. As a consequence, conflicts have not been satisfactorily resolved between competing demands and styles of infrastructure appropriate to national as opposed to international beach tourism and private residential housing.

Many drilling companies do not request permits to drill wells, and their activities extend illegally into the one-kilometer coastal area. Although tourist businesses request permission to build on the coast and their plans to dispose solid and liquid waste are approved, they often fail to follow those plans when developing the sites. An even more serious problem exists in the construction of housing in mangrove areas. Not only are mangroves destroyed, but toilet facilities are located in a manner that results in contamination of the places where water is extracted for domestic use. With no enforcement and

219

monitoring by the municipalities and the Ministry of Health, the estuaries become contaminated. There are ample examples in the heavy tourist sites in Puntareanas and Golfito. Up to 16,000 coliformes per 100 cc of water have been found in the Golfo de Nicoya area.

7.1.5 Policy Gaps, Alternatives and a Policy Research Agenda

No policy relates to the holistic management of coastal and near-shore resources. As a result, more than half of the nearly 1,400 km of mainland coastline have limited or no management under this program. Moreover, priority has been given to the Pacific coast, where a generally calm ocean breaks on a highly scenic, beach-studded shoreline with alternating embayments, estuaries, islets, and rocky promontories. Beach-type tourism is favored here and foreign developers have already invested heavily in infrastructure.

Because of lack of ICT funds and initiative, no evaluation of the implementation of any beach regulation plan has been conducted. Yet, there is anecdotal evidence of significant gaps between what the plans say and what actually develops.

The MTZ law is generally good insofar as it goes, but it simply does not go far enough: Its policy framework and the relevant institutions fail to treat the coastal zone as an ecological and geographic entity, and they totally disregard the adjacent ocean and tidal estuaries linked to it. The ICT's mandate is to promote the development of tourism so it is not focused on the management and use of the coastal zones. On the other hand, the municipal governments lack the technical capacity and economic resources to adequately fulfill their responsibilities for coastal zone management.

Few other laws exist to fill the gap. Forestry laws now apply to the exploitation of the mangrove and other coastal wetland forests, yet they are hardly enforced. These forests are considered marginal to the major issues of inland sawtimber forestry and are exploited principally for non-sawn timber products: charcoal, firewood, tanbark, salt, and shellfish.

In the numerous bays, gulfs, and estuaries and the near-shore waters where public recreation takes place, water is contaminated with solid and liquid wastes, including untreated effluent from the nation's major cities. Agriculture is another major contributor to marine pollution, and its toxic and often carcinogenic by-products are passed to the public via ingested fish and mollusks. Yet neither the nation's laws nor the Ministry of Public Health address marine pollution. For example, no policy exists to clean up beaches fouled by plastic and other non-biodegradable objects. This contamination affects both recreational users of the ocean and the fish, birds, and animals which inhabit it.

Thus, no policy provides an effective remedy for the problem, informs or protects the public: The ocean appears to be invisible to both the public and decision makers. Moreover, Costa Rica lacks the scientific equipment to test the fish for chemical damage: Only correlative and not causal evidence can be provided.

-220-

The Gulf of Nicoya is an excellent example of the economic and natural resource consequences of this policy gap. The Gulf provides 50 percent of Costa Rica's commercial fish catch, and the main source of income for many families is linked to the Gulf. At the same time, the main rivers emptying into the Gulf are used as dumping grounds for toxic wastes from agrochemical production and runoff from heavy pesticide use in cotton, rice, and sugar cane production. The adverse consequences are intensified because the toxic substances are not easily diluted in the Gulf's relatively small (80 by 50 km) enclosure. A massive fish kill (in the millions) occurring in the Gulf between September and October 1985, (citing approximately 1,000 dead fish every several hundred meters) was scientifically attributed to an agricultural toxin (Cheney, 1990a). In addition to being a direct cause of death in the fish stock, water contamination also indirectly affects the stock by lowering rates of reproduction.

It would appear that new policies should be introduced to supplement the old rather than making major policy changes. These additions plus minor changes might be incorporated in a modified MTZ and/or in additions and changes to the regulations set up under the existing law. However, the current beach zoning law should be modified to more fairly balance all national interests, including national and international recreation and tourism.

A major addition to the law would be to extend its geographic coverage by including all ecologically relevant areas, including wetlands, estuaries, islands and islets, non-beach uplands terminating at the water's edge, inland areas impacting directly on the littoral zones, and urbanized and port facility areas. Rules specific to the conservation and optimal long-term uses of each of these ecosystems would be developed by committees of specialists in consultation with all economic and social interest groups.

The foregoing implies a need to broaden the number of public and private institutions involved in any way in coastal zone management plans under the law. Of particular importance would be the establishment of mechanisms to obtain effective institutional coordination and cooperation in this process. One national institution should have overall authority and responsibility in achieving this goal, including development of needed research activities and training of specialized personnel. This institution must have the capacity to generate specific key policies concerning management, zoning, and sustainable use of the coastal zones. Specific attention must be given to the impact of policies on the coastal environment and adjacent waters and on their biological resources. From this perspective, the ICT and municipality governments could offer support but not be responsible for executing the policies.

A third addition to the law would be to recognize and assert in a broader, deeper law and regulations that the adjacent sea is an integral part of the coastal zone. This would entail incorporating both legislation and several public institutions, especially those relating to health, agriculture and forestry, commercial fisheries, science, transport, and national security, in an integrated coastal zone management process.

Establishment of a public prosecutor for coastal-marine related legislation would strengthen the presently weak enforcement of laws relating to this sector.

321

In the past, the formulation of policies to protect marine resources in the National Parks has been inefficient or neglected. Usually government institutions create ad hoc commissions to analyze specific problems. Members of these commissions participate as individuals for the most part, rather than as official representatives of institutions. As a result, the policies and recommendations issued by these ad hoc commissions are only partially accepted. Recently, however, a commission was formed with several organizations to analyze this problem. The commission, comprising high-level representatives for the Ministry of Natural Resources, Energy and Mines (MIRENEM), University of Costa Rica, Universidad Nacional, el Centro de Investigacion en Ciencias del Mar y Limnologia (CIMAR), Fundacion Argos, is coordinated by a full-time biologist from MIRENEM. Also, the Government is discussing the possibility of creating a marine reserve in the north Pacific region of Ballenas.

7.2 Unsustainable Fishery Yields

7.2.1 Issue Description

Fisheries are a limited resource in Costa Rica, given problems of water contamination from agriculture, industry, and urban activities, destruction of mangroves from land clearing and salt production, and human population growth. Thus, in addition to sound water and land use policies, there is a need for conservation of marine resources and sustainable fishing practices.

Current commercial fishing practices are unsustainable: Fishing is concentrated on a few species with high economic value in limited geographical areas. From 1970-1986, both fishing and shrimp production doubled, and exports expanded significantly, especially for pargo, seda and cabrilla. Ninety-seven percent of the production came from Pacific waters. In the Gulf of Nicoya, yields fell 40.7 percent from the 1975 peak of 7,311.7 metric tons to 4,335.4 metric tons in 1987, while the number of fishing boats doubled between 1980 and 1988. This expansion of production and concentrated fishing of particular species in certain waters is not sustainable in the long run.

Destructive fishing techniques, combined with this general overfishing, deplete commercial fish and shellfish stocks to the point of no return, and commercial longliners are decimating naturally scarce recreational fish species. For example, a recent article in the Tico Times reported that an insecticide was deliberately dumped into the Atlantic coast canals near Matina on July 16, 1990, most likely with the intent to kill or stun the fish (Andrews, 1990).

Moreover, foreign fleets have taken over the potential for a managed and lucrative national tuna fishery in patrimonial waters (estimated at 36,000 metric tons per year), decimating several species of marine mammals in the process.

7.2.2 Policy Framework

Several international, regional, and bilateral policies directly relate to the fishing industry. Costa Rica follows the international convention of the high seas and the international convention on fishing and conservation of living resources of the high seas. An international convention on ocean dumping was

282

signed by 26 countries, including Costa Rica, in 1972. The Convenio Constitutivo de la Organizacion Latinoamericana de Dearrollo Pesquero (OLDEPESCA) of 1984 calls for regional cooperation in conservation, consumption, and promotion of commercial systems and improvement of productive and institutional capacity with respect to marine resources. The Convention for Tuna Fishing in the Eastern Pacific Ocean, 1983, between Costa Rica, Panama and the US, establishes a licensing system for tuna fishing fleets to guarantee the rational exploitation of the tuna resources. Panama and Costa Rica have signed a treaty on the Delimitation of Marine Areas and Cooperation, 1981, which sets the marine boundaries between the two countries and calls for cooperation to protect the resources found in their seas.

However, the main policies affecting the marine resources fall under the national fisheries law. The Law on Fresh and Saltwater Fishing (No. 190, 1948) and its regulations (No. 363, 1949) includes the official government policies and rules concerning fishing in estuarine, coastal, and maritime territorial waters. An old law written before the country declared a 200-mile offshore patrimonial sea, its stated objective is to set the conditions that maximize economic and social benefits while ensuring a sustainable level of production of marine resources. Promoting sport fishing as an avenue for tourism is also an objective.

The fisheries law and its regulations provide the Ministry of Agriculture with appropriate authority to manage the fishery resources. The law grants general powers to the Ministry of Agriculture and Livestock (MAG) to:

- Regulate the construction of dikes or dams on waterways;
- Determine regulations that restrict fishing by foreigners in territorial waters;
- Restrict physical zones, times, techniques, and types of fishing;
- Regulate the commerce of fishing, including transportation, marketing, importing and exporting; and
- Issue fines for violations of the law.

Several specific regulations correspond to the general statements in the law:

- Restricted zones and times for fishing (including sport fishing) can be declared, with a 90-day advance notice.
- Permits for commercial fishing and transportation and sports fishing are issued.
- Special permits are required for sardines.
- A tax of 3 colones per quintal of lobster fished in territorial waters is imposed.
- Fishing techniques which use explosives or chemicals are prohibited.

-223-

- Fishing nets cannot be longer than 450 meters without being subject to an additional tax per additional meter of net.

- Seventy-five percent of the revenues collected from fishing taxes are designated for technical studies on fisheries and water resources.

- The fine for minor violations is between 100-500 colones, and for major violations, a maximum fine of 5,000 colones, suspension, or permanent retraction of the boating license is imposed.

In 1975, MAG and FAO developed a National Plan for the Development of Aquaculture whose main thrust entailed the investigation of the economic potential for specific fish, either local or imported species, the evaluation of different geographical zones from ecological and socio-economic perspectives, encouragement for private sector construction of ponds, and improvement in fishing techniques. However, recent national plans only superficially mention fishing issues, reflecting the lack of national government support and the lack of clear policies, objectives, and strategies for the optimal development of the sector.

Several decrees directly concern marine resources:

- Declaration of protected areas for turtles (Decreto Ejecutivo 13200-A, 1982) sets the Playa Ostional as an area protected for the reproduction of turtles.

- Decreto Ejectivo 14524-A, 1983, limits the capture of green turtles to the Caribbean Sea, establishes a limit of 30 permits per year and a maximum capture of 20 turtles per permit, and prohibits the exportation of turtles or turtle products.

- Diesel subsidies for fishermen, under various decrees, authorize RECOPE to sell to the Consejo Nacional de Produccion a specific quantity of diesel per month at a below market price.

- Decreto Ejectivo 13371-A, 1982, limits the size of pianguas that can be captured.

- Fishing with nets in the Golfo de Nicoya is prohibited except by the artisan shrimp fishermen who use hand-held nets, and the distribution of permits per zone is defined in Decreto 5404-A, Decreto Ejectivo 13372-A, 1982, and Decreto Ejectivo 13893-A, 1982.

- Fishing with nets in the Golfo Dulce is prohibited except by the artisan shrimp fishermen and researchers who use hand-held nets under the Decreto Ejecutivo 15121-MAG, 1984.

- Shrimp fishing and terms for concessions are established in the Decreto Ejecutivo 13575-A, 1982.

224

- Decreto Ejecutivo 15301-MAG-MIEM, 1984, under the Regulation Article 6 of Law 6901, establishes the categories, quotas, and mechanisms for obtaining a fishing boat license.

- Decreto Ejecutivo 15303-MAG, 1984, establishes the terms for obtaining permits for fishing, processing, and selling of fish products.

Domestic fishing activities receive preferential treatment. Foreign fishermen are required to obtain 60-day permits, whose cost is based on volume of catch, with lower costs per ton for relatively larger volumes. Fees are reduced if the product is processed in Costa Rica. Domestic fishermen permit fees are fixed (not dependent on volume) and insignificant (200 colones).

In addition, several policies indirectly affect the fisheries sector, the most important of which are:

- Non-traditional exports are subsidized by a 15 percent f.o.b. price, and primary inputs imported for non-traditional production receive a 10 percent subsidy. Fish are considered a non-traditional product.

- The General Health Law, No. 5395, 1973, mandates regulation of the sanitary conditions of fishing boats, ports, processing plants, and transportation equipment.

7.2.3 Institutional Framework

The Fisheries Law is administered by the Department of Fish and Aquaculture Resources within the Ministry of Agriculture. The Department includes the sub-departments of Fisheries, Protection and Registration, and Aquaculture. Regional departments exist for Puntarenas, Guanacaste, Golfito, and Limon. This regional policy has been only partially successful, principally because of the lack of personnel capacity at the director level and for the lack of an integrated vision concerning the current status and future potential of the resources. The limited capacity of the regional offices that issue fishing permits has contributed to an increased pressure on certain resources. An example is the relationship with the fishing permits for white shrimp in the Golfo de Nicoya issued to artisan fishermen. The number of permits has increased by more than 300 between 1986 and 1989, accompanied by a decline of over 50 percent in yield (500.8 metric tons in 1985 to 193.4 tons in 1989). An additional problem of this regionalization is the lack of key mechanisms to coordinate between the regional offices and the Direccion General.

MAG allots a mere 3 percent of its budget to implementation, despite the large unrealized potential of the off-shore (tuna) fishery and the evident crises in production of virtually every commercial species resulting from unregulated over-fishing of the near-shore seas, gulfs, and littoral. MAG does conduct some research in fisheries, particularly with respect to the Golfo de Nicoya.

In addition to MAG, 10 other public or quasi-government institutions have some relation to the fishery sector. Four institutions are research centers: el

Centro de Investigacion en Ciencias del Mar y Limnologia (CIMAR) at the University of Costa Rica, with laboratory and computer facilities, is dedicated to research on marine and fresh water ecosystems, and the conservation and rational use of their respective resources; the School of Biology at the National University offers degrees in marine biology, aquaculture, and fishing technology and conducts marine biology research; the Centro Nautico Pesquero del Instituto Nacional de Aprendizaje offers several technical and practical courses related to fishing in an 18-month certified program, and the Colegio Universitario de Puntarenas offers a degree in fishing and sea navigation.

The other six institutions have offices or departments especially devoted to fishery issues: el Consejo Nacional de Produccion (CNP) is concerned with commerce in fisheries under the CNP program; el Instituto Costarricense de Puertos de Pacifico (INCOP), administers infrastructure such as ports and dikes; el Instituto de Fomento Cooperativo (INFOCOOP) organizes and supports fishing cooperatives and offers credit; el Ministerio de Planification y Poltica Economica (MIDEPLAN) develops plans for the fishing industry; and the Instituto Mixto de Ayuda Social (IMAS) formulates and executes development projects and offers credit (1,663,500 colones in 1982 and 1,1000,000 colones in 1983).

In the private sector, 14 fishing cooperatives, four chambers, one labor union, and two federations are located on the Pacific coast. The Corporacion Costarricense de Desarrollo (CODESA) and the Junta Administracion Portuaria y de Desarrollo Economico de la Vertiente Atlantica (JAPDEVA) investigate the feasibility of developing the aquaculture sector along the Atlantic coast. There are no profession associations directly related to fishing.

The international donor community (FAO, OLDEPESCA, IDB) and specific countries (i.e. Spain, 1971, Republic of China, 1981, Korea, 1981, and Mexico, 1980) have created technical assistance projects with the cooperation of MAG, MIDEPLAN, and the Ministry of Foreign Affairs. The Fundacion Interamericana financed development of the fishing industry oriented toward small fishing operations, with donations and credits worth US$800,224 between 1983 and 1987.

7.2.4 Issue Analysis

What Works

Under the auspices of the Fisheries Law, MAG has established regulations to protect the main resources. The most important include the prohibition against lobster fishing in three areas, including the Golfo de Nicoya, a prohibition against fishing with gill nets during three months of every year in the Golfo de Nicoya, regulations on sizes of fishing nets used by artisan fishermen, the prohibition against fishing in river outlets and the protection of all turtle species that nest in Costa Rican waters.

Under the powers granted by the Fisheries Law, MAG for the first time issued a prohibition against fishing in Golfo de Nicoya for three months every year in order to counteract the natural resource depletion from past overfishing.

Several institutions publish information on the fisheries sector. MAG

periodically publishes statistical and technical information; CIMAR has a computerized databank on fisheries; La Asociacion Bananera Nacional Publica publishes a newsletter on agriculture that periodically includes information on aquaculture; the Instituto Technologico disseminates technical information to a limited audience of scientists concerning construction of boats and physical properties of the sea; and the University of Costa Rica disseminates scientific information on results of research projects to the fishermen and aquaculture producers, which also covers socio-economic and legal aspects of the industry. The Consejo Nacional de Investigaciones Cientificas y Tecnologicas established in 1985 el Sistema de Informacion en Ciencias Marinas, Recursos Pesquesros y Acuacultura (SIMPA), with the mandate to process and disseminate information related to marine science and fisheries. SIMPA issues a periodic bulletin with bibliographic information.

What Does Not Work

The major problem in relation to the marine resources is the lack of a clear political framework. An analysis of the Planes Nacionales de Desarrollo in the last 12 years demonstrates that marine resources have not received the needed priority. As a result, they have not been included in the government strategy statements that serve as a reference point for efficient administration of the resources. Without this national long-run commitment, short-term policies are formulated at MAG. However, MAG's human capacity is concentrated in agriculture, not fisheries. The policies, lacking an integrated vision of the problems and based on inadequate technical advice, often have a negative impact. This situation leaves a very small margin at the Direccion de Pesca, which generates technical policies and scientific justifications for them. In this respect, la Direccion is basically the executor of MAG's policies. This system has favored the intervention of a number of public institutions such as the Instituto Mixto de Aydua Social (IMAG) and the Ministry of Labor which have executed projects that exploit marine resources without appropriate coordination with MAG.

In the past, the national banking system lumped fisheries together with cattle and hunting or game management for purposes of allocating credit. Credit to fishing activities was always granted for maintenance rather than development purposes. In 1981, banks began to assign credit funds specifically for fisheries, though in very small amounts. In 1984, the Central Bank of Costa Rica established a 1,600,000 colones credit program for fishing, but it was suspended the same year.

Scientific and technical information concerning the marine resources is relatively limited. Consequently, it is difficult to establish, apply, and verify necessary regulations to ensure the protection of the resources. Moreover, there is no scientific criteria for use in court cases against violators.

The number of fishing permits granted continues to increase but no criteria for sustainability are set. The number of permits for shrimping rose from 69 in the 1970s to 118 in 1980 to 131 in 1988. Artisan boats operating on the northeast coast rose from 90 in 1980 to 511 in 1988. Similarly, the number of fishing boats in the Golfo de Nicoyarose rose from 720 in 1980 to 1,425 in 1988.

7.2.5 Policy Gaps, Alternatives and a Policy Research Agenda

No single dominant institution creates and implements the rules of fishing and no formal system exists to disseminate information on fisheries in Costa Rica. For example, the legal framework does not specifically identify one institution responsible for issuing permits for mollusks or cultivation of fish in suspended cages in estuary zones. Consequently, no single policy guarantees the integral and sustainable development of marine resources based on technical and scientific criteria.

Moreover, the institutions active in the fishery sector have no coordination, resulting in a high project failure rate, duplication of efforts, and large economic losses. The best of various examples that illustrate this situation probably concerns the development project for fishing in the Pacific waters, funded by the IDB and executed by the Banco Anglo Costarricense. A commission was established at a high political level to execute the project. Its representatives were from a number of institutions, including the Consejo Nacional de Produccion, el Instituto de Fomento y Desarrollo Cooperativo, el Banco Anglo Costarricense, el Instituto Costarricense de Puertos, and MAG. Among the reasons for failure were the difficulty the institutions had in taking on specific responsibilities and the inefficiency of coordination mechanisms.

The project of the Terminal de Multiuso of the Barrio El Carmen en Puntarenas is another example of the problems of institutional coordination. This project was created as an administrative mechanism with Ministry of Public Works and Transportation funds, even though cooperatives, federations, and the union were already utilizing the installations.

Finally, the economic potential of both the Pacific and Atlantic marine resources needs to be investigated, particularly the potential for aquaculture production of shrimp and clams.

228

CONCLUSION

This inventory was conducted to gain a comprehensive understanding of the specific influences of relevant policies, or lack thereof, and the political, institutional, social and economic factors which surround natural resource conditions. In addition to several macro policy issues, 15 natural resource policy issues are presented and over 100 policies analyzed. These policy influences are largely qualitative matters, often involving incommensurable factors of political power, social, and economic forces. Seldom can they be documented quantitatively. Yet this complexity does not decrease their importance.

The inventory demonstrates that Costa Rica's policy environment is complex with both positive and negative elements affecting the management and use of the country's renewable natural resources. Many laws and policies are in place or recent policy reforms have brought significant improvements in the management of Costa Rica's natural resources. Problems often arise at the policy implementation stage. For example, watershed management policies in Costa Rica lack a community participation component which contributes to the failure of watershed management projects. With respect to the management of Costa Rica's forests, some government policies are appropriate, such as the requirements to submit and adhere to forest management plans, however, the National Forest Service lacks the resources necessary to effectively implement these policies. The inventory also identified significant policy gaps. Some examples include: (1) government agencies do not follow a standard land classification system which is impairing Costa Rica's ability to follow a sustainable path of development, particularly in the agricultural sector; (2) the Water Law is outdated and a new law is needed to reflect Costa Rica's current priorities for water resource policies and (3) no policy relates to the holistic management of coastal and marine resources.

Further research on policies will be needed over time to clarify the impacts and assess new responses and evolving conditions. The inventory of policies in this report is designed to fulfill the need for better information on existing strategies which will help stimulate the design of policies and actions for sustainable, equitable development and natural resource management in Costa Rica and the entire Central American region.

APPENDIX A
INTERVIEWS CONDUCTED AND POTENTIAL CONTACTS FOR FURTHER RESEARCH

INTERVIEWS CONDUCTED

Jose Joaquin Acuna, SEPSA, Apartado Postal 10094-1000, San Jose, Costa Rica. Tel. 23 35 70

Edwin Alpizar, Consulting forester associated with the Tropical Science Center, San Jose, Tel 25 26 49

Rafael Angel, OCAMPO, UICN, CATIE, Turrialba, Costa Rica, Tel 56 25 60

Guillermo Arias, Secretaria Tecnica de Cuencas, AID/BID Office, Calle Principal San Pedro, La California, San Jose, Costa Rica
Tel.21 51 95

R. Artavia, President of the Camara Nacional de Industrias Madereros, San José.

William Aspinall, Director of Monteverde Cloud Forest Reserve, Tropical Science Center, San Jose, Tel 25 26 49

Alexander Bonilla, MIRENEM, Apartado Postal 10104-1000
Tel, 33 45 33

Jan Bauer, Plan Accion Forestal, MIRENEM.-De la Casa Italia 100 m. oeste y 15 m. sur, San Jose, Costa Rica, Tel. 25 05 09

Juan Belt, Chief Economist, USAID, Apartado 825-1200, Pavas, Tel. 20 45 45

Gilbert Canet, Director, Programa Desarrollo Campesino DGF.

Ms. Luis Diego Castillo, Servicio Nacional de Aguas Subterraneas, Riego y Avenamiento.

Luis Chacon

Carlos Chavez, Secretaria Tecnica de Cuencas, AID/BID Office, Calle Principal San Pedro, La California, San Jose, Costa Rica
Tel.21 51 95

Richard Donovan, Proyecto BOSCOSA,Fundacion Neotropica, Apartado Postal236-1002, Paseo de los Estudiantes, San Jose, Costa Rica
Tel. 33 00 03

Jose Flores, Catie, Turrialba, Tel. 56 15 60

Victor Flores, Ministerio de Obras Publicas y Transporte, San Jose, Costa Rica, Tel. 27 21 88

230

Rodrigo Gamez, INBIO, Apartado Postal 3110 Tel. 36 28 10

Heinrich Greub, President, Balsatica, S.A., Apartado 430-1007 Centro Colon, San Jose, Costa Rica, Tel. 33 13 88

Andres Incer, Departamento de Control Ambiental, Division de Saneamiento Ambiental, Ministerio de Salud, San Jose, Costa Rica,

Max Koberg, General Manager, STONE FORESTAL, Apartado 6265-1000, San Jose. Tel. 57 24 42

Peter Kranstover, USAID, Apartado 825-1200, Pavas, Tel. 20 45 45

Miguel Loria, USAID, Apartado 825-1200, Pavas, Tel. 20 45 45

Tirso Maldonado, Fundacion Neotropica, Apartado Posta 236-1002 Paseo de los Estudiantes, San Jose, Costa Rica Tel. 33 00 03

Alberto Negrini, Project Officer, Costa Rican Tourism Institute, Apartado Postal 777-1000, San Jose, Costa Rica Tel. 23 17 33

Mario Pareja, Project Director, CATIE/MIP, Turrialba, Tel 56 25 60

Carlos Quesada, ECODES, Apartado Postal 127-2070, Sabanilla, San Jose, Costa Rica Tel. 24 03 40.

Manuel Ramirez, Conservation International (CCT) Apartado Postal 8-3870-1000 Tel. 53 32 67

Roque Rimolo, Sub-Director of Construction, Miniserio de Obras Publicas y Transporte, San Jose, Costa Rica, Tel.

Carlos Rivas, Director of Watershed Management Unit, RENARM, CATIE, Turrialba, Cost ARica, Tel 56 25 60

Hugo Rodriguez, Departamento de Estudios y Proyectos, AyA, Edificio La Yacuna, San Jose, Costa Rica

Juan Carlos Romero, Director Area de Conservacion Cordillera Volcanica Central, Servicio de Parques Nacionales, MIRENEM, Tel. 33 40 70 or 33 42 46

Walter Ruiz, Vice-Minister, Ministry of Agriculture and Livestock (MAG), Apartado Postal 10094-1000, San Jose, Costa Rica.
Tel. 31 23 44

Jose Luis Salas, Plan Accion Forestal, MIRENEM, De Casa Italia 100 m. oeste, 15 m. sur, San Jose, Costa Rica, Tel. 25 05 09

Jorge Sanchez, Gerente General, PORTICO, Apartado Postal 7-1730-1000, San Jose, Costa Rica. Tel. 37 25 58

Vivian Solis, Director Fundacion FORESTA Apartado Postal

231

91-1009- 1000 San Jose, Costa Rica. Tel. 35 65 68

Alvaro Ugalde, Ministerio de Recursos Naturales, Energia y Minas, Apartado Postal 237-1002, San Jose, Costa Rica, Tel.
33 45 33

Alvaro Umana, Ex-Minister of Natural Resources, Energy and Mines (MIRENEM) INCAE, Apartado Postal 960-4050, San Jose, Costa Rica, Tel. 41 22 55

Alvaro Vargas, Secretaria Tecnica de Cuencas, Apartado Postal No.5120-1000, San Jose, Costa Rica, Tel. 21 51 95

Vera Varela, Director, Fundacion Neotropica, Apartado Postal 236-1002, San Jose, Costa Rcica, Tel. 33 00 03

Alexis Vasquez, consultant, Apartado Postal 490-1100, Tibas, San Jose, Costa Rica. Tel. 36 02 81

Carlos Villalobos, Biologist, Universidad de Costa Rica, Escuela de Biologia, # 39, San Jose, Costa Rica, Tel. 24 56 16

Luis Villalobos, Director, Direccion General Forestal, Apartado Postal 10104-1000, San Jose, Costa Rica, Tel. 57 06 97ns

REFERENCES

Andrews, L. "Officials: Fish Kill Was Deliberate." The Tico Times. August 3, 1990.

"Anteproyecto Ley de Aguas." Informe Final a GEC, Comision Interinstitucional Anteproyecto Ley de Agual (CIALA), Secretaria Tecnica de Cuencas (STC), julio de 1988.

Arnold, Peter and McCaffrey, Dennis. "Technical Analysis: Forest Management Component, Evaluation of the FORESTA Project." USAID/Costa Rica, San Jose, September 1988.

"Articles on Debt for Equity Swaps in Central America." Agriculutral Policy Analysis Project, Phase II and Renewable Natural Resource Management Project Workshop, Abt Associates, Washington DC, August 1989.

Barahona, Rodrigo. "Informe Final de las Investigacion sobre el Regimen Juridico de los Recursos Naturales Renovables en Costa Rica." working papaer, San Jose, 1985.

Barahona, Rodrigo. "El Regimen Juridico de los Recursos Naturales Renovables en Costa Rica." 1985

Barahona Riera, F. Reforma Agraria y Poder Politico: El Caso de Costa Rica, Editorial Universidade de Costa Rica, San Jose, 1980.

"Bilateral Annex to RENARM Project Paper." USAID/Costa Rica, San Jose Costa Rica, 1989.

"Biodiversity" National Biodiversity Institute of Costa Rica (INBIO)

Boletin Informativo. Manejo Integrado De Plagas, CATIE, Turialba, Costa Rica, various issues.

Bravo, H. and Niehaus B. "La Ecología es Parte Fundamental del Actual Gobierno." Periódico La Nación, 11 agosto 1990, p. 13-A.

Budowski, Gerado. "Politicas, Estrategias y Herramientas para la Gestion de Areas Silvestres Protegidas en America Tropical." CATIE, Turrialba, Costa Rica, March 1982.

"Caribbean Conservation Corporation Comprehensive Conservation and Development of Tortuguero, Costa Rica." Quarterly Report to USAID/Costa Rica, Grant No. 515-0249-G-IR-9001-00, 1989.

"Carta de Entendimiento Entre el Ministerio de Recursos Naturales, Energia y Minas y el Instituto Costarricense de Turismo." setiembre 1989.

Catterson, T. M., Dulin, P. A., Hughes-Hallett, P. and Shearer, E. "Regional Tropical Watershed Management Project and Tree Crop Production Project:

232

Report of the Evaluation." USAID/Costa Rica, March 1, 1989.

Censo Agropecuario, 1950, 1955, 1963, 1973 and 1984, Direccion General de Estadistico y Censo, San Jose.

"Censo de la Industrial Forestal: 1986-1987." Departamento de Desarrollo Industrial, Dirección General Forestal, MIRENEM, San José, 1988.

"Central Bank Delays 'Debt fot Nature' Swaps." Tico Times, August 3, 1990.

Chacon, R. and Gamboa, O. Boletin Estadistica. Direccion General Forestal, Ministerio de Recursos Naturales, Energia y Minas, San Jose, Costa Rica, No. 3, 1989.

Chaverri, R. "El Programa de Manejo Costero de Costa Rica: Lo Postitivo y lo Negativo." Reunion de Expertos en la Planificacion de los Usos del Mar y Administracion de las Zonas Costeras en America Latina y el Caribe, San Jose, noviembre 1989.

Cheney, K. "Experts Fear Pesticide Buildup Polluting Gulf." The Tico Times, August 3, 1990a.

Cheney, K. "Toxic Pesticides Routinely Misused in C.R." The Tico Times, July 20, 1990b.

"Complejo Portuario Limon Moin Costa Rica." Junta de Administracion Portuaria y de Desarrollo Economico de la Vertiente Atlantica, San Jose 1989.

"Comportamiento de las Principales Actividades Productivas del Sector Agropecuario Durante 1985." SEPSA, No. 105, San Jose 1985.

"Conclusiones y Recomendaciones en Relacio con el Informe Final de la Junta Interventora de la Comision Nacional de Asuntos Indigenas." San Jose, febrero 1987.

"Conservation and Development of the Arenal-Tempisque Irrigation Project." CATIE, 1986.

"Consolidacion y Desarrollo de los Areas Silvestres Protegidas en la Cordillera Volcanica Central, Costa Rica: Antecedentes y Recomendaciones. Presented to USAID/Costa Rica, San Jose, June 1988.

"Consolidacion de las Areas Silvestres del Pais por Medio del Servicio Nacional de Areas de Conservacion." Ministerio de Recursos Naturales, Energia y Minas, San Jose, agosto de 1989.

"Constitucion del Subsistema de Direccion y Planificacion Regional." Decreto No. 18059-PLAN, Ministro de Planificacion Nacional y Poltiica Economica, San Jose, 10 del marzo 1988.

"Convenio Interinstitucional para el Manejo Integral de Cuencas Hidrograficas en Costa Rica, MIEM, MAG, AyA, ICE, SENARA, SNE." La Gaceta, No. 81, 28 de

224

abril de 1988.

"Convenio Interinstitucional para el Manejo Integral de Cuencas Hidrograficas en Costa Rica Secretaria Tecnica para el Manejo Integra de Cuencas: Plan General de Trabajo." San Jose, 24 de noviembre 1988.

"Costa Rica: Un Dilema de Política Económica." INCAE, Alajuela, Costa Rica, 1983.

"Costa Rica: Informe Socioeconomico." Banco Interamericano de Desarrollo, febrero 1987.

"Creacion del Subsistema de Direccion y Planificacion Sectorial." Decreto No. 14184-PLAN, Ministro de Planificacion Nacional y Poltiica Economica, San Jose, enero de 1983.

"Crisis, Deuda Externa, Politicas Macroeconomicas y sus Relaciones con el Medio Ambiente en America Latina y el Caribe." United Nations Program for the Environment, CEPAL, 1988.

"Cuencas Prioritarias." Secretaria Tecnica de Manejo de Cuencas (STC), Acuerdo del Grupo Ejecutivo de Manejo de Cuencas (GEC), Acta No. 4-88, 12 mayo de 1988.

Davis, K. Forest Management: Regulation and Valuation. New York: McGraw-Hill, Inc., 1966, 519 pp.

"Decreto de Emergencia Forestal." El Presidente de la Republica y el Ministro de Agricultura y Ganaderia, 1987.

"Decreto de Emergencia El Presidente de la Republica y el Ministro de Agricultura y Ganagderia de la Ley 4374 de 14 de Agosto de 1969." San Jose, 18 del seteimbre de 1969.

"Desarrollo Socioeconomico y el Ambiente Natural de Costa Rica." Fundacion Neotropica, San Jose, 1988.

"Diagnositico Preliminar Sobre la Problematica Turisitica de Monteverde." Instituto Cosarriecense de Turismo, Direccion de Planificacion, San Jose, June 1990.

"Diagnostico del Sector Agropecuario de Costa Rica, 1962-1976". Oficina de Planificacion Sectorial Agropecuaria, San Jose, 1979.

"Diagnostico Tecnologico del Subsector Pesca y Acuacultura de Costa Rica." Volume I, CONICIT, 1984

"Direccion Sectorial de Energia: Informe de Labores Ano 1988." San Jose, enero 1989.

"Direccion Sectorial de Energia: Informe de Labores Ano 1989." San Jose.

235

"Direccion Sectorial de Energia: Programa de Trabajo 1990." San Jose.

Duerr, W.A. Forest Economics as Problem Solving. Syracuse, New York: Orange University Press, 1988.

Duisberg, P. and Newton, H. "Soil Science in Costa Rica: Classifiction, Fertility and Conservation." CATIE. Turrialba, Costa Rica, 1978.

Echeverri, J. "Incremento de la Productividad Agropecuaria y la Conservación de los Recursos de Agua, Suelo y Bosque." draft, RUTA, San José, 1990.

"Ecologia y Diplomacia Ecologica." editorial, La Republica, 30 de junio 1990, p. 12A.

"El Enfoque Estructuralista y su Aplicación a Empírica a Costa Rica y Nicaragua." technical note, INCAE, Alajuela, Costa Rica, 1985.

"Environmental and Natural Resource Management in Central America: A Strategy for A.I.D. Assistance." A.I.D., Bureau for Latin America and the Caribbean, Washington DC, 1989.

"ECODES: Estrategia de Conservacion para el Desarrollo Sostenible de Costa Rica." Ministerio de Recursos Naturales, Energia, y Minas, San Jose, abril 1990.

"Estrategia 'Conservacionista' que Amenaza el Desarrollo del País." draft, Camara Nacional de Minera, San José, 1988.

"Estrategia para el Desarrollo Institucional de la Reserva de la Biosfera La Amistad." Conservation International/OED, MIRENEM, San Jose, 1990.

"Estructura Organizativa Direccion General Forestal." Ministerio de Recursos Naturales, Energia y Minas Direccion General Forestal Unidad de Credito y Projectos. San Jose, enero 1990.

"Estudio Diagnositico de las Cuencas Hidrograficas y las Acciones Ejecutadas o por Ejecutar en Manejo de Cuencas en Costa Rica." Comite Asesor Nacional del Projecto Regional de Manejo de Cuancas (CAN), CATIE, por INGEOSA, San Jose, julio 1988.

"Estudio de Impacto Ambiental Expediente de Explotacion No. 2093." Ministerio de Industria, Energia y Minas, Direccion de Geologia, Minas e Hidrocarburos, diciembre 1989.

"Evaluacion de la Conservacion de los Recursos Biologico." Fundacion Neotropica, San Jose, 1988.

"Financiamiento para el Desarrollo Turistico." Instituto Costarricense de Turismo, San Jose, 1989.

Flores J.G. "Diagnositco del Sector Forestal." Editorial Universidad Estatal a Distancia, San Jose, 1985.

236

"Fondo de Pargues Nacionales Presupusto Ordinario 1989." MIRENEM Servicio de Parques Nacionales, San Jose, setiembre 1988.

"Forest Resouces for a Stable Environment Project (FORESTA)." USAID/San Jose, September 1988.

Gamez, R. "Development, Preservation of Tropical Biological Diversity, and the Case of Costa Rica." International Agriculture, Vol. 5, No. 1, 1990, pp. 1-3.

Garcia, G. J. "Memorias I Seminario 'Manejo de Suelos Tropicales: Posibilidades y Limitaciones Ecologicas." Instituto Goethe de San Jose, Proyecto de Desarrollo Agricola y Forestal, Programa de Educacion Ambiental de la Universidad Estatal a Distancia, San Pedre de Montes de Oca, Costa Rica, 12-15 de marzo de 1990.

González, L., Alpízar, E. Calvo, J. and Muñoz, R. "Problemática del Sector Forestal." Comisión de Trabajo, Asociación de Profesionales en Ciencias Forestales de Costa Rica, Serie en Facsímiles No. 8, Centro Científico Tropical, 1987.

Gow, D. "Environmental Assessment for the Northern Zone Consoildation Project in Costa Rica." DESFIL, Washington DC, August 1988.

Guardia, J. "Más Duro de lo que Pensaba." Periódico La Nación, 5 agosto 1990, p. 18-A.

Guardia, Q. J., Di Mare F. A., Hugo, C. V., Corrales, J. y Baldares, M. La Politica de Precios en Costa Rica. San Jose: Consultores Economicos y Legales, 1987.

"Guia para Planes de Manejo en Bosque Natural." Dirección General Forestal, Ministerio de Recursos Naturales, Energia y Minas. San José, 1990.

Hartshorn, G., et al. "Costa Rica: Country Environmental Profile A Field Survey." USAID, San Jose, Costa Rica, December 1982.

Husch, B., Miller, C. and Beers, T. Forest Measuation. New York: The Ronald Press Company, 1972.

"Hydrogeological Investigations in the Valle Central Final Report." BGS-SENARA, 1988.

"Informacion Basica del Sector Agropecuria de Costa Rica." No. 3, SEPSA, San Jose, 1986.

"Informacion Basica del Sector Agropecuria de Costa Rica." SEPSA, San Jose, 1989.

"Informe Anual 1987-1988." Comision Nacional de Asuntos Indigenas. San Jose.

- 237

"Informe de Labores: Ministerio de Recursos Naturales, Energia y Mians 1986 - 1990." San Jose.

"Informe de Labores 1989: Projecto Arborizacion Urbana y Mejoramiento Ambiental Ministerio de Recursos Natruales, Energia y Minas." Ministerio Recursos Naturales, Energia y Minas, San Jose.

"Informe de Labores II Semestre 1987." Instituto Desarrollo Agrario Direccion Planificacion Dpto. Evaluacion y Estadistica." San Jose, Mayo 1988.

"Integracion de la Conservacion con el Desarrollodo en el Proyecto de Riego Arenal-Tempisque, " Vol. II, CATIe, 1986

"Instituto Meteorologico Nacional: Informe del Periodo 1986-1990." San Jose.

"Instrucciones para el Manejo de Areas de Conservacion No. 1." Servicio de Parques Nacionales y Areas de Conservacion, Ministerio de Recursos Naturales, Energia y Minas. julio 1990.

Katz, Ricardo y McCaffrey, D. "Plan de Operaciones: Proyecto de Ordenamiento Ambiental de la Gran Area Metropolitana (GAM) de Costa Rica." Banco Interamericano de Desarrollo, draft, 21 noviembre 1988.

Kauck, D. and Tosi, J. "Public Policy Decisions and Private Sector Resource Use: Changing Patterns of Deforestation and Land Use in the Lake Arenal Basin, Costa Rica", Tropical Science Center, 1989.

Learman, Jan G. "Financial and Economic Assessment: Evaluation of the FORESTA Project." USAID/Cost Rica, San Jose, September 1988.

Levine, D., Lewandowski, A., Rodriguez, F. and Kiernan, M. "The First Evaluation of the Forest Conservation and Management Project (BOSCOSA) Osa Peninsula, Costa Rica January 1988 to October 1989." USAID, San Jose, Costa Rica, November 22, 1989.

"Ley Constitutiva de los Centros Agricolas Cantonales, Ley No. 4521 y su Reglamento." Ministerio de Agricultura y Ganaderia, San Jose, junio 1987.

"Ley Constitutiva del Instituto Costarricense de Acueductos y Alcantarillados: Reforma y Anexos." AyA, San Jose, 1986.

"Ley Constitutiva y Otras Disposiciones Relativas al Instituto Costarricense de Electricidad." ICE, San Jose, julio de 1987.

"Ley de la Conversion del Ministerio de Industria, Energia y Minas en Ministerio de Recursos Naturales, Energia y Minas." La Gaceta, No.117, 21 junio de 1990, San Jose.

"Ley de Creacion de la Comission Nacional de Asuntos Indigenas (CONAI)." No. 5251, San Jose, 9 de julio de 1973.

-256

"Ley del Creacion del Servicio Nacional de Aguas Subterraneas Riego y Avenamiento (S.E.N.A.R.A)." Ley No. 6877, San Jose, 14 de julio de 1983.

"Ley de Creacion del Servicio de Parques Nacionales." Ley No. 6084, San Jose, 1977.

"Ley de Fomento a la Produccion Agropercuario." No. 7046, San Jose, 8 de mayo 1987.

"Ley de Planificacion Nacional." No. 5525 del 2 mayo 1974, San Jose.

"Ley del Reglamento Organico del Ministeris de Recursos Naturales, Energia y Minas." San Jose, draft.

"Leyes de Tierras y Colonizacion (No. 2825 del 14 del Octubre de 1961), de Creacion del Instituto de Desarrollo Agrario (No. 6735 del 29 de marzo de 1982) y de Jurisdiccion Agraria (No. 6734 del 25 de marzo de 1982)." Instituto De Desarrollo Agrario, San Jose.

"Ley Forestal." La Gaceta, No. 85, San Jose, 7 de mayo de 1986.

"Ley General de Salud y Ley Organica del Ministerio de Salud"La Gaceta, 1974.

Ley de Fomento a la Produccion Agropecuaria" FODEA, La Gaceta #8, San Jose, Mayo 8, 1987.

"Ley de Creacion del Instituto de Desarrollo Agrario" IDA La Gaceta, San Jose, 1985.

"Ley de Creacion de Ministerio de Recursos Naturales, Energia y Minas, MIRENEM", La Gaceta #117, June 1990.

Losilla, M. "Determinacion de Recarga Potencial Anual de Aguas Subterraneas en Costa Rica." Informe Tecnico a Gerencia, SENARA, San Jose, noviembre 1983.

Losilla, M. Internal Technical Report, SENARA, 1986a.

Losilla, M. "Mapa Hidrogeologico del Valle Central." Revista Geologica de America Central, No. 4, Escuela Centroamericana de Geologia, Universidad de Costa Rica, San Jose. No. 4, 1986.

Losilla, M. "Proyecto Proteccion de Acueductos y Areas de Recarga en la Cuenca Alta del Rio Virilla," Boletin Informativo, PRMC-CATIE, No. 9, julio-diciembre 1989.

Losilla, M. and Blair, E. "Situacion Institucional del Manejo de Cuencas en Centroamerica y Panama y Acciones del PRMC-CATIE." San Jose, 1987.

Losilla, M. and Ramirez, W. "Recarga Artificial a las Acuiferos de la Cuenca Alta del Rio Virill." Memoria del III Congreso Nacional de Recursos Hidricos, Costa Rica, noviembre 1989.

"Manual para la Determinacion de la Capacidad de Uso de las Tierras de Costa Rica." Centro Cientifico Tropical, San Jose, 1988.

Matamoros, Alonso. "Areas Silvestres de Costa Rica." San Jose, April 1987.

"Memoria 1988." ICE, San Jose, 1988.

"Memoria Anual." Junta de Administracion Portuaria y de Desarrollo Economico de la Vertiente Atlantica, 1983-1984, 1985, 1988, San Jose.

"Memoria Anual." Ministerio de Ciencia y Tecnologia, 1987-1988, 1988-1989, San Jose.

"Memorias", ACORDE, San Jose 1988

"Memoria 1er Congreso: Estrategia de Conservacion para el Desarrollo Sostenible de Costa Rica." Ministerio de Recursos Naturales, Energia y Minas, Repbulica de Costa Rica, San Jose, Costa Rica, 1989.

Monge, G. R. y Corrales Q. J. Politicas de Proteccion e Incentivos a la Manufactura, Agroindustria y Algunos Sectores Agricolas en Costa Rica. San Jose: ECONOFIN, 1988.

McNeely, J. Economics and Biological Diversity: Developing and Using Economic Incentives to Conserve Biological Resources. Gland Switzerland: International Union for Conservation of Nature and Natural Resources, November 1988.

Naranjo, F. "Pide Bajar Impuesto de Ventas." Periódico La Nación, 15 agosto 1990, p.6-A.

"Natural Resource Management in Costa Rica: A Strategy for USAID." USAID, San Jose, Costa Rica, December 1987.

Nelson, M. "Issues in Resource Management and Economic Development: Costa Rica." The World Bank, 1988.

"Normas que Regulan las Empresas y Actividades Turisticas." Instituto Costarricense de Turismo, Departamento de Servicios Turisticos, San Jose, 1990.

"Objetivos y Politicas del Sector Agropecuario". SEPSA, San Jose, 1990.

Olson, G.W. Soils and the Environment. New York: Chapman and Hall, Inc., 1981, 178 pp.

Orientacion para el Tramite de Permisos Forestales que Requieren Estudios Técnicos. Dirección General Forestal, MIRENEM, San José, 1990.

Ortiz M. "Planificacion y Ejecucion de Raleos en Plantaciones Forestales. Instituto Tecnologico de Costa Rica, Serie de Apoyo Academico, No. 10, 1989.

Perez, M. C. "El Programa de Conversion de Dueda Externa para el Desarrollo y Proteccion de los Recursos Naturales: La Experiencia de Costa Rica y el Futuro del Programa." Segunda Reunion de Consulta con Entidades Publicas y Otganizaciones no Gubernacmentales Vinculadas con la Proteccion Ambiental y la Conservacion del los Recursos Natuales, 24-26 de mayo de 1989.

PID for Community Watershed Management Project, No. 5150246, USAID/Costa Rica, San Jose, 1990.

"Plan de Acción Conjuta en Apoyo a la Reactivación y el Desarrollo Agropecuario en los Países del Istmo Centroamericano y la República Dominicana." IICA, San José, 1989.

"Plan de Acción Forestal para Costa Rica: Documento Base y Perfiles de Proyectos." Ministerio de Recursos Naturales, Energía y Minas, 1990.

"Plan de Accion del MIRENEM: 1986-1990." Ministerio de Recursos Natuales, Energia u Minas, San Jose.

"Plan de Acción Recursos Naturales Renovables 1990-1994." Partido Unidad Social Cristiana, San José, 1989.

"El Plan de Acciones Inmediatas para el Manejo la Reserva de la Biosfera la Amistad." Primer Taller Interinstitucional para la Planificacion Integradad del los Reucursos de la Reserva de la Biosfera La Amistad, Jardin Botanico R. y C. Wilson en Las Cruces de Coto Brus, 10-14 agosto de 1988.

"Plan Anual Operativo de la Direccion General Forestal para el Periodo 1989." Ministerio de Recursos Naturales, Energia y Minas Direccion General Forestal, San Jose, marzo 1989.

"Plan Anual Operativo Institucional 1988." Ministerio de Recursos Naturales, Energia y Minas, Servicio de Parques Nacionales.

"Plan Anual de Trabajo 1989." Ministerio de Recursos Naturales, Energia y Minas, San Jose, marzo 1989.

"Plan Anual de Trabajo 1990." Ministerio de Recursos Naturales, Energia y Minas, San Jose, 1990.

"Plan de Manejo de la Cuenca Alta del Rio Vivilla." draft, CATIE, STC, San Jose, 1989.

"Plan de Manejo de la Cuenca del Rio Parrita". A.I.D., OEA, FAO, DGF. 1985.

"Plan Maestro de Educacion Ambiental Costa Rica." Fundacion Neotropica, 1989.

241

Politicas Para el Desarrollo de las Area de Conservacion." working paper, MIRENEM, Servicio de Parques Nacionales y Areas de Conservacion, June 1990.

Politicas y Acciones Prioritarias del Sector Agricola ECODES/MIRENEM, 1989

Politicas y Acciones Generales y Acciones Prioritarias con Enfasis en Ordenamiento y Uso de la Tierra y Proteccion Ambiental, ECODES, 1989.

Politicas del Sector Agropecuario CAC, Ministerio de Ciencia y Tecnologia, 1988-1989

Pomareda, C. "Politica Económica y Desarrollo Sostenido de la Ganadería." IICA, San José, 1990.

Pratt, R., Adamczyk, C., Andic, F., Esteve, H., Joel, C. and Tugendhat, E. "Private Sector: Costa Rica." A.I.D. Evaluation Special Study No. 9, A.I.D., Washington DC, March 1983.

"Presupuesto Ordinario Fondo de Parques Nacionales 1990." MIRENEM Servicio de Parques Nacionales, San Jose, agosto 1989.

"Problematica del Sector Forestal, Serie en Facsimiles No. 8." Centro Cientifico Tropical por Comision de Trabajo de la Asociacion de Profesionales en Cienceias Forestales de Costa Rica, San Jose, junio 1987.

"Programa de Control de la Contaminacion del Agua." Ministerio de Salud, Division de Sanamiento Ambiental, San Jose, 1982.

"Programa de Cooperacion FAO/Gobierno Plan de Operaciones: Reforestacion y Conservacion de Recursos Naturales en Comunidades Rurales de la Region Chorotega." San Jose.

"Los Programas de Ajuste Estructural y Sectorial, Alcances para la Reactivación y Desarrollo de la Agricultura." IICA, San José, 1989.

"Projecto Arborizacion Urbana y Mejoramiento Ambiental." Ministerio de Recursos Natuales, Energia y Minas, San Jose.

Proyecto de Ley para la Conservacion de Suelos. SENACSA, San Jose, 1989.

"Projecto 'Limpieza de Playas'." Informe de Labores 1988-1989, Ministerio de Recursos Natuales, Energia y Minas, San Jose.

"Projecto de Incremento de la Reforestacion en la Region Brunca."Russo, Sandra., Bremer-Fox, Jennifer., Poats, Susan., Craig, Laurene. "Gender Issues in Agriculture and Natural Resource Management." AID, April 1989.

"A Quien Beneficia la Ley FODEA?", Panorama Campesino, Centro de Estudios para la Accion Social. 1 julio 1987.

242

Qureshi, Ata H., Hamilton. Lawrence S., Mueller-Dombois, Dieter., Carpenter, Richard A. "Assessing Tropical Forest Lands, Their Suitability for Sustainable Uses." East-West Center, Hawaii, January 1980.

"La Readecuacion de Deudas a los Productores Agropecuarios", Panorama Campesino, Centro de Estudios para la Accion Social. 2 diciembre 1987.

Revista del Projecto, Manejo Integrado de Plagas, CATIE, Tourialba, Costa Rica, various issues.

Reyes, R. "Mecanismos y Responsabilidades Institucionales en el Manejo de Cuencas Hidrograficas en Costa Rica." CATIE, Turrialba, Costa Rica, octubre de 1986.

Rodriguez, E. "Plan de Accion para el Manejo de los Recursos Forestales." version final, San Jose, octubre de 1989.

Rodriguez, E. "Plantación y Charral: Opciones para la Producción de Leña en Abangares, Costa Rica." Silvoenergia, Proyecto Leña y Fuenetes Alternas de Energia, CATIE, Turrialba, Costa Rica, 1985.

Rodriquez, E. "Situación de los Recursos Naturales y el Medio Ambiente en Costa Rica." MIRENEM, San José, 1990.

Rodriguez, J. and Borge, V. "Cultura, Sociedad y Conservación de los Recursos Naturales." EUNED, San José, 1985.

Rojas, F. "Hidrogeoquimica del Acuifero de Barranca, Provincia de Puntarenas, Costa Rica." Tesis de Grado, Escuela Centroamericana de Geologia, Universidad de Costa Rica, San Jose, 1979.

Rovira, J. "Costa Rica en los Años 80." Editorial Porvenir, San Jose, 1989.

Rovira, J. "Estado y Politica Economica en Costa Rica, 1948-1970." Editorial Porvenir, San Jose, 1988.

Saenz P. and Knight, F. "Tenure Security, Land Titling and Agricultural Development in Costa Rica." University of Costa Rica School of Law, Agrarian Law Project, USAID contract 515-178-T, San Jose, 1971.

Salas, J. "La Industria Forestal en Costa Rica." Primer Congreso Nacional Forestal, 1985.

Salazar, Roxana. "Analisis del Marco Legal Interinstitucional de la Reservas de lo Biosfera la Amistad." consultorio para la OED, San Jose, 1989.

Sanchez, P. "Suelo de Amazonia y su Manejo para Producion Continua de Cultivo." Instituto Nacional de Agronomo Pecurio Carlonia del Norte, 1988.

Sanchez, P. Testimony to the U.S. House of Representatives Subcommittee on Natural Resources, Agricultural Research and the Environment Committee on Science, Space and Technology, Washington DC, February 23, 1989.

-243

"Sector Recursos Pesqueros, Estrategia Nacional de Conservacion para el Desarrollo Sostenido." Carlos Villalobos, 1989

"SENARA: Fomenta el Desarrollo Agropecuario del Pais por Medio del Riego y el Avenamiento." San Jose.

"Servicio Nacional de Conservacion de Suelo y Agua." Ministerio de Agricultura y Ganaderia y FAO. San Jose.

"Sistema para la Determinacion de la Capacidad de Uso de las Tierras de Costa Rica." Centro Cientifico Tropical, San Jose, agosto 1985.

Solis, O. "La Caja Chica y el Desarrollo." Periódico La Nación, 5 agosto 1990, p. 15-A.

Sorensen, Jens. "An Assessment of Costa Ricas's Coastal Management Program." draft, Department of Marine Affairs, University of Rhode Island, November 6 1989.

Sorensen, J. and Brandani, A. "An Overview of Coastal Management Efforts in Latin America." Coastal Management, Vol. 15, pp. 1-25, 1987.

"Survey Report: Forestry Development in Costa Rica." USAID, San José, 1987.

Tosi, Joseph A. "Esbozo de la Palabras Ofrecidas en la Mesa Redonda sobre 'Recomendaciones al Nuevo Gobvierno de la Republica en Materia de Recursos Natruales.' Auspiciado por la Universidad Estatal a Distanci, el 9 de junio de 1978." San Jose, junio de 1978.

Tosi, Joseph A. "Notas Sobre el Ano 2000, Costa Rica." al pedido del biologo Alvaro Ugalde Biquez, Jefe, Servicio de Parques Nacionales, Ministerio de Agricultura y Ganaderia, San Jose, octubre 1976.

Tosi, Joseph and Holdridge, L.R. "Notas Tecnicas y Economicas, No. 1: Potencial para la Ordenacion Tecnica del Bosque Natural en Costa Rica." San Jose, Julio 1973.

Tosi, Joseph and Holdridge, L.R. "Potencial para la Ordenación Técnica del Bosque Natural en Costa Rica." Notas Técnicas y Económicas, No. 1. Centro Científico Tropical, San José, 1973.

Trejos, J. "Desarrollo Económico, Informe sobre el Estado del Medio Ambiente en Costa Rica." San José, 1987.

Ugalde, Alvaro. "Analisis de Politicas de Manejo de Areas Silvestres en Costa Rica." working papaer, San Jose, 1989.

Umana, A. "Debt Relief for Energy Efficience, Conservation and Sustainability." Washington, DC, May 1989.

244

Vargas, F. C. "Propuesta para la Creacion de una Unidad de Manejo de Cuencas en AYA, (Costa Rica) y Determinacion de su Marco Refernecial de Operacion." thesis para Magister Scientiae, Universidad de Costa Rica, San Jose, 1987.

Vargas, T. "Fijado Límite a Gastos en 1991." Periódico La Nación, 15 agosto 1990, p. 4-A.

Vargas, T. "El Futuro es Esperanzador." Periódico La Nación, 15 agosto 1990, p.18-A.

Vasquez, A. "Carografía y Clasificación de Suelos de Costa Rica (escala 1:200,000). Proyecto 'Apoyo al Servicio Nacional de Conservación de Suelos y Aguas'". FAO, Rome, 1989.

Villasuso, J. "Discusión Fiscal y Economía Nacional." Periódico La Nación, 5 agosto 1990, p. 15-A.

Villasuso, J., Trejos, R., Celis, R., Taylor, M. and Vazquez, A. "El Sector Productivo: Crisis y Perspectivas." Editorial Porvenir, San Jose, 1984.

"Watershed Management: Economioc Issues in Developing Countries." Sfeir-Younis, Alfredo. The World Bank. December 1987.

Ugalde, Alvaro. "Analisis de Politicas de Manejo de Areas Silvestres en Costa Rica." working papaer, San Jose, 1989.

Umana, A. "Debt Relief for Energy Efficience, Conservation and Sustainability." Washington, DC, May 1989.

- 245

APPENDIX C

TEAM MEMBERS

Ms. Theresa Bradley, Development Economist
Abt Associates, Bethesda, Maryland

Ms. Bradley serves as econometrician and policy methodologist within the International Economic Area of Abt Associates and is a Ph.D. candidate at the Department of Economics, University of Pennsylvania. In addition to her work in Central America, she has worked with USAID/Cairo under the AID/S&T funded Agricultural Policy Analysis Project, Phase II in evaluating price liberalization policies for major Egyptian agricultural commodities.

Mr. Dennis McCaffrey, Lawyer
Gaithersburg, Maryland

Mr. McCaffrey has written environmental assessments for USAID natural resources projects in Peru, Costa Rica, and Guatemala. He has also participated in the USAID funded environmental action plan for Honduras and in the preparation of the environmental profiles of Bolivia and Paraguay. Mr. McCaffrey consults to the IDB, the World Bank, and to several international conservation organizations as well as to AID. He is fluent in Spanish.

Francisco Rodriguez Vega, Agronomist
San Jose, Costa Rica

Mr. Rodriguez received his B.A. and M. A. degrees in Agriculture and Extension Education from New Mexico State University in the 1960s. He has work extensively in Costa Rica, El Salvador and Peru on issues of technology transfer and training and natural resource management. In Peru, he designed and implemented a technology transfer and training center under a USAID/Peru project. He recently consulted with USAID/Costa Rica on agronomy resources management for the BOSCOSA Project in the Osa Peninsula and for the Northern Zone Consolidation Project.

Marcelino Losilla Penon, Hydrologist
San Jose, Costa Rica

Mr. Losilla received his Masters of Science in Hydrogeology from the University of London in 1975 and has several years of post graduate schooling. He has participated in over 40 short term consulting assignments related to hydrogeology and watershed management and has published over 35 technical papers on the evaluation, exploitation and management of water resources in Central America. In addition, he teaches at the Central American School of Geology at the University of Costa Rica.

Dr. Joseph Tosi, Ecologist
Tropical Science Center, San Jose, Costa Rica

Dr. Tosi helped create TSC and has forty years of experience in tropical ecology, forestry, and land utilization in Costa Rica. In addition, he has consulting experience in Bolivia, Peru, Colombia, Panama and Nicaragua. Dr. Tori has a Ph.D. in Geography. Dr. Tosi is fluent in Spanish, Portuguese and French.

Thomas Divney, Consulting Forester
Tropical Science Center, San Jose, Costa Rica

Thomas Divney is a consulting forester with the Tropical Science Center specializing in forest resource management. He received his B.S. and M.S. in Forestry from Michigan Technological University and a B.A. in Natural Resources from Northland College. He has resided in Costa Rica since 1986, working as a forestry extensionist and consulting on various forest management and natural resource policy projects. He is fluent in Spanish.

Raul Solorzano, Agricultural Economist
Tropical Science Center, San Jose, Costa Rica

With a M.S. in Natural Resources Raul Solorzano has ample experience in the forestry sector within the Central American region especially in forestry economics, forestry policy, and land use economy. He is former Sub-Director General to DGF and CORENA in Costa Rica. Mr. Solorzano consults through the Tropical Science Center to FAO, World Bank, PNUD, USAID, PENUMA, ACDI, OTS, World Resources Institute.

Dr. David M. Kauck, Sociologist
Tropical Science Center, San Jose, Costa Rica

Dr. Kauck serves as a consultant with special interest in problems to the environment, agricultural policy, household and farm economics, land tenure and institutional development. Dr. Kauck works on a consultant basis for A.I.D., CATIE, IICA in Guatemala, El Salvador, Honduras, Nicaragua and Costa Rica. Dr. Kauck has a Ph.D in Sociology from the University of Washington and is fluent in Spanish.

Rafael Bolanos, Forester
Tropical Science Center, San Jose, Costa Rica

Mr. Bolanos has been a member of TSC for over eleven years. He consults on forestry and ecology and land use issues in Central America, Peru and Belize.

247

Mario Rojas, Wildlands specialist

For ten years Mr. Rojas has worked for the National Parks Service as Administrator and Director of the Planning Office. He has also is a consultant to the United Nations Office for Refugees and their Government counterpart DIGEPARE. Presently, he is the Director of the Biosphere Reserve "La Amistad" in Talamanca.

Martha Molina de Carcabelos, Administrative Assistant
San Jose, Costa Rica

Ms. Molina de Carcabelos has experience in public relations and office management. Ms. Molina de Carcabelos is fluent in Spanish and French and frequently serves as translator.

Carlos Villalobos, Fisheries Expert
San Jose, Costa Rica

Mr. Villalobos is a professor at the University of Costa Rica, with more than 25 years of experience in teaching and research in the area of marine resources. He received his Masters degree in Marine Biology from California State University and has published numerous works concerning the biology and ecology of marine and freshwater organisms. His most recent works relate to fisheries administration and policy issues.

-248

AGRICULTURAL POLICY ANALYSIS PROJECT, PHASE II

Under contract to the Agency for International Development, Bureau for Science and Technology, Office of Agriculture
Project Office Hampden Square, 4800 Montgomery Lane, Suite 500, Bethesda, MD 20814 • Telephone: (301) 913-0500
Telex: 312636 • Fax: (301) 652-7530 • Fax: (301) 652-7791

COSTA RICA NATURAL RESOURCE POLICY INVENTORY USAID/ROCAP RENARM PROJECT

VOLUME III

TECHNICAL APPENDICES

OCTOBER 1990

TECHNICAL REPORT NO. 112

**Conducted under contract with Abt Associates Inc.
and the Agricultural Policy Analysis Project, Phase II (APAP II)
in collaboration with the Tropical Science Center (San José, Costa Rica)**

Main Authors: **Theresa Bradley**
Thomas Divney
Marcelino Losilla Penon
Dennis McCaffrey
Francisco Rodriguez Vega
Joseph Tosi

Prime Contractor: **Abt Associates Inc.,** 55 Wheeler Street, Cambridge, MA 02138 • (617) 492-7100

Subcontractors: **Harvard Institute for International Development,** Harvard University, One Eliot Street, Cambridge, MA 02138 • (617) 495-2164
Food Research Institute, Stanford University, Stanford, CA 94305-6084 • (415) 723-3941
North Carolina State University, Department of Economics and Business, Box 7645, Raleigh, NC 27695-7645 • (919) 737-7187
Abel, Daft & Earley, 1410 King Street, Alexandria, VA 22314 • (703) 739-9090
International Science and Technology Institute, 1129 20th Street, NW, Suite 800, Washington, D.C. 20036 • (202) 785-0831
International Food Policy Research Institute, 1776 Massachusetts Avenue, NW, Washington, D.C. 20036 • (202) 862-5600

249

TABLE OF CONTENTS

VOLUME ONE: EXECUTIVE SUMMARY

ACKNOWLEDGEMENTS ix

ABSTRACT x

ACRONYMS xi

1. INTRODUCTION 1
   Contents of the Report 1

2. KEY MACRO ISSUES 2

   2.1 Macroeconomic Issues 2

   2.2 Population Growth and Demands on Natural Resources 6

   2.3 Private Property Rights 6

   2.4 National Strategies for Development 7

3. SUSTAINABLE AGRICULTURE 9

   3.1 Improper Soil, Water and Land Use Management Practices 9
      3.1.1 Issue Description 9
      3.1.2 Policy and Institutional Framework 9
      3.1.3 Issue Analysis 10

   3.2 Misuse of Agrochemicals 12
      3.2.1 Issue Description 12
      3.2.2 Policy and Institutional Framework 12
      3.2.3 Issue Analysis 13

   3.3 Agricultural Technology Research and Extension Services 13
      3.3.1 Issue Description 13
      3.3.2 Policy and Institutional Framework 14
      3.3.3 Issue Analysis 14

   3.4 Policy Gaps, Policy Alternatives and A Research Agenda 16

4. MANAGEMENT OF WATER RESOURCES 18

   4.1 Water Pollution 18
      4.1.1 Issue Description 18
      4.1.2 Policy and Institutional Framework 18
      4.1.3 Issue Analysis 19

   4.2 Competition for Water Resources 20
      4.2.1 Issue Description 20
      4.2.2 Policy and Institutional Framework 21
      4.2.3 Issue Analysis 22

4.3 Watershed Deterioration 23
4.3.1 Issue Description 23
4.3.2 Policy and Institutional Framework 24
4.3.3 Issue Analysis 24

4.4 Policy Gaps, Policy Alternatives and A Research Agenda 26

5. PRODUCTION FROM FORESTS 28

5.1 Deforestation 28
5.1.1 Issue Description 28
5.1.2 Policy Framework 28
5.1.3 Institutional Framework 29
5.1.4 Issue Analysis 30

5.2 Reforestation 31
5.2.1 Issue Description 31
5.2.2 Policy and Institutional Framework 32
5.2.3 Issue Analysis 33

5.3 Ineffective Forest Management 35
5.3.1 Issue Description 35
5.3.2 Policy and Institutional Framework 36
5.3.3 Issue Analysis 37

5.4 Inefficient Production from Forest Resources 40
5.4.1 Issue Description 40
5.4.2 Policy and Institutional Framework 40
5.4.3 Issue Analysis 41

5.5 Policy Gaps, Policy Alternatives and A Research Agenda 42

6. MANAGEMENT OF WILDLANDS 44

6.1 Inadequate Conservation of Biodiversity and Consolidation of Wildlands 44
6.1.1 Issue Description 44
6.1.2 Policy and Institutional Framework 44
6.1.3 Issue Analysis 46

6.2 Inappropriate Land Uses in Buffer Zones 47
6.2.1 Issue Description 47
6.2.2 Policy and Institutional Framework 48
6.2.3 Issue Analysis 48

6.3 Inadequate Long Term Planning for Ecotourism Activities 49
6.3.1 Issue Description 49
6.3.2 Policy and Institutional Framework 49
6.3.3 Issue Analysis 50

6.4 Policy Gaps, Policy Alternatives and A Research Agenda 51

7. MANAGEMENT OF COASTAL AND MARINE RESOURCES 55

7.1 Lack of Coastal Zone Management 55
7.1.1 Issue Description 55
7.1.2 Policy and Institutional Framework 55
7.1.3 Issue Analysis 56

7.2 Unsustainable Fishery Yields 58
7.2.1 Issue Description 58
7.2.2 Policy and Institutional Framework 58
7.2.3 Issue Analysis 59

7.3 Policy Gaps, Policy Alternatives and A Research Agenda 60

8. CONCLUSION 63

VOLUME TWO: THE INVENTORY

PREFACE ix
Purpose of the Report ix
Background Context of the Policy Inventories x
Contents of the Report xi
Summary xi

ACKNOWLEDGEMENTS xiii

ABSTRACT xiv

ACRONYMS xv

LIST OF CHARTS AND MAPS xx

CHAPTER ONE: INTRODUCTION 1

1.1 Scope and Orientation of the Analysis 1
1.1.1 Natural Resource Themes 1
Sustainable Agriculture. 1
Production from Forests. 1
Management of Water Resources. 1
Management of Wildlands. 1
Management of Coastal and Marine Resources. 2

1.1.2 Criteria for Selecting Policies 2

1.2 An Overview of Costa Rica's Environment 3
1.2.1 Physical Diversity 3
1.2.2 Climatic Diversity 5
1.2.3 Ecological and Biological Diversity 5
1.2.4 The Natural Resources 6
Soils 6
Land Use and Land Capability 7
Soil Erosion 8
Water 9
Forests 10
Coasts 11

CHAPTER TWO: THE MACRO POLICY ENVIRONMENT 13

2.1 Introduction 13

2.2 Human Ecological Factors 13

2.3 Macroeconomic Factors 15
2.3.1 Historical Perspective 15
Sustained Import Substitution. 16
Economic Instability and the Move Toward a Planned Economy,1973-79. 17
Economic Crisis and Fiscal Retrenchment, 1980-90. 18

-25-

2.3.2 Economic Policies and Patterns of Land Use.
Finacial Incentives 20
Property Rights 21

2.4 Political and Institutional Factors and Their Consequences for Long Run Natural Resource Management Policies 22

2.5 Cultural Factors 24

CHAPTER THREE: SUSTAINABLE AGRICULTURE 25

3.1 Improper Soil, Water and Land Use Management Practices 25
3.1.1 Issue Description 25
3.1.2 Policy Framework 26
3.1.3 Institutional Framework 27
3.1.4 Issue Analysis 28
3.1.5 Policy Gaps, Alternatives and a Policy Research Agenda 31

3.2 Misuse of Agrochemicals 32
3.2.1 Issue Description 32
3.2.2 Policy Framework 33
3.2.3 Institutional Framework 33
3.2.4 Issue Analysis 34
3.2.5 Policy Gaps, Alternatives and a Policy Research Agenda 35

3.3 Agricultural Technology Research and Extension Services 36
3.3.1 Issue Description 36
3.3.2 Policy Framework 37
3.3.3 Institutional Framework 37
3.3.4 Issue Analysis 38
3.3.5 Policy Gaps, Alternatives and a Policy Research Agenda 39

CHAPTER FOUR: MANAGEMENT OF WATER RESOURCES 41

4.1 Water Pollution 41
4.1.1 Issue Description 41
4.1.2 Policy and Institutional Framework 42
4.1.3 Issue Analysis 43
4.1.4 Policy Gaps and Alternatives 45

4.2 Competition for Water Resources 46
4.2.1 Issue Description 46
4.2.2 Policy and Institutional Framework 47
4.2.3 Issue Analysis 48
4.2.4 Policy Gaps and Alternatives 50

4.3 Watershed Deterioration 51
4.3.1 Issue Description 51
4.3.2 Policy and Institutional Framework 53
4.3.3 Issue Analysis 56
4.3.4 Policy Gaps and Alternatives 59

4.4 Policy Research Agenda and Policy Alternatives 60
4.4.1 Water Laws Reforms 60
4.4.2 National Water Plan 61
4.4.3 Watershed Management Secretariat (STC) 61
4.4.4 Water Monitoring Program 61
4.4.5 Water Management Strategies and Concepts 61
4.4.6 National Constitutional Reforms 62

CHAPTER FIVE: PRODUCTION FROM FORESTS 64

5.1 Deforestation 64
5.1.1 Issue Description 64
5.1.2 Policy Framework 64
5.1.3 Institutional Framework 65
5.1.4 Issue Analysis 67
5.1.5 Policy Gaps, Alternatives and a Policy Research Agenda 69

5.2 Reforestation 70
5.2.1 Issue Description 70
5.2.2 Policy Framework 70
5.2.3 Institutional Framework 73
5.2.4 Issue Analysis 75
5.2.5 Policy Gaps, Alternatives and a Policy Research Agenda 79

5.3 Ineffective Forest Management 80
5.3.1 Issue Description 80
5.3.2 Policy Framework 81
5.3.3 Institutional Framework 83
5.3.4 Issue Analysis 84
5.3.5 Policy Gaps, Alternatives and a Policy Research Agenda 87

5.4 Inefficient Production from Forest Resources 88
5.4.1 Issue Description 88
5.4.2 Policy Framework 90
5.4.3 Institutional Framework 92
5.4.4 Issue Analysis 92
5.4.5 Policy Gaps, Alternatives and a Policy Research Agenda 94

CHAPTER SIX: MANAGEMENT OF WILDLANDS 96

6.1 Inadequate Conservation of Biodiversity and Consolidation of Wildlands 96
6.1.1 Issue Description 96
6.1.2 Policy Framework 101
6.1.3 Institutional Framework 102
6.1.4 Issue Analysis 103
6.1.5 Policy Gaps, Alternatives and a Policy Research Agenda . . . 105

6.2 Inappropriate Land Uses in Buffer Zones 106
6.2.1 Issue Description 106
6.2.2 Policy Framework 107
6.2.3 Institutional Framework 108
6.2.4 Issue Analysis 108
6.2.5 Policy Gaps, Alternatives and a Policy Research Agenda . . . 109

6.3 Inadequate Long Term Planning for Ecotourism Activities 111
6.3.1 Issue Description 111
6.3.2 Policy Framework 112
6.3.3 Institutional Framework 114
6.3.4 Issue Analysis 114
6.3.5 Policy Gaps, Alternatives and a Policy Research Agenda . . . 116

CHAPTER SEVEN: MANAGEMENT OF COASTAL AND MARINE RESOURCES 118

7.1 Lack of Coastal Zone Management 118
7.1.1 Issue Description 118
7.1.2 Policy Framework 118
7.1.3 Institutional Framework 119
7.1.4 Issue Analysis 120
7.1.5 Policy Gaps, Alternatives and a Policy Research Agenda . . . 123

7.2 Unsustainable Fishery Yields 125
7.2.1 Issue Description 125
7.2.2 Policy Framework 125
7.2.3 Institutional Framework 128
7.2.4 Issue Analysis 129
7.2.5 Policy Gaps, Alternatives and a Policy Research Agenda . . . 131

CONCLUSION 132

APPENDIX A: LIST OF CONTACTS A-1

APPENDIX B: REFERENCES B-1

APPENDIX C: TEAM MEMBERS C-1

VOLUME III: TECHNICAL APPENDICES

TECHNICAL APPENDIX A: PUBLIC POLICIES A-1

TECHNICAL APPENDIX B: PUBLIC INSTITUTIONS B-1

TECHNICAL APPENDIX C: NON-GOVERNMENTAL ORGANIZATIONS C-1

-256-

TECHNICAL APPENDIX A

PUBLIC POLICY TABLES

The following policies are presented in seventeen tables in this appendix:

1. Natural Resources Policy Statement of the Current Government of Costa Rica, Partido Unidad Social Cristiana: Plan de Accion Recursos Naturales Renovables 1990-1994 (1989)

2. Conservation Strategy for the Sustainable Development of Costa Rica (ECODES) (1990)

3. Agrarian Reform and Land Settlement Laws:
Ley de Tierras y Colonizacion (1961)
Ley de Creacion del Instituto de Desarrollo Agrario (1982)
Ley de Jurisdiccion Agraria (1982).

4. Natural Resources Conservation Law (1953)

5. Agricultural Sector Laws:
Ley de Fomento a la Produccion Agropecuaria (1987)
Ley de Sanidad Vegetal (1978)
Ley del Consejo Nacional de Produccion
Ley de Salud (1974).

6. Forestry Laws:
Ley Forestal (1986)
Ley Forestal (1990)
Ley de Reforestacion Nacional (1977)

7. Forestry Emergency Decree (September 18, 1987)

8. Tropical Forestry Action Plan (PAFCR) (1990)

9. Water Laws:
Ley al Servicio Nacional de Electricidad (1941)
Ley de Aguas (1942)
Ley General de Agua Potable (1953)
Ley de Creacion del Servicio Nacional de Aguas Subterraneas Riego y Avenamiento (1983)
Ley Constitutiva del Instituto Costaricense de Acueductos y Alcantarillados (1986)
Ley Constitutiva y Otras Disposiciones Relativas al Instituto Costarricense de Electricidad
Anteproyecto de Ley de Reformas a la Ley de Aguas
Ley de Salud (1973).

10. Health Code:
Ley General de Salud (1974)
Ley Organica del Ministerio de Salud (1974)

251

11. Mining Law (1982)

12. National Parks:
Ley de Parques Nacionales (1977)
Various laws and decrees establishing individual national parks and analogous protected areas.

13. Wildlife Laws:
Ley de Conservacion de la Fauna Silvestre (1983)
Treaties for the protection of endangered species
Laws and regulations establishing wildlife refuges.
Laws and regulations to regulate hunting and fishing.

14. Indigenous Reserves Laws:
Ley Indigena (1977)
Ley de la Comision Nacional de Asuntos Indigenas (1973)
Various decrees establishing indigenous reserves.

15. Coastal Zone Management:
Ley Sobre la Zona Maritimo Terrestre (1977).

16. Maritime Fisheries Laws:
Ley de Pesca y Caza Maritimas (1948)
International Convention of the High Seas
International Convention on Fishing and Conservation of Living Resources of the High Seas
International Convention on Ocean Dumping
The Convenio Constitutivo de la Organizacion Latinoamericana de Dearrollo Pesquero (OLDEPESCA) (1984)
The Convention for Tuna Fishing in the Eastern Pacific Ocean (1983)
Delimitation of Marine Areas and Cooperation (1981).

17. Tourism Laws:
Ley Organica del Instituto Costarricense de Turismo (1955)
Ley de Industria Turistica (1960)
Ley de Incentivos para el Desarrollo Turistico (1985).

Natural Resources Policy Statement of the Current Government of Costa Rica, Partido Unidad Social Cristiana:

Plan de Accion Recursos Naturales Renovables 1990-1994 (1989).

Summary Contents:

The natural resources policy statement focuses on four areas: forestry development, which it accords top priority, nature conservation and environmental management, ecotourism, and environmental education and training. The action plan contemplates a program of new legislation to accomplish its goals and a national land use capability study to serve as a technical basis for making decisions and allocating government investment.

Affected Institutions:

The Ministry of Natural Resources will carry out most aspects of the action plan. The plan also assigns responsibility to the Costa Rica Tourism Institute and to the National Commission for Environmental Education. The plan calls for increasing the amount of public land dedicated to forest production and protection by expanding the existing forest reserves and redesignating them as national forests. The plan also anticipates consolidation of the existing park system into seven large parks and expansion of the area in parks by incorporation of four additional park sites.

Effect on Environment and Natural Resources:

Nearly all of the twenty actions specified in the plan should result in positive effects on the environment and natural resources if they are properly implemented. Most noteworthy in their probable beneficial effect are: creation of legal property rights in trees, management of 50,000 hectares of natural forest, and pilot projects to reverse deforestation. Three points out of the twenty, although not intrinsically negative from an environmental point of view, merit special notice because they are likely to lead to significant adverse environmental consequences if they are carried out improperly. One point is the proposal to create a national forestry fund that would make preferential credit available for reforestation. It is important to establish standards for the use of this credit to avoid situations in which it operates to deplete existing natural forests, especially natural second growth forests, without replacing those forests with new forests that are their environmental equivalents. The second point is the proposal to carry out feasibility studies for establishing new pulp and paper factories in Costa Rica that would obtain their raw material from national plantations of mostly exotic species of trees. It is important to evaluate the environmental feasibility of such a program as well as its feasibility from other points of view. The third point is the proposal to reforest 80,000 hectares of land by planting 100 million trees. In some instances, better environmental results might accrue from natural regeneration of the forest than from reforestation by tree planting.

Effect on Economic Development:

The whole thrust of the action plan is to affect economic development positively by investing today in measures that will ensure availability of renewable natural resources now and in the future. Implementation would require substantial public funding. However, if the plan is carried out as proposed, it should have the desired long-run beneficial economic effect.

Conservation Strategy for the Sustainable Development of Costa Rica:

Estrategia de Conservacion para al Desarrollo Sostenible de Costa Rica (ECODES) (1990).

Summary Contents:

ECODES identifies nineteen separate sectors of national interest to Costa Rica, and describes current problems and opportunities in each sector with reference to conservation and development. The strategy also recommends a continuing process to formulate and implement policies that further sustainable development.

Affected Institutions:

ECODES refers to all the ministries of the government, municipal government, nongovernmental organizations, the formal private sector, and individual citizens. With regard to environment and natural resources, the strategy emphasizes the roles of the Ministry of Natural Resources and the Ministry of Planning and Economic Policy.

Effect on Environment and Natural Resources:

ECODES designates sustainable agriculture, forests, water resources, wildlands, and coastal and marine resources as sectors, each of which it treats in detail. If ECODES were fully implemented, development in each of these sectors would take into account long-term conservation of the natural resources that comprise each of these sectors as well as their development for socio-economic benefit.

Effect on Economic Development:

ECODES should induce greater attention to intersectoral planning for long-term economic development. To the extent that the ECODES process allocates public and private investment more rationally, it should affect economic development favorably. The ECODES process may well reduce short-term economic gain from unsustainable exploitation of natural resources, but should result in more stable, higher yielding economic development in the longer term.

Agrarian Reform and Land Settlement Laws:

Ley de Tierras y Colonizacion (1961)
Ley de Creacion del Instituto de Desarrollo Agrario (1982)
Ley de Jurisdiccion Agraria (1982).

Summary Contents:

These laws establish the Institute for Agrarian Development, IDA, and grant it authority to purchase private lands for the purpose of redistributing them as small farms. The laws also provide for similar distribution of government lands with agricultural potential.

Affected Institutions:

The laws primarily affect IDA and its predecessor,ITCO, the Institute for Lands and Settlement, which these laws establish, and also the system of Agrarian Tribunals which these laws establish to adjudicate controversies over rural lands. To a lesser degree these laws affect the Ministry of Agriculture in its function of providing services to farmers and the Ministry of Natural Resources in its function of administering public lands for purposes other than agriculture, especially public lands in forest reserves.

Effect on Environment and Natural Resources:

IDA and ITCO have distributed some lands with good agricultural potential whose use for agriculture has had no negative effect on environment and natural resources. On the other hand, ITCO did not, and IDA still does not, determine the land use capacity of the lands under its jurisdiction. They have settled lands which do not have long-term capacity for agricultural production and have presided over the deforestation of these lands. IDA does not recognize forest management as an appropriate use for the lands it distributes to small holders and does not provide services to settlers to practice forest management analogous to those it provides for agriculture.

Effect on Economic Development:

The agrarian reform and land settlement laws were promulgated for the express purpose of promoting national economic development by making land available to people who would not otherwise have had access to land. The rationale behind this policy is that it will bring more land into production, thereby improving the national economy. The policy has worked on lands with adequate soils and topography for high and medium yield agriculture. The policy has not worked on lands that have very poor soils and very rough topography, and which, therefore, should remain in forest. Clearing forest from them further reduces their quality and also results in loss of potential forest products. Some of the least productive farms have even been abandoned which means their settlement has resulted in direct social failure as well as in degradation of forest and soil resources.

362

Natural Resources Conservation Law:

Ley de Conservacion de Recursos Naturales (1953).

Summary Contents:

This law seeks to control soil erosion and the deleterious effects of erosion on streams and watersheds by way of education and imposition of regulations on land use practices. It promotes reforestation and other soil conservation measures on eroded lands and directs the Ministry of Agriculture to carry out a national soil survey. The law establishes fines for landowners who do not follow the provisions of the law but, apparently, the fines are either not imposed or are too small to deter the actions the law tries to prevent.

Affected Institutions:

The Ministry of Agriculture and Livestock, the forest service, and the Ministry of Education.

Effect on Environment and Natural Resources:

The natural resources conservation law has not controlled soil erosion or deforestation, both of which have increased noticeably during the quarter century the law has been in effect.

Effect on Economic Development:

The law has probably had little direct effect on economic development. It certainly appears to have had no effect in regulating land uses that cause erosion, e.g. forest clearing and cattle raising on steep slopes in tropical wet areas, or in persuading farmers to institute soil conservation measures. The failure of the law will probably prove to have had long-term, indirect negative economic impact through loss of forest resources and continued erosion of soils.

Agricultural Sector Laws:

Ley de Fomento a la Produccion Agropecuaria (1987)
Ley de Sanidad Vegetal (1978)
Ley del Consejo Nacional de Produccion
Ley de Salud (1974)

Summary Contents:

The agricultural sector laws accord preferred treatment to persons engaged in agriculture by way of adjustment of existing debt, duty free imports of inputs and machinery, government sponsored research, and price supports for certain commodities. The laws regulate imports of pesticides and control domestic manufacture and application of pesticides.

Affected Institutions:

The Ministry of Agriculture and Livestock and its subdivisions and dependencies; the banking system.

Effect on Environment and Natural Resources:

The agricultural sector laws do not tie agricultural production to natural resource capacity. By subsidizing agricultural and livestock production on lands that do not have the capacity to sustain those activities, the laws probably promote destructive land use that would not occur in their absence and if unregulated market forces had more direct impact on landowners' decisions regarding land use. The laws have also promoted increased use of all types of agrochemicals. Although the laws attempt to regulate pesticides, the regulation does not operate to control the types or amounts of chemicals used, thereby leading to health hazards to agricultural workers, contamination of food, and pollution of water and soil.

Effect on Economic Development:

The agricultural sector laws have promoted expansion of agriculture both in terms of modernizing it through mechanization and use of agrochemicals and in terms of bringing more land into production. Short-term effects have been positive in increased export revenues, increased domestic employment, and lower food prices. Long-term economic effects may well be negative if environmental contamination and natural resource deterioration are taken into account.

Forestry Law:

Ley Forestal (1986)
Ley Forestal (1990)
Ley de Reforestacion Nacional (1977).

Summary Contents:

The forestry law establishes the National Forest Service, Direccion General Forestal, DGF, within the Ministry of Natural Resources. The law also regulates tree cutting and forest harvesting on private lands and provides for the management of Costa Rica's forest reserves, each of which is established separately by decree. The law further provides for establishment of a national forestry fund to support reforestation and also for tax credits (certificados de abono forestal, or CAFs) for reforestation.

Affected Institutions:

DGF is the principal institution affected by the forestry law. Under the law, DGF issues permits for forest harvesting on private lands and concessions for forest harvesting on forest reserves. It requires management plans for timber harvesting and sets allowable cuts and harvest practices. The Forest Service also sets stumpage prices, collects log transport taxes, and operates forest tree nurseries.

Effect on Environment and Natural Resources:

The forestry law provides for conservation of forests as well as for assuring timber supply. Forest harvesting permits and management plans are the principal mechanisms whereby DGF is supposed to accomplish both objectives. In practice neither objective is met. Although Costa Rica has had legislation similar to the current forestry law for a little over twenty years, it has been unable to contain deforestation even in forest reserves. Forests on both public and private land continue to fall victim to unmanaged timber cutting and clearing for other land uses. The CAFs have not been fully effective either. Landowners have taken advantage of them to reduce their taxes but often field reforestation has either replaced existing natural forest with plantations of lower environmental quality or occurred on land better used for agriculture.

Effect on Economic Development:

The failure of the forestry law to contain deforestation has boosted Costa Rica's economy in the short run by making an ample wood supply available cheaply and also by making large amounts of land available for cattle production and agriculture. Similarly the CAFs inject money into the economy, though at the expense of government revenues. Longer run negative economic effects include loss of future wood supply, loss of opportunity to upgrade forest industries technology, loss of positive environmental benefits from forests like erosion control and water regulation, and negative environmental effects like loss of biodiversity and spoiling of prospective tourism sites.

205

Forestry Emergency Decree:

Decreto de Emergencia (September 18, 1987).

Summary Contents:

The forestry emergency decree declares a national state of emergency with regard to deforestation and bans the export of unfinished forest products. It directs the national forest service to determine how much forest is left in Costa Rica and to take steps to protect the remaining forest. The decree further directs the forest service to reduce the number of permits and concessions it issues. It also adopts a national land use classification system and directs all government agencies to use that system. The decree directs the Institute for Agrarian Development to set aside ten percent of each parcel of land under its jurisdiction for forestry development. It also bans credit for agricultural and livestock activities that entail deforestation.

Affected Institutions:

The national forest service, Direcion General Forestal, DGF, in the Ministry of Natural Resources; the Institute for Agrarian Development, Instituto de Desarrollo Agrario,IDA, attached to the Ministry of Agriculture; and an interministerial commission established by the decree, the Forestry Emergency Commission, Comisiom de Emergencia Forestal, which oversees implementation of the decree.

Effect on Environment and Natural Resources:

The initial impact of forestry emergency decree may well have been negative in that people who surmised the decree was under consideration probably cut trees they might otherwise not have (* at least 6 months of deliberation). The longer term impact of the decree is probably positive in that it focuses public awareness on a serious natural resources problem and proposes some concrete steps to resolve it. Actual implementation is slow, however. Government agencies other than DGF are still wrangling over how best to classify land use capability and the chronic incapacity of the forest service to attain forest management continues.

Effect on Economic Development:

One aspect of the emergency decree that seems to have been implemented successfully is the ban on export of raw timber products. Very few firms finish their products sufficiently to qualify for export permits. This gives the most modern, high tech manufacturers an advantage that could eventually lead to modernizing more of the national forest industry and elimination of the least efficient producers.

Tropical Forestry Action Plan:

Plan de Accion Forestal de Costa Rica (PAFCR) (1990).

Summary Contents:

The forestry action plan for Costa Rica is one of a series of national plans that many countries are preparing under the worldwide Tropical Forestry Action Plan coordinated by the FAO. The plan programs investment by the national government, the private sector, and from international development assistance agencies over the next twenty years, with emphasis on the next five years. The plan focuses on five areas: forestry and land use, forest industries, fuelwood and energy, ecosystem conservation, and forestry institutions. The plan recommends 31 separate development projects that span all five areas. It calls for a total investment in forestry of $276 million by 1995, mostly from donated development assistance funds. The plan would allocate $87 million to reforestation plantations and $8.6 million to natural forest management.

Affected Institutions:

The Ministry of Natural Resources, MIRENEM, prepared the national forestry action plan with assistance from the government of the Netherlands. MIRENEM, and its line agencies, the national forest service and national park service, would have principal responsibility to implement the plan. Some implementation responsibility would also lie with NGOs, private industry, and other government agencies.

Effect on Environment and Natural Resources:

The net effect on environment and natural resources of the program outlined in the national forestry action plan would certainly be positive. The plan would allocate approximately $96 million to protected areas, primarily the seven consolidated conservation areas that include Costa Rica's most important national parks. About one-third of proposed investment under the plan would go to reforestation for establishing large scale tree plantations. The plantations would provide greater environmental benefit than low-grade pasture but less than would be obtained by managing second growth forests. The relatively low priority given to natural forests, as contrasted to plantations results in less investment in natural forests as economic production units, thereby reducing both environmental and economic benefits they could provide if they were accorded greater weight.

Effect on Economic Development:

Simply producing the national forestry action plan calls attention to the economic potential of forestry in Costa Rica and probably promotes investment in forestry. On the other hand, the plan relies heavily on development assistance donations for its implementation which raises two questions: whether such large amounts of development assistance donations are available to Costa Rica; and

whether it is desirable to allocate development assistance donations to forestry in preference to other areas of potential investment. Finally, even though the projected investment comes from donations, it implies a huge administrative commitment to forestry institutions that Costa Rica might find difficult to meet.

Water Laws:

Ley al Servicio Nacional de Electricidad (1941)
Ley de Aguas (1942)
Ley General de Agua Potable (1953)
Ley de Creacion del Servicio Nacional de Aguas Subterraneas Riego y Avenamiento (1983)
Ley Constitutiva del Instituto Costaricense de Acueductos y Alcantarillados (1986)
Ley Constitutiva y Otras Disposiciones Relativas al Instituto Costarricense de Electricidad
Anteproyecto de Ley de Reformas a la Ley de Aguas
Ley de Salud (1973).

Summary Contents:

The water laws deal primarily with water supply and, to a lesser extent, with disposition of waters after use, notably through drainage. The laws establish a set of preferences for rights to water, recognize private and public rights and preferences, and establish a group of institutions to provide for water supply and to regulate water use. Proposed revisions to the water laws would revise the preferences to reflect changes in conditions over the past half century and would focus greater attention on securing water supply through watershed management and in disposing of used waters appropriately. The proposed law would assign more responsibility to the users to preserve water resources and obtain more community participation.

Affected Institutions:

The National Electricity Service; the National Service for Ground Water, Irrigation, and Drainage; the Costa Rican Institute for Water and Sewerage; the Costa Rican Institute for Electricity.

Effect on Environment and Natural Resources:

Until recently the water laws have had relatively little affect on environment and natural resources because Costa Rica has abundant water and abundant capacity to absorb waste water. In the last few years, however, it has become apparent that the country must take steps to manage watersheds to assure consistent supplies of water and to reduce siltation that affects hydroelectric facilities. Water pollution and disposition of domestic, agricultural, and industrial waste waters have also emerged as important issues within the past decade.

261

Effect on Economic Development:

Up to now, the existing policy framework for water supply appears to have assured adequate supplies of water at reasonable cost. Similarly, the lack of emphasis on disposition of waste waters appears not to have had significant, adverse economic effects. Soon, however, both water supply and waste water disposal will become sufficiently important to have an impact on the economy. The country foresees this impact and has undetaken review of current water policies.

Health Code:

Ley General de Salud (1974)
Law No. 5412 (Ley Organica del Ministerio de Salud) (1974)

Summary Contents:

The health code contains numerous provisions concerning public health, the practice of medicine, and the provision of public and private health services. It also establishes the current structure of the Ministry of Health to include the division of environmental health, Division de Saneamiento Ambiental. The division of environmental health has charge of environmental conservation and improvement, which means it deals, usually in conjunction with other agencies in other ministries, with pesticides and other toxic chemicals, drinking water and sewage, and solid waste.

Affected Institutions:

The Ministry of Health, particularly the Division of Environmental Health; the Ministry of Agriculture and Livestock; and the Costa Rican Institute for Water and Sewers, Instituto Costarricense de Acueductos y Alcantarillados.

Effect on Environment and Natural Resources:

National policies on environmental health do not prevent or control water pollution, misuse of pesticides, or improper disposition of solid wastes effectively. But the presence of these policies probably has some positive effect on maintaining a healthy environment and could serve as the basis for attaining greater environmental protection through stronger institutions and more diligent enforcement. A big obstacle to implementing the policies more effectively is the absence of national standards for environmental quality, e.g. water quality standards for streams.

Effect on Economic Development:

Current policies do not create economic burdens on industry by requiring pollution control measures. Absence of enforcement of environmental health standards probably has a negative economic impact because it reduces the general health of the Costa Rican population.

Mining Law:

Codigo de Mineria (1982).

Summary Contents:

The mining law regulates mining throughout Costa Rica including its territorial seas. The law establishes the Bureau of Geology, Mines, and Hydrocarbons, Direccion de Geologia, Minas e Hidrocarburos, within the Ministry of Natural Resources. The law provides for the authorization of mining permits subject to environmental impact analysis performed by the Bureau of mines and restricts mining in protected areas.

Affected Institutions:

The Ministry of Natural Resources and its dependencies that deal with mining and with administration of protected areas.

Effect on Environment and Natural Resources:

The mining law effectively allows the government to restrict or prohibit mining in protected areas, e.g. prohibition of gold mining in Corcovado National Park. The law's provisions on environmental impact assessment, though not very rigorous as currently applied, could serve as a model to extend environmental impact analysis to other types of situations that have potentially adverse environmental impacts.

Effect on Economic Development:

The mining law appears to regulate mining sufficiently to prevent conflicts between mining and other productive and social activities without placing undue economic burdens on the mining industry.

National Parks:

Ley de Parques Nacionales (1977)
Numerous laws and decrees establishing individual national parks and analogous protected areas.

Summary Contents:

The national parks law establishes the National Park Service, Servicio de Parques Nacionales, in the Ministry of Natural Resources, and charges the park service with responsibility for protecting and managing Costa Rica's national parks. The law declares the parks to have the principal purpose of conserving the national natural patrimony. It prohibits all extractive uses in the parks except for regulated sport fishing.

Affected Institutions:

The Ministry of Natural Resources, particularly The National Park Service, and the country's national parks and biological reserves.

Effect on Environment and Natural Resources:

The national parks law effectively protects the environment and natural resources inside the national parks from exploitation and habitat destruction. The conservation capability of some of the parks, however, suffers from loss of habitat and activities that conflict with conservation outside the boundaries of the parks. Emerging concepts of protected areas management in Costa Rica would give the park service a lead role in influencing activities in forest reserves and buffer zones that adjoin parks with the purpose of using these areas to augment the conservation function of the parks.

Effect on Economic Development:

National parks in Costa Rica usually occupy lands with very low productive capacity and therefore their establishment has not withdrawn land from agricultural or pastoral uses. Most of the parks are forested however and their strict protection prevents timber harvesting inside them. As deforestation continues in Costa Rica, there could be some pressure to harvest the forests they contain. The presence of the parks as attractions for tourists, both national and international, has a positive effect on economic development. The most economically problematic effect of parks relates to the new concept of buffer zone management. On the one hand, restricting land uses in buffer zones may result in lower short-term incomes from agriculture and livestock raising. On the other hand, promotion of ecotourism and eventual positive economic effects of conservation measures should produce positive economic development in the buffer zones over the longer term.

Wildlife Laws:

Ley de Conservacion de la Fauna Silvestre (1983)
Treaties for the protection of endangered species
Various laws and regulations establishing wildlife refuges
Numerous laws and regulations to regulate hunting and fishing.

Summary Contents:

The wildlife laws establish the Wildlife Division, Division de Vida Silvestre, within the Ministry of Natural Resources and eleven national wildlife refuges. The laws authorize the Wildlife Division to protect and manage national wildlife refuges, to enforce international treaties on protection of endangered species, and to regulate hunting and fishing on public and private lands. The wildlife laws also establish open and closed seasons for hunting and fishing and prohibit capturing or killing certain endangered species.

Affected Institutions:

The Ministry of Natural Resources, primarily the Wildlife Division, and the national police, Guardia Rural, who enforce the fish and game s.

Effect on Environment and Natural Resources:

The wildlife laws have been reasonably effective at setting aside land for wildlife habitat. The laws are less effective at controlling hunting and fishing and protecting endangered wildlife, although Costa Rica does have a good reputation internationally for enforcing CITES, the Convention on International Trade in Endangered Species.

Effect on Economic Development:

Wildlife laws probably have very little effect on hunting and fishing for subsistence. To the extent that the laws have protected wildlife and habitat effectively to make them available for tourism, they have probably had a positive effect economically.

Indigenous Reserves Laws:

Ley Indigena (1977)
Ley de la Comision Nacional de Asuntos Indigenas (1973)
Various decrees establishing indigenous reserves.

Summary Contents:

The indigenous reserves laws establish the National Commission on Indigenous Affairs which has responsibility to protect communal and individual rights of Costa Rica's indigenous peoples. The laws also establish a system of indigenous reserves composed of 21 separate units of territory, mostly in the Talamanca mountain range. Under the s, indigenous communities exercise autonomous authority inside each reserve.

Affected Institutions:

Primarily the National Commission on Indian Affairs, Comision Nacional de Asuntos Indigenas, CONAI, and the governmental authorities of each indigenous community.

Effect on Environment and Natural Resources:

Most of the indigenous reserves are located in remote areas and most remain forested. They tend to harbor fairly intact ecosystems with high levels of biodiversity, though some may be subjected to over-hunting and over-fishing. Many of the reserves border on national parks and forest reserves so they will figure prominently in the emergence of expanded conservation units and in the management of buffer zones. As deforestation continues outside the reserves, pressure mounts to harvest timber inside the reserves. Pressure also exists to explore for and exploit minerals inside reserves. Some reserves have remained fairly intact from settlement by people who are not members of indigenous communities, others have not. Nationwide, about 40 percent of the land in indigenous reserves is owned by nonmembers of indigenous communities.

Effect on Economic Development:

The indigenous reserves represent the current phase in an historical process in Costa Rica in which indigenous peoples have withdrawn into remote lands with little capacity for agriculture. The reserves, therefore have not had a negative economic effect in terms of making land unavailable for production. The same is probably true of forests. Although the reserves are forested, the forests tend to have relatively low capacity for sustained production. Within the next few decades, such high quality resources as do exist in the reserves will probably be brought into production, perhaps with long-term negative environmental and social effects that could offset short-term gains from exploitation.

Coastal Zone Management:

Ley Sobre la Zona Maritimo Terrestre (1977).

Summary Contents:

The Coastal zone management law declares a national coastal zone along the entire national coast which includes all lands within 200 meters of the mean high tide line, mangroves, estuaries, tidal flats and inshore islands. The law establishes public ownership over all lands in the coastal zone not privately owned and public interest in land use on all lands within the coastal zone regardless of ownership. The law regulates land uses and promotes tourism in the coastal zone.

Affected Institutions:

The Costa Rican Tourism Institute has principal responsibility for implementing the coastal zone . ICT coordinates implementation with municipal governments, the National Institute for Housing and Urbanization, INVU, the Institute for Agrarian Development, IDA, and the Atlantic Coast Port Authority, JAPDEVA.

Effect on Environment and Natural Resources:

The coastal zone law directly affects coastal resources and the coastal environment through a system of permits that allow certain land and resource uses in the coastal zone and prohibit others. Although application of the law should balance development with conservation, some critics of the way in which the law has been implemented contend that pressures for development, especially for large scale tourism facilities, override environmental considerations.

Effect on Economic Development:

The coastal zone management law seeks positive economic results through planned development of coastal zones. Tourism in the coastal zone, both national and international, is an important economic force in Costa Rica. New investment in tourism infrastructure which the law has fostered probably has had significant positive economic impact. Future negative economic effects could arise if the quest for rapid development does not take environmental quality sufficiently into account and, therefore, provokes serious environmental deterioration.

2716

Maritime Fisheries Laws:

Ley de Pesca y Caza Maritimas (1948)
International Convention of the High Seas
International Convention on Fishing and Conservation of Living Resources of the High Seas
International Convention on Ocean Dumping
The Convenio Constitutivo de la Organizacion Latinoamericana de Dearrollo Pesquero (OLDEPESCA) (1984)
The Convention for Tuna Fishing in the Eastern Pacific Ocean (1983)
Delimitation of Marine Areas and Cooperation (1981).

Summary Contents:

The Marine Hunting and Fishing Law (1948) and its regulations (1949) includes the official government policies and rules concerning fishing in estuarine, coastal, and maritime territorial waters. An old law, written before the country declared a 200-mile offshore territorial sea, its stated objective is to set conditions that maximize economic and social benefits while ensuring a sustainable level of production of marine resources. Promoting sport fishing as an avenue for tourism is also an objective.

Costa Rica follows the international convention of the high seas and the international convention on fishing and conservation of living resources of the high seas. An international convention on ocean dumping was signed by 26 countries, including Costa Rica, in 1972. The Convenio Constitutivo de la Organizacion Latinoamericana de Dearrollo Pesquero (OLDEPESCA) of 1984 calls for regional cooperation in conservation, consumption, and promotion of commercial systems and improvement of productive and institutional capacity with respect to marine resources. The Convention for Tuna Fishing in the Eastern Pacific Ocean, 1983, between Costa Rica, Panama and the US, establishes a licensing system for tuna fishing fleets to guarantee the rational exploitation of tuna resources. Panama and Costa Rica have signed a treaty on the Delimitation of Marine Areas and Cooperation, 1981, which sets the marine boundaries between the two countries and calls for cooperation to protect the resources found in their seas.

Affected Institutions:

Public sector institutions include: the Department of Fish and Aquaculture Resources within the Ministry of Agriculture, the Centro de Investigacion en Ciencias del Mar y Limnologia (CIMAR) at the University of Costa Rica, the School of Biology at the National University, the Centro Nautico Pesquero del Instituto Nacional de Aprendizaje, the Colegio Universitario de Puntarenas, the Consejo Nacional de Produccion (CNP), the Instituto Costarricense de Puertos de Pacifico (INCOP), the Instituto de Fomento Cooperativo (INFOCOOP), the Ministerio de Planification y Poltica Economica (MIDEPLAN) and the Instituto Mixto de Ayuda Social (IMAS).

In the private sector, 14 fishing cooperatives, four chambers, one labor union, and two federations are located on the Pacific coast. The Corporacion Costarricense de Desarrollo (CODESA) and the Junta Administrativa Portuaria y de

277

Desarrollo Economico de la Vertiente Atlantica (JAPDEVA) investigate the feasibility of developing the aquaculture sector along the Atlantic coast.

Effect on Environment and Natural Resources:

Current commercial fishing practices are unsustainable because fishing is concentrated on a few species with high economic value in limited geographical areas. Destructive fishing techniques, combined with general overfishing, deplete commercial fish and shellfish stocks to the point of no return, and commercial longliners are decimating naturally scarce recreational fish species.

Effect on Economic Development:

The fishing industry is not a significant contributor to Costa Rica's Gross National Product and has received little attention in national strategies for economic development. Investment of both physical and monetary capital in the fishing industry is not significant. Continued mining of the marine resources leaves little hope to reverse this trend. Foreign fleets have taken over the potential for a managed and lucrative national tuna fishery in Costa Rica's territorial waters decimating several species of marine mammals in the process.

Tourism Laws:

Ley Organica del Instituto Costarricense de Turismo (1955)
Ley de Industria Turistica (1960)
Ley de Incentivos para el Desarrollo Turistico (1985).

Summary Contents:

The enabling act for the Costa Rican Tourism Institute, (Law #1917, 1955) authorizes ICT to carry out a series of activities for tourism promotion including encouraging visits from overseas tourists and promoting the construction and maintenance of tourism facilities. The Ley de Incentivos para el Desarrollo Turistico offers fiscal incentives to hotel, airline, taxi and restaurant businesses for development that attracts tourists and to aquatic transportation and travel agencies whose clientele consist entirely of tourists.

Affected Institutions:

The Costa Rican Tourism Institute (ICT); private sector businesses engaged in providing transportation, accommodations, recreation and other services to tourists.

Effect on Environment and Natural Resources:

Promotion of the tourism trade affects the environment indirectly, both positively and negatively. On the positive side tourists form a constituency for the conservation of Costa Rica's flora, fauna, scenery, and cultural sites. On the negative side, uncontrolled development has spoiled the scenery and tranquility at some beaches. Poor siting of facilities, and facilities which are out of scale with their surroundings, also create local pollution problems, particularly water and beach pollution.

Effect on Economic Development:

Tourism has become the third largest source of hard currency earnings to Costa Rica's economy. Costa Rica's natural and environmental attractions and its rich biodiversity, notably those which are protected under the national parks system, provide the country a comparative advantage in ecotourism.

TECHNICAL APPENDIX B

PUBLIC SECTOR INSTITUTIONS ACTIVE IN THE NATURAL RESOUCE SECTOR

The following public sector institutions are presented in this appendix:

Ministry of Natural Resources, Energy and Mines (MIRENEM)
- Direction of Geology, Mines and Hydrocarbon (DGMH)
- Forest Service (DGF)
- Department of Wildlife (DVS)
- National Parks Service (SPN)
- Office for Electric Power and Fuel (DSE)
- Government Commission for the Control and Evaluation of Studies on Environmental Impact (GCCESEI)

Underground Water and Drainage Service (SENARA)

Technical Secretariat for Integral Watershed Management (STMIC)

Servicio Nacional de Electricidad (SNE)

Costa Rican Institute for Water and Sewer Systems (AYA)

Costa Rican Institute of Electricity (ICE)

Ministry of Agriculture and Livestock (MAG)
- Soil and Water National Conservation Secretariate (SENACSA)
- The Office of Fisheries Resources and Aquiculture (DRPA)
- Agricultural Cantonal Centers (CAC)

Institute for Agrarian Development (IDA)

The Agricultural Natural Resources Planning Sector (SEPSA)

Ministry of Health
- Environmental Sanitation Division (DSA)

Ministry of Public Works and Transportation (MOPT)

National Commission for Indigenous Affairs (CONAI)

Costa Rican Tourism Institute (ICT)

National Meteorologic Institute (IMN)

Ministry of Science and Technology (MICIT)

Atlantic Coast Economic Development and Port Authority (JAPDEVA)

280

Name: Ministry of National Planning and Economic Policy Formulation (MIDEPLAN)
Ministerio de Planificiacion Nacional y Politica Economica.

Objectives: To coordinate among national, regional and local institutions to promote solutions to economic and social problems of the country.

Structure:

Functions: To carry out studies, inventories, technical analyses and edit publications on the behavior of the economy, income distribution, social evolution as well as rural and urban development, human resources, public administration and natural resources. To present the Government with political proposals on socio-economic development plans. To participate in the formulation and implementation of plans and policies. To formulate administrative policies for the State institutions. To analyze and approve requests for reorganization of governmental institutions. Preparation of the National Budget.

Budget: Colones 303,993,000.00 (1990)

281

Name: Ministry of Natural Resources, Energy and Mines (MIRENEM)
Ministerio de Recursos Naturales, Energia y Minas

Objectives: To preserve and increase forest reserves establishing protected zones, protecting forests' fauna, preventing and controlling the degradation of forest lands, promoting environmental education and supporting scientific research.

Structure: MIRENEM comprises the Forest Service, the National Parks Service, the Office of Geology, Mines and Hydrocarbons, the Office of Transportation and Commercialization of Fuel, a Legal Department, the Metereological Institute, the National Zoo and the Simon Bolivar Botanical Garden.

Function: To prepare, plan and implement natural resources policies. To direct and control the development of forest resources. To promote the development of natural resources, energy and mines. To promote and implement the legislation and norms on conservation and on the rational use of natural resources. To promote environmental education programs. Implement the regulations needed for the efficient management of the economic resources. To prepare and implement the laws on geological exploration, exploitation.

Budget: Colones 596,350.000 (1990)

Name: Direction of Geology, Mines and Hydrocarbon (DGMH)
Direccion de Geologia, Minas e Hidrocarburos

Objectives: To promote, control and manage the exploration exploitation and exportation of minerals.

Structure: Direction and SubDirection, Advisory Committee, Administration Department, National Mines Registry, Mining Control Department, Mining Development Department, Environmental Impact Government Control Comission.

Function: To develop and implement the National Geology Program. To keep a National Mining Registry. To supervise and monitor mining activities. To implement the Annual Operation Plans. To process national mining information. To prepare and evaluate projects. To undertake studies on environmental impact. To monitor the rational use of mining activities. To set the standards and regulations for environmental impact of mining activities. To set standards for the protection and conservation of natural resources.

Policy Formulation:

- Under preparation policies to guarantee the implementation of programs on environmental protection and control of illegal mining activities.

Name: Forest Service (DGF)
Direccion General Forestal

Objectives: To see that laws on protection, conservation, utilization, industrialization, administration of renewable natural resources are carried out. To establish the necessary mechanisms for the preparation of a National Development Plan. To guarantee the permanence of natural forests.

Structure: General Direction, Sub-Direction, several supporting departments:

Function: To Implement the Forestry Law and the Law for the Conservation of Wildlife. To prepare, manage, supervise and periodically evaluate all activities. To establish regulations for the periodic elaboration of national development plans. To propose forestry development and wildlife conservation policies. To manage financial and human resources. To coordinate with institutions and organizations of lumbermen the implementation of forestry policy. To carry out the necessary economic studies. To approve or cancel incentives to the forestry development established by the Forestry Law. To request the necessary funding from Banco Central. To periodically approve priority reforestation areas. To carry out environmental education programs.

Budget: Colones 231.654.231.00 (1989)

Personnel: 459 staff (1989)

-284-

Name: Department of Wildlife (DVS)
Division de Vida Silvestre

Objectives: To promote the rational administration and protection of the country's wildlife.

Structure: Functions under the direction of the DGF.

Function: To protect wildlife areas. To generate the necessary biological information and carry out the necessary studies for the creation of wildlife refuges. To conduct wildlife research. To enforce wildlife laws. To manage wildlife refuges. To develop wildlife policies. To assist land owners, hunters and communities. To maintain contact and subscribe agreements with national and international organizations.

28

Name: National Parks Service (SPN)
Servicio de Parques Nacionales

Objectives: Contribute to the socio-economic development of the country through the establishment, management and development of national parks.

Structure: Direction, Sub-Direction, Legal Advisor, Planning Unit, 4 departments, 21 field units.

Function: Specific function: the development and administration of 28 conservation areas which represent more than 8% of the national territory. To prepare surveys to detect areas apt for the preservation of the flora and the fauna, suitable for the establishment of national parks. To advice MIRENEM on policies, legislation and management of national parks. To assist MIRENEM in the implementation of national parks programs. To propose plans for the development and management of national parks. To monitor the conservation of national parks. To establish programs for the dissemination of objectives. To channel economic resources. To establish coordination mechanisms with other national and international organizations. To integrate wildlife areas. Encourage scientific research. To establish programs of environmental education in and out of the reserves.

Budget: Colones 24,108,343 (1990)

286

Name: Office for Electric Power and Fuel (DSE)
Direccion Sectorial de Energia

Objectives: Development and maintenance of a permanent planning system for the use of electric power and fuel.

Structure:

Function: To incentivate the rational use of energy. Identify and monitor projects. To manage electric power and fuel demand. To study other energy sources (specific studies on fuel wood)

Budget: Colones 29,540,150 (1988)

287

Name: Government Commission for the Control and Evaluation of Studies on Environmental Impact (GCCESEI)

Comision Gubernamental de Control y Evaluacion de los Estudios de Impacto Ambiental.

Objectives: To control and evaluate the studies on environmental impact.

Structure: A coordinator experienced in evalution of environmental impact. A Director of Geology, Mines and Hydrocarbons. A Geologist. A Biologist. A Forester. A Civil Engineer. An Economist.

Function: To coordinate the preparation, approval and implementation of studies on Environmental Impact. To establish guarantees. To develop environemtal education programs.

Name: Underground Water and Drainage Service (SENARA)
Servicio de Aguas Subterraneas y Avenamiento

Objectives: Promote agriculture and livestock production and development. Contribute to the implementation of agriculture and livestock projects. See that in the districts where there are irrigation and drainage projects there is a rational modification of land use.

Structures: A Board of Directors with 7 memebers, including the Ministry of Agriculture, cooperatives, rural organizations.

Functions: To promote the utilization of water resources in the country. To assist in the formulation of rational irrigation policies. To research, protect and promote the use of hydric resources. To promote inter-institutional coordination. To prevent, correct and eliminate contamination from water sources. To prepare and up date and inventory on water resources. To promote soil improvement and conservation. To design, construct and maintain irrigation works. To prevent underground water contamination. To maintain an inventory of national water resources.

Name: Technical Secretariat for Integral Watershed Management (STMIC)
Secretaria Tecnica para el Manejo Integrado de Cuencas

Objectives: Formulate policies and guidelines on watershed management.

Structure: Composed of Cabinet level ministers, executive presidents and managers from government and autonomous institutions: MIRENEM, ICAAS, SNE, DGF, ICE, SENARA, MAG, SNE, and AYA.

Functions: Coordinate water resource efforts of member institutions. Establish priorities for addressing the issues required to protect water resources. Implement the "Ley de Aguas". Support the National Plan for Hydric Resources. Promote and consolidate coordinating mechanisms for watershed management. Plan the sustainable development and conservation of watersheds with other institutions. Prepare and implement management plans.

Budget: Colones 8,923.000 (1990)

Name: Servicio Nacional de Electricidad (SNE)
National Electricity Service

Objectives: Administer, utilize, supervise all of the country's water supply (exception made of drinking water) Grant concessions for water utilization.

Structures: Board of Directors, Internal Auditor, Legal Advisor, Direction, Legal Services, Technical Department, Several other departments: technical, administrative, legal and basic studies.

Functions: To regulate rates of some public services including electricity, drinking water. To utilize and manage water resources, exception made of drinking water. To implements the Ley de Aguas. To grant water utilization permits.

Name: Costa Rican Institute for Water and Sewer Systems (AYA)
Instituto Costarricense de Acueductos y Alcantarillado

Objectives: To establish policies and norms for the utilization of water supplies.

Structure: Board of Directors.

Functions: To direct and monitor all activities related to drinking water supply. To plan and implement projects for water supply, collection and disposal of sewer water and liquid industrial residues. To maintain records and data. To coordinate with other institutions, watershed and ecological protection. To coordinate environmental education programs. To develop research programs. To carry out a watershed and water resources inventory. To carry out, promote, plan and finance projects. To increase water production. To solve any problems related to water supply, drainage and liquid industrial residues. To implement the "Ley General de Agua Potable.

Policy Formulation:
To promote the conservation of watersheds and the ecological protection. To produce the necessary economic resources for the conservation, enhancement and protection of water resources owned by municipalities. To advice and coordinate with other State organizations matters related to the contamination of water resources. To prohibit the installation of buildings or works near sources of water provision when they damage the physical, chemical and bacteriology conditions. To participate in the supervision and protection of water sources. To assist in the protection of watersheds. To protect natural resources (forests, watersheds and wildlife). To establish national parks, forestry reserves and refuges for wildlife.

Budget: Colones 3,343,000 (1986)

292

Name: Costa Rican Institute of Electricity (ICE)
Instituto Costarricense de Electricidad

Objectives: To satisfy the demand for electricity and telecommunications. Develop energy sources in the country and rationalize its use. Protect natural resources.

Structure: ICE is managed by a Board of Directors appointed by the Government.

Function: To satisfy the demand for electric power, and telecommunications. To promote industrial development. To protect hydraulic resources and watersheds. To regulate the utilization of rivers for irrigation. To promote reforestation and soil conservation.

Budget: 3,920,630 (1988)

293

Name: Ministry of Agriculture and Livestock (MAG)
Ministerio de Agricultura y Ganaderia

Objectives: To manage, promote and coordinate agriculture and livestock development. To supervise the utilization, conservation, protection and management of watersheds and other hydric resources.

Structure: Minister, Vice-Minister, C.A.N. Legal Department, Agriculture Information Department and 8 Offices.

Functions: MAG does not have an organic law, but administers several specific laws: Forestry, Protection to Wildlife, Fisheries, Vegetal Sanitation, Animal Health and others. MAG carries out its functions through different semi-autonomous institutions. Subscribes project agreements with other institutions that are users of water resources thus preventing and controlling the environmental impact of such projects.

Name: Soil and Water National Conservation Secretariate (SENACSA)
Servicio Nacional de Conservacion de Suelos y Aguas

Objectives: Its four principle objectives are to: 1) create a stable service of soil and water conservation within MAG and strength existing technical knowledge; 2) promote legislation related to soila dn water conservation; 3) promote good use and management of land and establish adequate and effective conservation practices for Costa Rica's conditions; and 4) evaluate soil degradation from water uses, using the watershed as the unit of measurement.

Structure: SENACSA is a division within MAG

Functions: SENACSA provides services to promote the conservation of soils and water in various regions throughout the country. Since 1985, SENACSA has expanded its activities by working with technicians from IDA in settlement areas and establishing demonstration farms and plots to train SENACSA personnel and verify soil and water conservation practices for particular agroecological zones in Costa Rica.

SENACSA's five year effort in soil and water conservation has resutled in a reference manual of methodologies and technical criteria. SENACSA also has established a data bank on natural resources. In 1988, SENACSA provided technical assistance to 135 farmers in soil and water conservation practices, erosion control, drainage, flooding, recuperation of gulleys, maintenace and management of vegetation covering. Activites were conducted on 366 hectares of land in Orotina, San Carlos, Cartago and the Golfito.

Name: The Office of Fisheries Resources and Aquiculture (DRPA)
Oficina de Pesca y Acuacultura

Objectives: To manage the fisheries sector

Structure: The DRPA is organized into departments of protection, registration, terrestrial and marine fishing and aquiculture.

Functions: To issue regulations for the rational use of fisheries resources; To determine optimum utilization of fisheries resources, including processing and sale of products; to conserve and restore marine fauna and their environment; to stimulate aquatic production of protein through a national aquiculture program.

Name: Agricultural Cantonal Centers (CAC)
Centros Agricolas Cantonales

Objectives: To promote participation of the local communities in the planning and implementation of national agricultural and agroforestry and agro-industrial programs.

Structure: An agriculture extension agent from MAG, a member of the Municipalities, a representative from the Rural Credit Association, or commercial banks and 4 farmers elected by the general assembly of the canton's agricultural center.

Function: To collaborate in the implementation of the National Plan for Agriculture and Livestock and with the MGA in the studies and implementation of projects. To study the agricultural and livestock problems of the region and recommend policies. To prepare the budget. To cooperate with the Agency of Agricultural Extension in the promotion of education and research. To assist in the organization of cooperatives and other associations.

Name: Institute for Agrarian Development (IDA)
Instituto de Desarrollo Agrario

Objectives: Implement the Government's policies on agriculture and land distribution. Contribute to the conservation and adequate use of reserves and renewable natural resources. To prevent land ownership for speculation. Prevent the exploitation of agricultural labor.

Structure: Board of Directors, President, Manager, Administration and Finance, Human Resources, Land, Indigenous Reserves Departments...31 regional offices.

Functions: To manage national reserves. To promote and exert legal measures aimed at the social function of propriety. To contract international financing. To cooperate in the conservation of natural resources. To collaborate with other institutions the construction of roads, irrigation projects and other infrastructure works. To request international assistance. To carry out the necessary studies and researches to determine land productivity. To encourage the organization of rural agricultural cooperatives.

Policy Formulation:
Policies are based on the Institution'sobjectives and functions and have been formulated: a)to direct the transformation of the structure of land ownership so that it may comply with its social function; b) to promote the integration of the rural community with the regional economy; c) to promote the rational use of natural resources in lands affected by development plans (settlements and development regions); d) to improve and enhance the services offered by the Institution; e) to support technically and financially, projects that are of interest to the institution;

Budget: Colones 1,267,118,909 (1988)

Personnel: 775 professionals

298

Name: The Agricultural Natural Resources Planning Sector (SEPSA)
Secretaria Ejecutiva de Planificacion Sectorial de Desarrollo Agropecuario y de Recursos Naturales Renovables.

Objectives: To increase and ensure the supply of agriculture and livestock products. To produce raw material to substitute hydrocarbons and petroleum by-products and develop non-conventional sources of energy. To formulate policies for integral development. To implement policies formulated by MAG.

Structures: Ministry of Agriculture and Livestock, Ministry of National Planning and Economic Policy, Ministry of the Presidency, National Council for Production, Agrarian Development Institute, representatives from the agriculture and livestock sector.

Functions: To prepare outlines, actions and strategies for the control, follow-up and evaluation of the Annual Sector Operation Plan and Institutional Operation Plan. To prepare the Budget taking into consideration objectives, policies and programs.

To prepare the National Plan for Agriculture, Livestock and Renewable Resources. To undertake studies at the national level and propose agriculture, livestock and renewable natural resources policies. To analyze, evaluate and supervise matters related to investments and international financial assistance. To establish adequate channels of communication with all the related institutions, including supply of data. To control and evaluate policies implementation.

Name: Ministry of Health
Environmental Sanitation Division (DSA)

Objectives:

Structure: There are five departments:
Sanitary Engineering
Environmental Control
Security and Industrial Hygene
Food Control
Toxic Substances

Functions: DSA acts as a technical advisor to the 150 local sanitation technicians under the administrative control of the Health Centers. DSA enforces sanitation and water quality policies.

Policy Formulation:
Sets water quality standards and requirements for industrial effluent treatment plants.

Policy Implementation:
Conduct site inspections and issue citations for violations of sanitation laws. Evaluates plans for effluent treatment plants. Collects data on effluents from industries and site inspection.

Personnel: 45 (1990)

300

Name: The Ministry of Public Works and Transportation (MOPT)
Ministerio de Obras Publicas y Transporte

Objectives: Design and construct highways and ports. Regulate public transport.

Structure:

Functions: Regulate public transport.

Name: National Commission for Indigenous Affairs (CONAI)
Comision Nacional de Asuntos Indigenas

Objectives: Promote socio-economic and cultural improvement of the indigenous groups.

Structure: Presidency of the Republic, UCR, IMAS, ITC, Ministry of the Interior, Ministry of Culture
representative from the indigenous groups, from associations protectors of indigenous groups and public and private organizations.

Functions: Programs of attention to indigenous affairs. Zoning of indigenous reserves (mapping, plans, parceling). To carry out productive, educational legal assistance, health and nutrition, housing and agricultural programs. To participate in environmental protection and natural resource conservation programs (Management of the Biosphere Reserve "La Amistad").

Policy Formulation:
Policy proposals on education, housing, production, health, infrastructures, land tenure and conservation of indigenous reserves, deforestation.

Budget: Colones 26,700,000 (1989)

302

Name: Costa Rican Tourism Institute (ICT)
Instituto Costarricense de Turismo

Objectives: To promote, regulate and manage tourism activities.

Structure: A Board of Directors (The Ministry of Foreign Relations, and four other persons of prestige).

Functions: To manage hotels and other infrastructures, transportation and any facility used for the tourism industry. To plan coastal zone development protecting mangroves, river mouths etc. To give maintenance to (tourism related) national parks, protecting the flora and the fauna, formulating regulations for their use. To protect a 50 km zone around volcanoes. To internationally promote Costa Rica. To declare tourism or non-tourism zones maritime or terrestrial areas.

Policy Formulation:

To protect the tourism industry, supervising hotels, restaurants, cafes, etc. Establishing rates and regulations. Regulation of tourism related publications. Regulation of tourist guides. For the establishment of tourism-related reserves and parks. Regulation of martime/terrestrial zones used by the tourism industry.

Policy Implementation:

ICT issues tourism related permits and certificates for tourist guides. Dictates norms and regulations for the use of zones declared to be of tourism use. ICT will keep a registry of maritime/terrestrial permits. All plans for urban or tourism-related development that affect the maritime/terrestrial zones should be approved by ICT. A guarantee is required for the development of tourism-related industries affecting this zones.

Budget: Colones 628,783,400 (1990)

Name: National Meteorologic Institute (IMN)
Instituto Meteorologico Nacional

Objectives: To provide the necessary meteorologic services to the general public and the institutions of the public and private sector.

Structure: A National Council of Metereology-with representatives from ministries, universities.

Function: Prepare weather reports.Address scientific, technical and administrative aspects of the institution. Prepare and present programs to the National Council of Meteorology. Gather meteorological information for agriculture purposes. Maintain a mobil station to gather information used for agriculture purposes. Encourage and provide advice on agrometereologic activities. Prepare climatological studies. Cooperate with schools in the teaching of Meteorology.

Name: Ministry of Science and Technology (MICIT)
Ministerio de Ciencia y Tecnologia

Objectives: Plan and implement policies. Prepare, coordinate and follow up on National Science and Technology projects. Identify, carry out and control national level studies. Analyze, evaluate and supervise together with related institutions, matters related with technical cooperation. Maintain adequate channels of communication with other related institutions. Control and evaluate policies on science and technology. Establish and Scientific and Technologic Data Statistics System.

Structure:

Functions: Scientific and technological policy formulation. Coordination of the National Science and Technology Program. Integrate the National System of Science and Technology. Direct and encourage scientific and technological activities in all development areas. Strengthen scientific and technological infrastructure. Encourage the establishment, development and consolidation of technological activities.

Policy Formulation:
To structure a scientific and technological system to tend to the short and long term needs of productive population sectors. To contribute to the transformation of technology and to prioritize the role of science and technology adopting national and international technical solutions while diminishing the use of external sources.

Budget: Colones 13.993.000 (1987)

c 3,6

Name: Atlantic Coast Economic Development and Port Authority (JAPDEVA)
Junta de Administracion Portuaria y de Desarrollo Economico de la Vertiente Atlantica

Objectives: To promote the integral socio-economic development of the Costa Rican Atlantic Slope.

Structure: A President, a Vice-President, an Administrative Council, Auditor, Legal Adviser, three managers, all prominent Limon citizens.

Functions: To efficiently manage the Port of Limon and to generate work sources for the poputation of Limon. To build schools, roads, and other infrastructure. To provide technical and economic assistance to the community and development associations. To undertake reforestation programs, aquiculture and establishment of tree nurseries. To manage and preserve the Green Turtle. To provide agricultural extension service. To give a permanent drainage service to the "Canales de Tortuguero".

Budget: Colones 263.893.381 (1989)

TECHNICAL APPENDIX C

LIST OF NGOs
WITH NATURAL RESOURCE AGENDAS IN COSTA RICA

1. INTERNATIONAL NGOS WITH NATURAL RESOURCE AGENDAS

Organization for Tropcial Studies (OTS)
Centro Internacional de Tecnologia Avanzada y Productividad
World Wildlife Fund (WWF)
Internatonal Union for the Conservation of Nature and Natural Resources (IUCN)
The Nature Conservancy
Conservation International
International Society for the Protection of Animals
Centro Agronomico Tropical de Investigacion y Ensenanza (CATIE)
Instituto Interamerican de Cooperacion para la Agricultura (IICA)
Caribbean Conservation Corporation
Green Peace
Asociacion Nacional de Nuevos Alquimistas (ANAI)
Associacion Ecologia Europa

2. NATIONAL ORGANIZATIONS WITH BROAD NATURAL RESOURCE AGENDAS

Centers:
Tropical Science Center (TSC)
Centro de Derecho Ambiental y de los Recursos Naturales (Environmental and Natural Resources Law Center) (CEDRENA)
Centro de Investigaciones Sociales, Ambientales y Tecnologicas
Instituto Nacional de Biodiversidad (InBio)

Foundations:
Fundacion para la Conservacion de la Naturaleza
Fundacion de Vida Silvestre
Funcacion de Educacion Ambiental
Fundacion de Parques Nacionales
Fundacion Neotropica
Fundacion Costaricense de Ecologia
Fundacion pro Naturaleza (PRONATURA)

Associations:
Asociacion Costarricense para la Conservacion del la Naturaleza (ASCONA)
Asociacion de Preservacion de la Flora y la Fauna Silvestres (APREFLOFAS)
Asociacion para la Conservacion de los Recursos Naturales (ACORENA)
Asociacion Ecologista Costarricense (AECO)
Asociacion para la Preservacion de la Naturaleza de Coto Brus (APRENABRUS)
Asociacion Ramonense para la Conservacion del Ambiente (ARCA)
Asociacion Juvenil de Voluntarios en Investigacion y Desarrollo Ambental (VIDA)

Asociacion para la Defensa de los Recursos Naturales
Asociacion Costarricense de Canaricultura
Asociacion Costarricense de Raices Tropicales
Asociacion para el Desarrollo y la Investigacion de la Agricultura Tropical Organica
Asociacion Nacional de Periodismo Cientifico
Asociacion de Ecodesarrollo
Asociacion Ecologica y de Desarrollo
Asociacion para el Control de la Calidad
Asociacion para la Defensa de la Calidad de la Vida
Asociacion Costarricense para el Desarrollo de Tecnologia Apropiada
Asociacion Instituto de Ciencias Sociales para la Protecion del Ambiente Regional
Asociacion Preservacionista de Flora y Fauna Silvestres
Asociacion Voluntarios en Recuperacion y Defensa Ecologica
Asociacion Costarricense de Desarrollo (FICDES)
Federacion Costarricense para la Conservacion (FECON)
Colegio de Biologos de Costa Rica
Grupo Verde
Voluntarios en Recuperacion y Defensa Ecologica (VERDE)
Comite Nacional Pro-Conservacion de los Recursos Naturales Renovables
Grupo Amigos de la Naturaleza de Dominical (ANADO)

3. NATIONAL ORGANIZATIONS WITH SPECIFIC NATURAL RESOURCE AGENDAS

Forest Resources:
Fundacion Forestal Costarricense
Fundacion del Bosque de los Leones
Asociacion para el Desarrollo Forestal
Asociacion Protectora de Arboles (ARBOFILIA)
Asociacion Costarricense de Orquideologia
Asociacion de Plantas Medicinales (ASAPLAN)
Asociacion de Amigos de las Plantas Medicinales

Agriculture:
Asociacion Instituto para la Investigacion, Fomento y Desarrollo del Sector Agricola de Costa Rica
Asociacion Costarricense de la Ciencia del Suelo
Asociacion para el Desarrollo de la Macadamia
Asociacion para el Desarrollo Apicola

Marine Resources:
Programa Internacional de Conservacion de Tortugas Marinas (WIDECAST)
Asociacion Costarricense de Derecho Maritimo
Asociacion para el Desarrollo de los Peces
Club de Pesca

Wildlife:
Asociacion Pro Zoologico Nacional
Asociacion Nacional Protectora de Animales
Asociacion Amigos de los Animales

4. PROFESSIONAL AND TRADE ASSOCIATIONS

Asociacion de Profesionales en Ciencias Forestales
Asociacion de Camaras de Ganaderos de Costa Rica
Asociacion Costarricense de Geografos
Asociacion de Pequenos Horticultores y Afines de Tibas
Asociacion de Profesionales en Geografia
Asociacion de Productores de Mango
Asociacion de Profesionales en Ciencias Forestales
Union Independiente de Pescadores Camaroneros
Distribuidores de Agroquimicos Asociados
Asociacion Camara Nacional de Ganaderos de Costa Rica
Asociacion Camara Nacional de Exportadores de Mariscos
Asociacion Camara Nacional de Avicultores de Costa Rica
Camara Nacional de Importadores, Fabricantes y Distribuidores de Insumos Agropecuarios
Camara de Horticultura Ornamental de Costa Rica
Camara Nacional de Productores de Cacao
Camara Nacional de Cocoteros
Camara Nacional de Agricultura
Camara Nacional de Empresarios Forestales

5. REGIONAL OR LOCAL ORGANIZATIONS WITH NATURAL RESOURCE AGENDAS

Forest Resources:
Asociacion Guanacasteca de Desarrollo Forestal
Liga de Conservacion de Monteverde
Asociacion Conservacionista de Monteverde
Comision de Desarrollo Forestal de San Carlos
Asociacion de Madereros del Atlantico

Marine Resources:
Asociacion de Pescadores de Chomes
Asociacion de Pescadores de Aguirre
Asociacion de Pequenos Cultivadores de Camaron de Punta Morales Chomes
Asociacion de Pescadores Artesanales de Golfito
Camara de Pequenos Pescadores Artesanales de Quepos
Camara Puntarenense de Pescadores
Camara de Pescadores Artesanales de Puntarenas
Camara de Pequenos Pescadores Artesanales de Quepos
Asociacion Centro Ecologico La Pacifica
Asociacion de Conservacion y Embellecimiento de Playas

Agriculture:
Union de Agricultores de Guanacaste
Asociacion de Fruitcultores de Altura de Los Santos
Asociacion de Apicultores de Puriscal y Lugares Circunvecinos
Asociacion de Productores Horticolas del Valle del Guarco
Club de Jardines de San Ramon

Others:
Junta de Proteccion Social de San Jose
Asociacion Guanacasteca para la Conservacion de los Recursos Naturales
Asociacion Conservadora de los Recursos Naturales de Atenas (ACORENA)
Asociacion para el Desarrollo Cultural y Turistico de la Region Huetar Norte
Funcacion para la Recuperacion y Utilizacion de Recursos
Asociacion de Oreros de la Peninsula de Osa
Grupo de Exploradores Nido de Halcon (GENIHA)
Club de Montanismo U.C.R.
Asociacion de Motosierreros de la Peninsula de Nicoya
Asociacion de Sierros de Quepos
Asociacion Nacional Isla Palo Seco
Asociacion de Piscicultores Los Santos
Asociacion Alajuelense para la Proteccion Animal