

# **PERFIL AMBIENTAL DE HONDURAS 1989**



## **ENGLISH SUMMARY**

PN-ABK-128

# Environmental Profile of Honduras 1989

## Summary



Funded by  
United States Agency for  
International Development

**A.I.D. Contract/DHR-5438-C-00-6054-11**

**The opinions and interpretations contained in this document must not be attributed to the United States Agency for International Development or to the contracting institutions.**

# Authors

## NATIONAL TEAM

Carlos R. Aguirre, Director General of Territorial Planning, Secretariat of Planning, Coordination and Budget (SECPLAN)

Horacio Martínez, Chief, Department of Environment, General Office of Territorial Planning (DGPT), SECPLAN

Carlos Guillen, Honduran Ecological Association (AHE)

### Socioeconomic and Cultural Context

Ernesto Galvez Mejía, Chair, SECPLAN

Marcio Sierra Mejía, SECPLAN

Roy Guevara Arzú, SECPLAN

Raf Flores, SECPLAN

### Water Resources and Watersheds

José F. Abarca, Chair, Executive Office of Land Registry (DEC)

Rafael Alduvín, SECPLAN

Edgardo Zúniga, National Electric Energy Company (ENEE)

Ivo Alvarado, ENEE

Ciriaco Andino, National Autonomous Service of Aqueducts and Sewers (SANAA)

Omar Oyuela, Honduran Forestry Development Corporation (COHDEFOR)

Omar Peña, ENEE

Gladys Murillo, Water Resources Division (DRH)

Gladys Rojas, DRH

### Agricultural Resources

Pedro Caballero, Chair, SECPLAN

Juan Enrique Cardona, DEC

Fausto Echeverría, National Agrarian Institute (INA)

Delmy Mendoza, Secretariat of Natural Resources (SRN)

Gilberto Mendoza, DEC

Bonifacio Sánchez, SRN

### Forest Resources

Jorge Palma, Chair, COHDEFOR

Arnulfo Cruz, COHDEFOR

Santiago Rufz, COHDEFOR

### Coastal Zone Resources

Jorge Varela Marquéz, Chair, AHE

### Wildlife and Wildlands

Francisco Martínez Gallego, Chair, AHE

Carlos Guillén, AHE

Marco A. Cruz, General Directorate of Natural Renewable Resources (PENARE)

Martha García, RENARE

Rigoberto González, RENARE

Gloria de Valladares, RENARE

### Environmental Pollution

Jorge Méndez, Chair, Secretariat of Public Health (SSP)

Herling Aguilar, National Autonomous University of Honduras (UNAH)

Catherine de Castañeda, UNAH

Mario Bu Contreras, SSP

Norman Gallegos, SSP

Danilo Godoy, SSP

Luis Munguía Guerrero, SSP

José León Murillo, SRN

Mauricio Paredes, Secretariat of Transportation (ST)

Jorge Rodríguez, MDC

Amelia Santos, SSP

### Environmental Education

Regina Andrade de Ochoa, Chair, Secretariat of Public Education (SEP)

Dario Cáliz, UNAH

Catherine de Castañeda, UNAH

Ibis Colindres de Galeano, UNAH

### Institutional and Legal Framework

Orfilia López Pineda, Chair, SECPLAN

Clarisa Vega de Ferrera, SRN

Hector Cerrato, SECPLAN

**DESFIL TEAM**

Howard E. Daugherty, Editor, Honduras  
Environmental Profile  
Joshua C. Dickinson, Director,  
Honduras Environmental Program  
Isabel Valencia, Coordinator, Honduras  
Environmental Program  
Philip D. Young, Director, DESFIL  
Project  
Catherine de Castañeda, National  
Coordinator, Honduras  
Environmental Management Program  
Jim Barborak, Consultant  
Ivo Kraljevic, Consultant  
Dennis McCaffrey, Consultant  
Frederick Tracy, Consultant

**USAID**

Peter Hearne, Project Officer, Honduras  
Environmental Program

**COLLABORATORS**

The Profile Team is grateful to many people from the Government of Honduras and private institutions for making available information and data, reviewing drafts, and providing other assistance in the preparation of the Profile. The complete list of these individuals is presented in the original Profile.

# Table of Contents

<b>Introduction</b>	<b>1</b>
The Environmental Profile of Honduras, 1982	1
Objectives of the Environmental Profile of Honduras 1989	4
Conclusions and Recommendations	5
Information and Basic Data	6
Scientific Research and Conceptualization of the Issues	7
Training and Awareness	7
The Legal Framework: Oversight and Enforcement	7
Institutional Coordination	7
Integrated Management of Critical Ecological Areas	8
<b>Demographic, Socioeconomic, and Cultural Contexts for Development</b>	<b>10</b>
Demography	10
Economy	11
Access to Land	11
Ethnic Groups	11
Archeological Resources	12
<b>Water and Watershed Resources</b>	<b>12</b>
The Choluteca Watershed	12
The Nacaome Watershed	12
The Ulúa Watershed	14
The Chamelecón Watershed	14
The Aguán Watershed	14
The Sico Watershed	14
The Patuca Watershed	14
Watershed Management in Honduras	14

Water and Health	15
Energy and Water	15
Recommendations	15
<b>Agricultural Resources</b>	<b>15</b>
Land Use	17
Agricultural Production	17
Area under Cultivation	17
Cattle Production	18
Land Tenure and Agrarian Reform	18
Recommendations	18
<b>Forest Resources</b>	<b>21</b>
Recommendations	23
<b>Coastal Zone Resources</b>	<b>23</b>
Socioeconomic Aspects	25
Recommendations	26
<b>Wildlands and Wildlife Resources</b>	<b>27</b>
Protected Areas	27
Degradation of Wildlands and Wildlife Resources	29
Environmental Education and Interpretation	29
Laws and Regulations	30
Recommendations	30
<b>Environmental Pollution</b>	<b>32</b>
Water Pollution	32
Air Pollution	32
Contamination of Soils	32

<b>Institutional Aspects</b>	<b>33</b>
Recommendations	33
<b>Environmental Education</b>	<b>34</b>
Recommendations	34
<b>Institutional and Legal Framework</b>	<b>35</b>
Recommendations	35
<b>List of Acronyms</b>	<b>37</b>
<b>References</b>	<b>39</b>

# List of Maps and Tables

## Maps

1	General Map of the Republic of Honduras	xiv
2	Geomorphology	2
3	Life Zones (Holdridge)	3

## Tables

1	Distribution of Properties, 1974	11
2	Studies of Land Use, 1985-1987	17
3	Surface, Production, and Yield of the Main Crops	19
4	Size of Cattle Farms and Herds in Honduras, 1974-1984	20
5	Land Ownership by Size of Farms, 1974	20
6	Groups, Associates, Area Titled, and Area Arable by Type of Organization at the National Level	21

## Prologue

Conscious of the increasing depletion of its natural resources, the government of Honduras has undertaken a review and evaluation of the activities conducted through development projects and programs. The purpose of this exercise is to reorient these programs to respect relationships among the different aspects of nature and to preserve the regenerative processes of ecosystems as the basis for achieving sustainable development.

Knowledge of natural resources should not be limited to geographic or statistical data; it is necessary to identify natural resources, understand their relationships, and determine the best way to use them rationally. It is imperative to include in development strategies an environmental component that minimizes the degradation and exhaustion of the natural resource base. The environmental component must contribute to the preservation and enhancement of the natural resource base through accumulation of scientific information and its application in concerted actions by the Honduran people.

With this vision, the Honduran Secretariat of Planning, Coordination and Budget (SECPLAN) signed a technical assistance agreement with the United States Agency for International Development through the Development Strategies for Fragile Lands (DESFIL) Project to formulate an environmental management program. The program included several activities: workshops on environmental management, design and implementation of a case study of the Southern Zone of Honduras, organization of the First National Meeting on Environmental Education, and updating of the Environmental Profile of 1982 as the base document for the preparation of an environmental management plan. The *Environmental Profile of Honduras 1989* was prepared with the participation of technicians from 21 public and private institutions, working in multidisciplinary teams. The Profile will be extremely valuable as a reference document for public and private institutions and for international agencies because the information presented is reliable and themes are treated intersectorially.

SECPLAN wishes to acknowledge all of the participating public institutions, USAID/Honduras, the DESFIL project, the Honduran Ecological Association, and the National Autonomous University of Honduras and collaborating faculty members, without whose assistance preparation of this document would not have been possible.

**CARLOS R. AGUIRRE**  
Director General of  
Territorial Planning,  
SECPLAN

**HORACIO ERASMO MARTINEZ**  
Chief, Department of Environment,  
General Office of Territorial  
Planning, SECPLAN

## Preface

This English Summary of the *Environmental Profile of Honduras 1989 (Perfil Ambiental de Honduras 1989)* has been prepared by Isabel Valencia with the assistance of Philip Young. Dr. Valencia is an Associate of the Development Strategies for Fragile Lands (DESFIL) Project. She serves as DESFIL Coordinator for the Honduras Environmental Program, a collaborative endeavor of the Government of the Republic of Honduras, the United States Agency for International Development mission in Honduras, and the DESFIL project. Dr. Young is the Senior Program Manager of the DESFIL project.

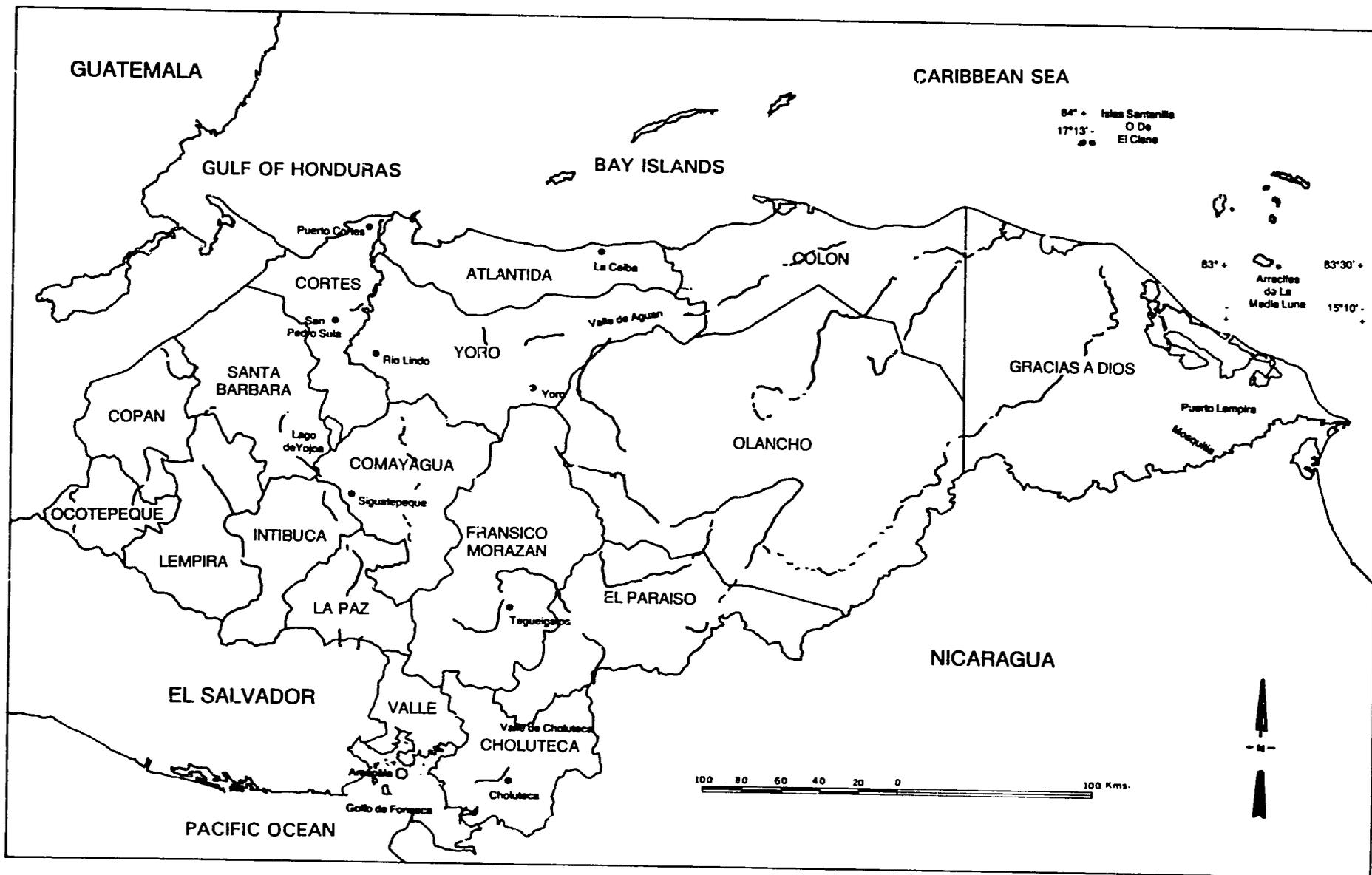
In this brief summary of a 375-page document, it has not been possible to retain the richness of data contained in the Profile and upon which the main conclusions and recommendations are based. We viewed our task as one of synthesis. The contents of each chapter of the Profile are summarized, highlighting the principal problems discussed and the main recommendations for action that follow from them. We have attempted to remain faithful to the content of the original document, which was prepared by numerous dedicated professionals, most of them Hondurans.

We thank all those who contributed to the *Environmental Profile of Honduras 1989*, while absolving everyone except ourselves of responsibility for inadvertent errors in this summary.

Isabel Valencia  
Raleigh, North Carolina

Philip Young  
Bethesda, Maryland

December 1990



MAP 1. GENERAL MAP OF THE REPUBLIC OF HONDURAS

## INTRODUCTION

With an area of 112,088 square kilometers, Honduras is the second largest country in Central America. Honduras enjoys rich renewable natural resources such as extensive woodlands, rivers, wildlife, and wildlands. Although these resources are not evenly distributed, Honduras still has enough to promote significant advances in the quality of life of its people. It also has sufficient natural resources to establish the bases for the well-being of future generations, provided that these resources are used in an integrated, rational, and scientific manner.

Geomorphologically, the country can be divided into three principal regions: highlands and interior valleys, lowlands of the Caribbean, and lowlands of the Pacific (see Map 2). The marine influence, rough topography, and soil variations have given rise to a diversity of ecosystems. The original general Life Zone map under the Holdridge System (1962) shows eight different Life Zones represented in Honduras<sup>1</sup> (see Map 3).

Notwithstanding its natural wealth, Honduras is the poorest country in Central America and one of the poorest in the Western Hemisphere. Within Latin America, Honduras is among the least-developed countries, measured by indicators such as nutrition, education, housing, and employment. Of 4.4 million inhabitants, the rural population makes up 60 percent. Of these, 70 percent live in "absolute poverty" (Leonard, 1987). Deterioration of natural resources and the ecological damage caused by their misuse—two closely related problems—have contributed significantly to the low level of socioeconomic welfare of most Hondurans.

---

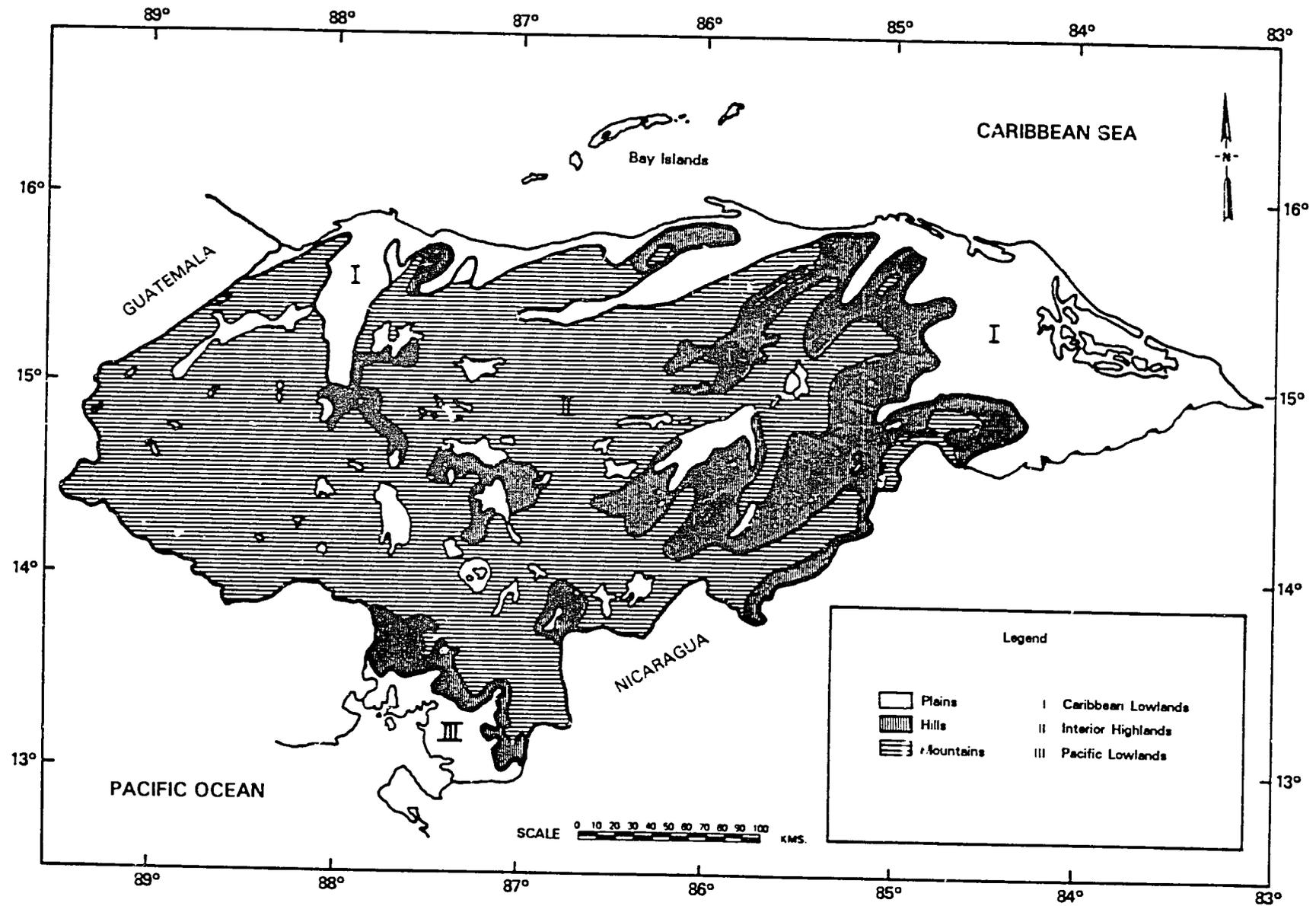
<sup>1</sup> According to Joseph A. Tosi (personal communication, 1989), the original mapping of the Life Zones of Honduras is very general, contains errors of interpretation, and needs verification. There are verified new maps for the five central departments of the country; mapping of the rest of the country remains incomplete. It is useful, nevertheless, to include the 1962 Life Zones map to provide a general picture.

The intrinsic relationship between development and the environment was noted in the conclusions of the 1982 Environmental Profile; it stated that "environmental problems are problems of development." This statement is still valid. The social and economic development of the country depends on the importance attached to reclaiming and rehabilitating affected ecosystems and on the magnitude of the efforts made to reverse the depletion of natural resources. The socioeconomic future of Honduras rests on the implementation of integrated management plans for renewable natural resources, based on the application of sound ecological and scientific principles to achieve sustainable development. This should be the fundamental goal of the government.

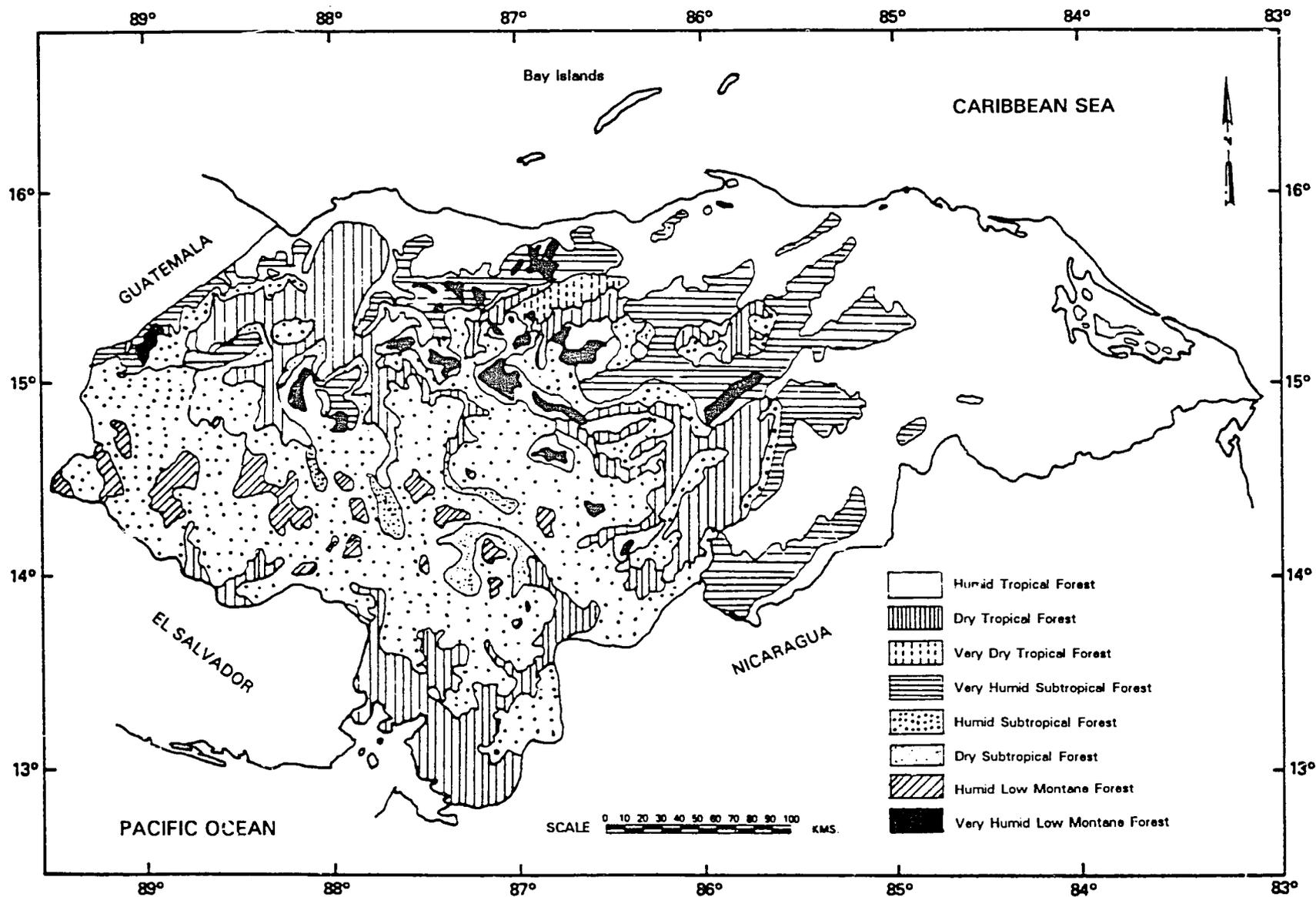
## The Environmental Profile of Honduras, 1982

The 1982 Environmental Profile, based on field studies, was among the first efforts made to reverse the deterioration and wasteful use of natural resources in Honduras. The study was conducted by a U.S. consulting firm under contract to USAID/Honduras, in collaboration with the Government of the Republic of Honduras. Although Honduran technicians did not officially participate as team members, many Honduran scientists were consulted and their opinions and research are reflected in the document.

A goal of the 1982 Profile was to provide information to help Honduran decision makers responsible for development policy and projects. To this end, the Profile analyzes cultural, political, and institutional limitations that had a negative effect on the social and economic development process. The conclusions and recommendations of the Profile provide a broad understanding of the environmental issues of the country, for effective resource administration and for the long-term goal of sustainable development. In addition, the study shows the value of the environmental sciences for development and points out the adverse consequences of resource deterioration (Dickinson et al., 1982).



MAP 2. GEOMORPHOLOGY



MAP 3. LIFE ZONES (HOLDRIDGE)

Based on the ecological and socioeconomic problems defined in the 1982 Profile, the team formulated the following list of conclusions and recommendations:

- (1) Environmental problems are problems of development; they are related to failure to apply ecological principles proven to improve agricultural production; environmental problems also result from economic activities that are destructive of and have no equivalent productive value to the goods and services provided by natural ecosystems.
- (2) Stronger leadership is required by the Honduran government to promote a development model of optimal economic, social, and ecological value. Nongovernmental organizations (NGOs) can assume a catalytic and supportive role in this commitment of the government by promoting environmental awareness and implementing projects oriented toward conservation.
- (3) As of 1982, Honduras did not have an agency, with strong support from the executive, responsible for integrating ecological and environmental issues of development.
- (4) No official commitment or external aid can have a positive effect in the long-term solution of these issues without development of Honduran capacity in environmental sciences.
- (5) The accelerated demographic growth occurring during the last decade is closely related to the level of poverty in the country.
- (6) The search for alternative sources of renewable energy is of utmost importance to reduce the immense cost of petroleum imports, which absorb a large portion of funds that could be invested in development.
- (7) The aesthetic and scientific values of natural ecosystems and of the cultural heritage of Honduras are not sufficiently recognized or exploited at the national level.

- (8) The 1982 Environmental Profile must be updated periodically to serve as an instrument for development planning.

## Objectives of the Environmental Profile of Honduras 1989

The goal of the *Environmental Profile of Honduras 1989* is to provide the basis for a sustainable development model that can improve the well-being of the Honduran people and restore the country's devastated resources and ecological systems. This goal would be achieved through the application of integrated management to promote optimal local use of renewable natural resources. This development model seeks to promote human welfare by maintaining the cycles, functions, and ecological values of the natural resource base, on which economic production ultimately rests.

The specific objectives of the 1989 Profile are to:

- (1) Evaluate the condition of natural resources in Honduras and their degree of devastation;
- (2) Analyze the socioeconomic and cultural context of the use of natural resources in Honduras;
- (3) Identify the main environmental problems in Honduras, evaluate the order of priorities required to restore the ecosystems and natural resources already degraded, and promote the maintenance of their productivity;
- (4) Update the 1982 Environmental Profile, evaluating the environmental and socioeconomic trends to date, and describe the degree to which the recommendations made in the 1982 Profile have been implemented, emphasizing the recommendations that have not received attention but are critical to the welfare of the population;
- (5) Compile in a single document the data and analysis on human ecology issues within the context of sustainable development so this information can be used by the government and other entities involved in decision making; and

- (6) Recommend, on the basis of the analyses, actions and policies that could receive strong support from the government, the private sector, NGOs, and international development assistance agencies.

## Conclusions and Recommendations

It is most important to note that the 1989 Profile team verified most conclusions of the 1982 study. The economic indicators continue to be low; the loss and degradation of renewable natural resources continue; the ecological problems are ever more acute; and the need continues for increased collaboration between government and nongovernment agencies involved in the administration of resources in Honduras.

Nevertheless, these conclusions should not be interpreted as completely negative. There have been significant achievements, such as in environmental education and in the system of parks and reserves. Other achievements include the design of a watershed management plan for Tegucigalpa, the preparation of a preliminary study of ethnic minority groups to assist in their protection, the passage of laws to protect natural resources and the environment, and the establishment of a Department of Environment within the Territorial Planning Unit of the Secretariat of Planning, Coordination and Budget (SECPLAN) to become the central planning and coordinating body that was so badly needed.

No country has reversed ecosystem degradation and reoriented the development process using sustainable practices in less than seven years. In this sense, the achievements and efforts of Honduras have been positive, proving it can indeed accelerate change toward a model of more sustainable development in the long term.

Honduras is now at a critical point. In the next decade—and within the first five years, which coincide with a change of government—decisions will be made that will determine the future pattern of natural resource use, the economic tendencies that will prevail, and the necessary balance between

resource conservation and productivity that will support the welfare of the Honduran people.

Several obstacles constrain the implementation of innovative strategies that could lead to more sustainable development of the country. The problem is to find the best way to achieve an adequate understanding of the relationships between economic and ecological factors—for example, between economic productivity and resource stability, between the quality of human life and of the environment, between human welfare and the rational use of natural resources, and between the protection of future generations of humans and the principles of biological conservation. The problems of sustainable development and the application of administrative systems that integrate the different resources into a complementary whole must be addressed.

A strategy is required that will define a novel and creative style of development that can integrate the socioeconomic, political, institutional, legal, ecological, and philosophical aspects of the Honduran reality. Conceptually, this new vision of national development would entail:

- Meeting human needs and aspirations;
- Capitalizing on human resources through self-management—that is, active participation of the Honduran people in their own development;
- Applying ecological principles to socioeconomic development, in general, and to specific projects conducted with adequate assessment of the possible effects of their activities on the environment;
- Integrating the management of renewable natural resources into administrative strategies and curtailing the dependency on sectorial development plans;
- Respecting the principles of human rights and social justice;
- Recognizing the importance of women to national development;

- Establishing a commitment to future generations, through respect for nonhuman life and conservation of genetic resources; and
- Recognizing the global ecological processes that transcend international frontiers.

The implementation of a program to achieve these objectives will require strong national leadership, with the willingness to take the risks associated with these innovations.

With specific guidelines for each sector, the 1989 Profile includes recommendations for the formulation of adequate policies and for planning and implementation of programs. Recommendations in each chapter share elements and themes. Among them are these six important undertakings:

- (1) Compilation and maintenance of information and basic data;
- (2) Promotion of scientific research and conceptualization of the problems;
- (3) Development of human resources through training;
- (4) Revision and improvement of the legal framework and its enforcement;
- (5) Improvement of institutional coordination; and
- (6) Promotion of integrated management for critical ecological areas.

## Information and Basic Data

Although the Profile contains a comprehensive compilation of the available data and information on Honduran natural resources, there is still an acute shortage of the basic data needed to study the environmental resource problems of the country, especially regarding the relationships among the different resources and their use and demand. This lack of data is an obstacle to innovative planning and to the implementation of plans, projects, and programs for the development and welfare of the Honduran people.

The 1989 Profile underscores the need to obtain more precise data to contribute to the planning process. Basic data urgently required include:

- A new agricultural census—the most recent one was conducted in 1974;
- A complete inventory with detailed cartographic maps of the forest resources, soils, and hydrology of the country;
- Maps of actual and potential land use, and completion of the Life Zone maps (Holdridge/Tropical Science Center), which have been completed for only five departments;
- An inventory of coastal and marine resources and biological research on life cycles (and other ecological factors) of species that are important for commercial fisheries;
- A system of analysis and control of the levels of environmental pollution, particularly that caused by pesticides and human and industrial waste;
- An inventory of biological diversity and of the genetic resources in the country;
- A systematic evaluation of the status and tendencies of wildlife populations to ensure the protection of species endangered by destruction of their habitat, large-scale export, and other threats from humans; and
- A complete census of population characteristics (despite the extremely useful national population census of 1988) to analyze in greater depth the relationships among demographics, development, and use of natural resources.

Given the urgent need for updated basic data, the Profile team sees as a priority the establishment of a geographic information system of national coverage. This system could be located in the Executive Office of Land Registry (DEC); it could be linked to and serve all institutions involved in the compilation, analysis, and evaluation of data related to the management of renewable natural resources.

## Scientific Research and Conceptualization of the Issues

Development planning rests on a basic level of knowledge; this knowledge can be summarized in four points:

- (1) Definition and evaluation of the extent and limits of natural resources (renewable and non-renewable) in the country;
- (2) Definition of the basic needs and wants of the population;
- (3) Analysis of the rates of approach to the maximum limits of use of natural resources, as well as the thresholds of irreversible deterioration; and
- (4) Knowledge of the mechanisms, technologies, and strategies that can be implemented to extend the limits of resources and the thresholds of deterioration.

Gathering these data to compile this information is a priority. Scientific research could be undertaken as a base study for sustainable development. This study should have continuity and institutional support, and be conducted by interdisciplinary teams of specialists in the natural and social sciences. It should be financed and coordinated by one central agency, such as SECPLAN's Department of Environment, with the strong support of the National Autonomous University of Honduras (UNAH). Specialists and scientists from all concerned private and public institutions should be included.

## Training and Awareness

The Profile recommends the need for trained and qualified specialists in sciences involving the administration of natural resources and for heightening the awareness of decision makers. Honduras already has made substantial progress in this area, particularly in the last few years, as a result of the government's recognition of this need. There has also been significant cooperation by international and bilateral agencies and NGOs.

Large numbers of technicians, specialists, scientists, and planners are still needed, however. A policy to strengthen the training efforts for all fields related to natural resources and environment must be maintained. In addition to the natural and technical sciences, law and policy specialists should be trained so that they can examine the legal framework with regard to the human and budgetary resources required to manage the environment, enforce existing laws, and promulgate new laws.

Planners are also needed. They should have interdisciplinary training to apply a vision of development involving societal welfare, equity, and natural resource stability over the long term.

## The Legal Framework: Oversight and Enforcement

The Honduran legal code includes laws pertaining to renewable and nonrenewable resources. These laws are often contradictory and vague, however, lacking specific standards to measure the damages they intend to prevent. In addition, a number of public institutions are charged with application of these laws but lack clear jurisdiction and responsibility for their enforcement.

It is strongly recommended that the laws pertaining to the administration and management of natural resources be analyzed to eliminate contradictions and duplication. New laws will also be needed, within precise frameworks and defined levels of responsibility. The Environmental Law proposed to Congress in 1988 should be evaluated to eliminate these kinds of shortcomings, and the budget and human resources necessary for its enforcement should be assessed.

## Institutional Coordination

A number of government institutions are involved in managing natural resources and the environment. These institutions could function with greater efficacy and impact if their networks of communication and cooperation were strengthened and their activities better coordinated. A more precise

definition of the responsibilities of each institution would contribute to meeting this objective.

Under the current institutional structure of the government, policies for development and for environmental management should be prepared by SECPLAN, in close coordination with and participation by other key government institutions. The level of accountability, personnel, budget, equipment, and technical capacity of the Department of Environment should be increased so that it can effectively discharge its responsibilities.

Increased coordination between the government and the NGOs would be beneficial. Models for this type of collaboration already exist in Honduras—for example, the agreement between the Honduran Ecological Association (AHE), the U.S. Peace Corps, and the Honduran government.

## Integrated Management of Critical Ecological Areas

Sustainable development is tied to the management of renewable natural resources in a manner that integrates physical factors as well as human and institutional factors. Prime examples of integrated management are agrosilvopastoral systems, when these are geared to increase agricultural and forestry productivity, control erosion, and increase water supply; integrated pest management, which reduces pesticide use and increases the use of internal resources while maintaining the stability of agricultural production; integrated watershed management, which improves forestry and agricultural productivity while protecting water and soil resources; and development of national park and reserve systems, when these promote the welfare of local communities, the protection of biological resources, and public education and awareness.

Programs and projects in these areas could be implemented by the government in a series of steps:

- Determination of critical ecological areas through research and analysis, and identification of problems through the use of environmental and social impact assessment of human activities;

- Design of integrated management plans for the critical regions and subregions, focusing on priority problems;
- Assignment of institutional, administrative, and legal responsibilities and implementation of programs and projects in accordance with these assignments; and
- Ongoing monitoring and evaluation of the implementation process, to include changes warranted by feedback.

The 1989 Profile team identified four critical areas for priority attention:

(1) The Choluteca River watershed and the higher tributary watersheds surrounding Tegucigalpa require attention to the following components:

- The water supply through implementation of the Management Plan for La Tigra National Park and the Ecodevelopment Plan for the La Tigra buffer zone;
- Primary treatment of the sewage waters of Tegucigalpa and Comayaguela, and secondary treatment of solid agroindustry residues in the river;
- Rehabilitation of the already-degraded slopes of the higher watershed through reforestation and agroforestry efforts; and
- Detailed re-evaluation of the proposed project to construct the dam in the higher Choluteca River, including potential rates of erosion and sedimentation; water volume available for irrigation; potential increase of salinity in irrigation water; and ecological and social effects on coastal communities, particularly fishermen, craftsmen, and other peasant groups.

(2) The Southern Zone, known 30 years ago as the granary of Central America, is now the scene of ecological deterioration and a profound conflict between land use and resource capacity. This zone includes and is affected by exploitative activities in the coastal lowlands of the Gulf of Fonseca and in the gulf itself, principally the shrimp industry. In many areas, the soils have been degraded and their

productivity has been reduced. This situation has resulted in the migration of thousands of peasants to other regions of the country, mainly to Tegucigalpa and the Northern Zone, where different and largely unfamiliar agricultural technologies are required. Actions proposed to address these problems include:

- A moratorium on land concessions to the shrimp industry until the appropriate locations, sizes, and number of apportionments can be determined;
- Scientific research on all aspects—economic, ecological, and social—of the shrimp industry;
- An analysis of the costs and possible benefits of irrigation in the area, including the possibility of an increase in salinity in the water and soils;
- Legal protection of the rights of artisanal fishermen and others living in communities established in the area;
- Trials with different production systems in the mangroves within a sustainable development framework; and
- Establishment of a regional research center to examine special problems of natural resources in the entire Southern Zone, including the coast and the islands of the Gulf of Fonseca and adjacent marine areas.

(3) The North Coast Region. The following actions would address the most urgent problems of this region:

- Resolution of the conflicts generated by colonization of the remaining broadleaf forests in the lowlands;
- Practice of sustainable exploitation of broadleaf forest resources, following the model used by the Honduran Forestry Development Corporation/Agriculture Cooperative Development International (COHDEFOR/ACDI) project or other suitable examples;
- Enforced protection of the Biosphere Reserve of the Río Plátano and of its biological diversity. Sufficient funds and human resources to imple-

ment the management plan proposed by the AHE/World Wildlife Fund (WWF) for the reserve and buffer zone would be necessary to achieve this goal. The importance of this neotropical area warrants this investment;

- Increased protection of ethnic and indigenous groups as well as their cultural values, heritage, and natural resource management systems. These have proved to be sustainable and productive for centuries; and
- Promotion of ecodevelopment in the Bay Islands. Given their great biological, cultural, and scenic value, this effort would increase the potential to generate tourism and currency.

(4) The national parks and reserves, which include the few intact Honduran ecosystems, can be considered collectively as a critical ecological area because of the accelerated rate of their destruction. The park system urgently requires the support of the government and the collaboration of the international development agencies. The following actions are recommended:

- Assign judicial responsibility and authority to a single competent entity with the appropriate budgetary support and mandate to enforce legislation pertaining to parks, reserves, and wildlife and to strengthen the legal and institutional framework regarding the use of resources in wildlands of Honduras;
- Promote the management of wildlife and protected areas as a tool for rural development. Several programs of integrated rural development function in Honduras, such as for the regions of Marcala-Goascaran and Yoro, the Integrated Rural Development Program of the Department of Santa Bárbara (PRODESBA) and La Paz-Intibucá, and the Western Region. None of these programs includes a component for the management of wildlife and wildlands, however, despite the importance of management and conservation of renewable natural resources in promoting sustainable development. It is also recommended that the government insist on including a strong component for the management of protected areas and fauna and that SECPLAN initiate reforms of the ongoing

integrated rural development programs to incorporate these components;

- Consolidate the national system of protected areas and establish new protected areas in the natural ecosystems of major ecological, hydrological, cultural, and touristic importance that are still without protection; and
- Evaluate and develop ecotourism projects in the La Tigra National Park, the buffer zone of the Río Plátano Biosphere Reserve, the Bay Islands, and other potential sites. Given the government's recognition of the great economic value of ecotourism, it is important to follow strict guidelines and to conduct ecological, cultural, and economic impact assessments before implementing these programs.

## DEMOGRAPHIC, SOCIO-ECONOMIC, AND CULTURAL CONTEXTS FOR DEVELOPMENT

### Demography

In the last 50 years, the population of Honduras has shown extremely high growth rates. Preliminary results of the population census of 1988 confirmed that this tendency has not only continued since 1974 but that it has notably increased, from an average annual rate of 2.7 percent between 1961 and 1974 to 3.6 percent between 1974 and 1988.

In 1988 the population was more than 4.3 million, an increase of 65 percent over the 1974 population of 2.6 million. Although the Honduran population has been growing at an accelerated pace for more than 50 years, the 3.6 percent annual rate of increase registered between 1974 and 1988 is among the highest rates of population growth in the world. If this rate were to remain constant, the population would exceed 6.6 million by the year 2000.

The demographic profile reveals a profound differentiation between the rural and urban populations. This difference demonstrates the need to undertake actions that improve the quality of life of the rural population as the best long-term solution to arrest the explosive population growth that exerts unsustainable pressure on natural resources.

The results of the National Survey of Epidemiology and Family Health indicate a slight decline in the fertility rate to 5.6 in 1987, from 6.4 in 1981. This decrease has been confirmed by other studies and surveys. It appears to be due to a decrease in fertility among rural area women, where the fertility rate went from 8.1 in 1981 to 6.7 in 1987 (SECPLAN, 1988). The decrease represents a significant demographic change. Between 1960 and 1980, no changes in the fertility rate of rural women were registered and the high rate was largely responsible for the rapid population growth. The recent decrease may indicate a trend, resulting from increased awareness from educational programs conducted by different institutions—among them the Honduran Association of Family Planning and the National Program for Support of Maternal Lactation—that are active in rural and urban areas throughout the country. Family planning programs have significantly contributed to this decrease; the use of contraceptives increased from 21 percent in 1984 to 36 percent in 1987 (data from the National Mother-Child Health Survey of 1984 and the National Survey of Epidemiology and Family Health of 1987).

Although these achievements are important, the fertility rate is still high and will continue to merit priority attention if Honduras is to reach a sustainable level of population growth. The gap between the urban and rural populations continues to be large. In the long term, the best population program increases the level of well-being of the people: the demographic data in Honduras show an inverse relationship between degree of instruction, socioeconomic status, and degree of urbanization, and the rates of fertility and infant mortality, the two most reliable indicators of quality of life in Honduras.

## Economy

The Honduran economy is linked to world markets and prices, and primary-level exports are important. During 1981-1983, the gross domestic product decreased, but between 1984 and 1988 it increased at a rate of 2 percent annually. Between 1980 and 1987, the balance of trade was negative, except in 1986. During that same period, the external debt doubled.

In addition, the sociopolitical conflict in Central America, focused in Nicaragua and El Salvador but also in the frontier zones of Honduras, has caused unrest. The conflict has also led to flight of capital and decrease in private investment.

These issues affect the allocation of financial resources. Projects and programs seen as conserving natural or cultural resources and the environment lose in competition with those viewed as producing short-term financial gains or oriented toward national defense.

An important effect of the balance-of-payments deficit is the relative shortage of foreign exchange. This shortage has forced a preference for export development and the establishment of supportive monetary and exchange measures. These policies have had little effect, and Honduras continues to depend on international markets for traditional products. Increasing public expenditures have generated excess liquidity in the economy. This liquidity translates into increased demand for imports, which, in combination with the trade deficit, generate internal price increases and inflation.

## Access to Land

Land concentration has persisted. The first agricultural census of 1952 showed that 75 percent of farms had an area of 1 to 9 hectares but they made up only 16.1 percent of the farmed land. At the opposite extreme, only 4.2 percent of farms were larger than 50 hectares, but they accounted for 56.8 percent of the farmed land. The most recent agricultural census (1974) reflects the continuation of this situation (Table 1).

Table 1. Distribution of Properties, 1974

Size (ha)	Farms	%	Surface Area (ha)	%
<1	33,771	17	21,542	1
1 to 2	38,650	20	53,648	2
2 to 5	52,360	27	163,803	6
5 to 10	28,264	15	201,274	8
10 to 50	34,390	18	729,361	8
50 to 100	4,433	2	301,228	12
100 to 1000	3,304	2	763,673	29
1000 and more	169	-	395,330	15
Total	195,341	100	2,629,859	100

Source: Censo Nacional Agropecuario de 1974. Cited by Ramón Salgado in Honduras: Estado y Sector Agrícola (Preliminary Version). Departamento de Ciencias Sociales, Universidad Nacional Autónoma de Honduras, 1988, Tegucigalpa.

Farms of 1-10 hectares represented 62 percent of the total but made up only 16 percent of the land area; farms larger than 50 hectares, although only 4 percent of the total, occupied 56 percent of the agricultural land. The structural situation seems unchanged in spite of the agrarian reform process begun in 1972.

Application of the Gini index to data from the Permanent Survey of Multipurpose Households (November 1988) shows that the degree of land concentration is 0.7020, placing Honduras among the countries of highest land concentration in Latin America.

## Ethnic Groups

The situation of ethnic and indigenous groups is a topic of increasing interest in Honduras. In 1987 SECPLAN completed the first government survey of Honduran ethnic groups. This effort represents a search for solutions to problems affecting these groups. In addition, a legislative project has been prepared to protect and develop Honduran ethnic groups. The project will set the stage for actions, including a law that will permit the development of an institutional framework. Its purpose is to implement development in communities based on their active participation in the process.

Vigorous support is recommended for this legislative project. Support is also recommended for the innovative implementation of integrated plans for the biological and cultural protection of zones where the ethnic groups and their traditional systems for managing natural resources are situated. Eight ethnic groups are recognized in Honduras, totaling 508,000 people.

## Archeological Resources

Honduras has vast archeological riches, with representative sites of several cultures that have been recognized as part of the cultural heritage of the country and as national treasures that must be restored. Maximum protection must be provided to architectural structures and artifacts, through scientific management and a sincere respect and appreciation for the cultural and anthropological heritage of the country.

The 1982 Profile lamented the lack of priority for archeological resources and compiled a long list of endangered sites. Since 1982 the Honduran Institute of Anthropology and History has made enormous progress in planning, managing, and developing the Cultural Monument and World Heritage Site of the Copán Ruins. The consolidation of the management and development of the monument shows what can be achieved by an appropriate institutional and legal framework, adequate planning, trained and motivated personnel, and scientific research. Many other archeological sites remain abandoned and undervalued, however. They badly need restoration, development, and protection. Budgetary problems and the increasing fiscal deficit constrain the actions required to protect the country's archeological sites.

## WATER AND WATERSHED RESOURCES

The disposition of water resources, in terms of quantity and quality, is fundamental for the development of Honduras, whose economy is based primarily on forestry and agriculture. In the Southern

Zone, in addition to the marked seasonality of rainfall and the relatively low amount of precipitation, the problems of water resources are related to negative effects of human activities on the quantity and quality of available water.

The seasonal scarcity of water is becoming increasingly acute because of widespread deforestation in the watersheds, mainly in the higher areas. The alarming degree of deforestation is caused by unsound forestry practices, destruction of forests by subsistence agriculturalists, and use of wood as the principal source of energy for homes and small industries. Deforestation leads to increased runoff of surface water; accelerated soil erosion; increased sedimentation in the lower reaches of watersheds; frequent floods; and destruction of habitats, flora, and fauna. The relationships among water, soil, forests, and wildlife make imperative the need for the integrated management of renewable natural resources.

Water pollution caused by human waste, agroindustrial residues, and other solid wastes is a critical problem throughout Central America; it affects infant mortality rates and other indicators of public health, and has a negative impact on hydrological resources such as rivers, lakes, and the sea. The significant problems of the main watersheds in Honduras are summarized below.

### The Choluteca Watershed

The hydrological balance of the Choluteca River presents the most critical deficit in the country. In 1983 there was a deficit of 36 percent of the total water requirement. This deficit was expected to double by 1990. The river supplies Tegucigalpa, three sugar factories, and several important irrigation districts. There are plans to irrigate an additional 24,000 hectares of land.

### The Nacaome Watershed

The Nacaome River also presents a considerable deficit; several new wells and one or more dams have been proposed as possible solutions. Irrigation



Boy with armadillo (*Dasypus novemcinctus*), an important source of protein in the diet of rural farmers (photograph by Vicente Murphy)



Carrying mangrove firewood, an important source of energy in Honduras (photograph by the Honduran Ecological Association)

capacity for new areas will depend on the success of the proposed projects. If unsuccessful, the irrigated area will have to be reduced in proportion to the deficit.

### **The Ulúa Watershed**

The greatest problem of the Ulúa watershed is the high frequency of floods, now partially controlled by the El Cajón dam. Water requirements downstream are expected to be met without difficulty.

### **The Chamelecón Watershed**

Irregular flow is a marked characteristic of the Chamelecón watershed; flooding is a serious problem during the wet season, followed by a deficit during April and May resulting from the activity of nearby sugar-processing plants. Depending on continuing agricultural and industrial development, it is expected that a dam will be needed before the year 2000.

### **The Aguán Watershed**

Extensive floods in the middle and low areas of the valley are frequent in the Aguán watershed. It has been suggested that this problem can be controlled by constructing several dams in the higher watershed.

### **The Sico Watershed**

Water requirements are negligible relative to availability in the Sico watershed. The National Electric Energy Company (ENEE) is conducting feasibility studies for the construction of a multiple-use dam.

### **The Patuca Watershed**

Given the abundant availability of water and the relatively small requirement, a deficit is not

expected soon in the Patuca Watershed. Since it has the highest hydroelectric potential in the country, it eventually will be the site for several multiple-use dams. These dams will also help in controlling the floods in the tributary watershed of the Guayape River.

## **Watershed Management in Honduras**

The concept of water management was first applied in 1976 by COHDEFOR in two projects with cooperation of United Nations Development Programme (UNDP) and Food and Agriculture Organization (FAO), following extensive damages caused by Hurricane Fifi. In 1981 the end of financing by the FAO significantly reduced COHDEFOR's activities in watershed management; in the 1987 reorganization of COHDEFOR, the Watershed Management Unit was closed, not to be reopened until 1989.

The Tropical Agricultural Research and Training Center (CATIE), through the Regional Watershed Management Project (PRMC), has promoted the integration of multidisciplinary interinstitutional groups to search for solutions to the problems of watershed management. As a result, the National Commission of Integrated Watershed Management (CONAMICH) has been formed with representatives from AHE, CATIE, COHDEFOR, DEC, ENEE, FAO, National Autonomous Service of Aqueducts and Sewers (SANAA), and SECPLAN.

In 1987 a national model watershed was selected; it includes the watersheds of the Grande, Sabacuante, and Tatumbra rivers and will supply the future dam of Concepción. The management plan for this watershed is in the planning stage.

ENEE and SANAA have created a joint Department of Watershed Management to coordinate with COHDEFOR and other institutions all actions involving the protection of watersheds and dams supplying hydroelectric plants.

## Water and Health

Given the characteristics and distribution of the population, it has been difficult to increase the provision of potable water and waste disposal. In 1987, according to the National Survey of Epidemiology and Family Health, potable water was available to 68.2 percent of the population, whereas 59.5 percent had access to sanitation systems. Lack of potable water and sanitary services is more serious in the rural areas. Water of poor quality and in insufficient quantity affects the health of the population and gives rise to high rates of mortality and morbidity.

The availability of potable water in rural areas has increased markedly, however, from 12 percent in 1973 to 55.7 percent in 1987. In urban areas, water supply systems to homes are frequently restricted or inoperative during the dry season. Some urban residents are without home systems. In areas of easy access to the distribution network, public access points are provided; elsewhere in the cities, water must be purchased. In smaller towns, surface water—generally contaminated—is used.

## Energy and Water

ENEE provides electrical energy to the country. Among its functions are the planning and execution of projects to cover present and future energy demands. With the completion of the hydroelectric plants of El Nispero in 1982 and El Cajón in 1985, energy demands will be amply met until 1993. With this installed capacity, ENEE has engaged in projects of urban and rural electric supply, such as the export of energy to almost all countries of Central America, including Panama. As a result of present and projected demands, ENEE is conducting feasibility studies for potential hydroelectric projects such as Sico II, El Remolino, and El Naranjito.

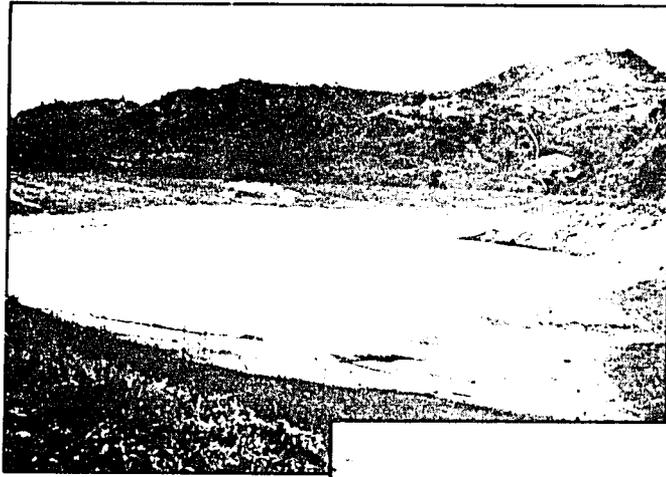
However, pressures on watersheds supplying energy as well as on potential sites cause disequilibrium in the ecosystem. Erosion and the sedimentation of the dams and reduction of their useful life alter the hydrological cycles.

## Recommendations

- Enforce laws and codes dealing with water protection, such as the Health Code, the SANAA Law, the Arbitrage Plan, the Municipal Laws, and the Construction Code;
- Promulgate a General Law of Waters, which would clearly assign responsibilities, regulations, budget, and personnel;
- Improve collaboration and coordination among institutions to assist the National Commission for Integrated Watershed Management to equalize technical criteria and policy by enacting a Presidential Agreement;
- Train and certify personnel in all aspects of the integrated management of watersheds;
- Provide nonformal education to farmers on silvopastoral systems, extractive reserves, and other multiple-use forest systems to improve farm income and contribute to watershed stability, especially in soils of upper slopes not suited for annual cropping;
- Install treatment plants soon for contaminated waters in the Tegucigalpa watersheds;
- Implement a monitoring and evaluation system, including various parameters of water quality, that considers annual fluctuation and seasonal availability; and
- Increase scientific research on the effects of pollution on human health and biological resources.

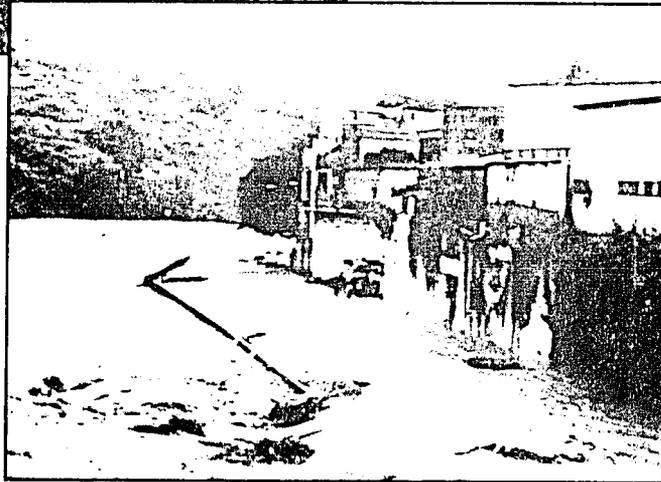
## AGRICULTURAL RESOURCES

Although forest resources predominate in Honduras, crops and cattle provide a major portion of the gross internal revenue and employment. Almost 4 million hectares are used for agriculture and cattle production, although only 2.8 million are con-

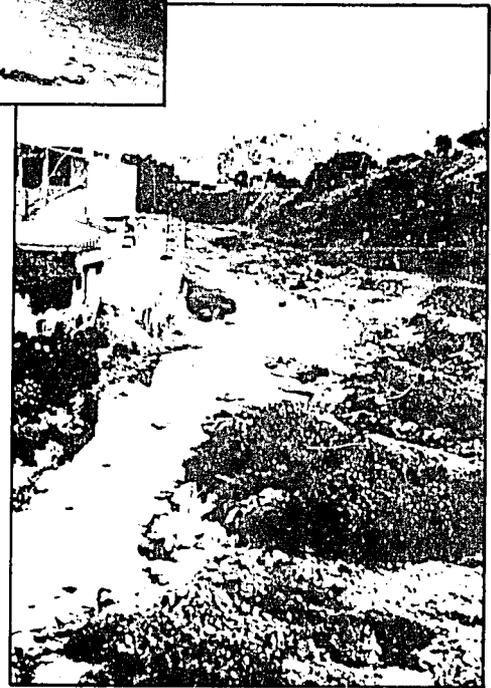


Los Laureles reservoir, one principal source of water for Tegucigalpa (photograph by Howard Daugherty)

The Choluteca River in Tegucigalpa during a winter hurricane, September 15, 1988 (photograph by Vicente Murphy)



The Choluteca River in Tegucigalpa during the dry season (photograph by Howard Daugherty)



sidered suitable for these uses. The additional area—mainly steep mountainsides—is used for shifting cultivation and extensive grazing, with consequent deterioration of the resource base by deforestation, erosion, and extensive floods.

## Land Use

Most information on land use in Honduras is obsolete; government institutions charged with generating this information ceased gathering it in 1980 because of budget problems. In 1972 DEC studied land use in the Departments of Valle and Choluteca, which make up 4.9 percent of the national territory. The information gathered in that project, published as a technical report and a 1:250,000 scale map, bears no relation to the present situation in the area.

In 1973 the National Agrarian Institute (INA) made 1:20,000 scale maps of some valleys and flat lands that were used by the agrarian reform program; these maps need to be updated. Between 1979 and 1980, DEC continued reconnaissance mapping of land use in five departments: Comayagua, Francisco Morazán, Cortés, Yoro, and Atlántida, which represent 24.8 percent of the national territory. Between 1985 and 1987, DEC implemented several land-use studies funded by international agreements (Table 2).

Table 2. Studies of Land Use, 1985-1987

Site	Km <sup>2</sup>	% of Area of Country	Department
Cabeceras Watershed	515	0.5	Fsco Morazán
Texiguat	854	0.8	Fsco Morazán
Orocuina	353	0.3	Fsco Morazán
Namale	477	0.4	El Paraíso
Sampile	552	0.5	Choluteca
Comayagua Valley	400	0.4	Comayagua
Quimistán Valley	211	0.2	Santa Bárbara
Jamastrán	177	0.2	El Paraíso
Palaja Watershed	323	0.3	Santa Bárbara
Jicatuyo Watershed	197	0.2	Santa Bárbara
<b>Total</b>	<b>4,059</b>	<b>3.8</b>	

Source: Dirección Ejecutiva del Catastro, Departamento de Recursos Naturales. Individual maps and reports of each area.

## Agricultural Production

In Honduras the use of technology is intimately tied to production, either for export or for internal consumption. Export crops include bananas, plantains, pineapples, sugarcane, cotton, oil palm, melons, citrus, and coffee. Because these crops are to be consumed in developed countries, the process involves sophisticated technologies, large economic investment, and low risk. This type of agriculture, with the exception of coffee, is practiced in the coastal lowlands of the Pacific and Atlantic.

Many export producers have their own technical assistance service, made up of agronomists who are familiar with the latest technologies. Producers of melons and bananas generally receive technical assistance from export agents, who then impose the rules. The state provides limited assistance to the other producers.

Agricultural production for domestic consumption consists of basic grains and horticultural crops. The large and medium-size operations, located on the flat lands of the interior valleys and coastal zones, use relatively advanced technology and some capital, considerable labor, and animal energy inputs. The operations receive free technical assistance from the government. Subsistence farmers, in contrast, are located on the sloping hillsides and generally must rent the land. Given their socioeconomic condition and geographic isolation, subsistence farmers seldom use new technologies because they lack either information or capital.

The public extension service offers assistance to subsistence farmers, but impact is limited because its technologies are inappropriate to the economic and cultural conditions of these farmers. Many still practice the traditional rotations with family labor, aided by fire to control and clear weeds.

## Area under Cultivation

The area under cultivation for basic grains has diminished since the census of 1974. Yet total production has increased, as a result of rice and maize cultivation and better technologies. In the last

few years, however, Honduras has become a net importer of basic grains.

The area cultivated and production of principal crops have increased significantly (Table 3). Use of inorganic fertilizers and pesticides has also increased significantly, including many pesticides forbidden or restricted in their countries of origin.

## Cattle Production

Cattle production occurs at three different technological levels, defined by the management practices the farmers use. The traditional level includes subsistence and small farmers, and owners of medium-size and large herds located on mountain slopes. These farmers lack any type of infrastructure to manage cattle or to control parasites or diseases. The farm is divided into large areas of natural pastures and shrubs, always overgrazed and burned annually; death of animals because of mismanagement is common. This type of producer tries to profit from milk and meat, although he or she obtains very low yields. Predominant cattle breeds are criollo-brahman crosses.

The second level of technology is the traditional advanced. It differs from the first level in the use of limited infrastructure, parasite and disease control, and somewhat improved management of pastures. Production is still geared to the sale of meat and milk, and the breeds are predominantly the criollo-brahman crosses, although some brown swiss and holstein crosses are present.

The third technological level includes producers who use modern technology and have a strong commercial focus. These producers generally undertake large capital investments in adequate infrastructure, control parasites and diseases, use modern methods for pasture management, and have high stocking rates. Most of these producers specialize in one product, either milk or meat. They use artificial insemination and purebred cattle to improve performance. Farms are generally located in the flat lands of coastal zones and valleys of the interior.

An important expansion of cattle production took place in 1970-1980 (Table 4); it included significant conversion of forests to pastures in response to a growing international market. The expansion also included establishing pastures on fragile lands, unsuitably steep hills, and areas already degraded. Other factors influencing the expansion of cattle production include the availability of credit; agrarian reform, which protected cattle production with legislation; and security of investment, as compared with that of annual or perennial cropping.

## Land Tenure and Agrarian Reform

Most farmers have plots smaller than 5 hectares or are landless, whereas the small agroindustrial sector controls more than 60 percent of agricultural lands, including those best suited for agricultural production (Table 5).

Analysis of the agrarian reform reveals a relatively organized reformed sector that groups the farmers into communities, cooperatives, or associative enterprises. The agrarian structure of the country has not been substantially modified.

It is important to note that the process of agrarian reform has not only been distorted, but has almost stopped. This situation resulted from the view that simply titling lands would provide sufficient incentive for the rational use and adequate exploitation of the resource base. An overview of the situation is presented in Table 6.

## Recommendations

- Conduct a new agricultural census, a fundamental tool to improve planning;
- Conduct inventories of soils and actual and potential land use at the national level, and publish the corresponding maps;
- Finish the ecological maps (Holdridge System) for departments still lacking them;

Table 3. Surface, Production, and Yield of the Main Crops

Crop	Average Surface	Average Surface	% Change	Average Production	Average Production	% Change	Average Yield	Average Yield	% Change
	1975-79	1983-87		1975-79	1983-87		1975-79	1983-87	
	(thousands of ha)			(MT/ha)			(MT/ha)		
<u>Cereals and Legumes</u>									
Corn	379,54	324,93	(14)	36,078	44,824	24	95	138	45
Rice	18,42	14,54	(21)	2,700	3,384	25	147	233	89
Sorghum	63,94	44,00	(31)	4,378	3,288	(25)	68	75	9
Beans	75,98	71,08	(6)	3,686	3,628	(2)	49	51	5
<u>Starches</u>									
Cassava	5,980	7,500	25	4,906	6,156	25	820	821	0
Plantain	10,920	15,720	44	9,830	14,124	44	900	898	0
<u>Horticultural</u>									
Tomato	1,920	3,280	71	1,770	2,996	69	922	913	(1)
Onion	780	1,480	90	232	422	82	297	285	(4)
Cabbage	960	2,820	194	870	2,572	196	906	912	1
Potato	560	1,120	100	566	1,116	97	1,011	996	(1)
<u>Fruits</u>									
Banana	20,040	18,700	(7)	114,000	115,450	1	5,689	6,174	9
Watermelon	1,100	1,740	58	392	630	61	356	362	2
Melon	760	2,020	166	304	848	179	400	420	5
Avocado	1,100	1,340	22	542	650	20	493	485	(2)
Orange	1,600	4,940	209	7,934	20,476	158	4,959	4,145	(16)
Grapefruit	300	1,700	113	1,652	3,206	94	2,065	1,888	(9)
Pineapple	3,240	4,280	32	5,786	19,588	239	1,786	4,577	156
Others	10,400	9,240	(11)	7,044	6,160	(13)	677	667	(2)
<u>Oil Seeds</u>									
Sesame	2,960	1,560	(47)	246	132	(46)	83	85	2
Oil Palm	11,800	20,220	71	5,502	29,772	441	466	1,472	216
Coconut	3,860	3,980	3	1,412	1,440	2	366	362	(1)
Cashew	600	2,400	300	10	848	380	17	20	20
Cacao	1,220	2,980	144	62	170	174	51	57	12
<u>Other</u>									
Coffee (gold)	115,060	13,740	19	5,824	746	28	51	54	7
Tobacco	8,160	9,280	14	818	826	1	100	89	(11)
Cotton (gold)	11,740	5,380	(54)	678	47	(31)	58	87	51
Sugarcane	37,760	5,030	33	18,094	27,976	55	4,792	5,562	16

Source: Dirección de Planificación Agrícola, Secretaría de Planificación, Coordinación y Presupuesto, 1989.

Table 4. Size of Cattle Farms and Herds in Honduras, 1974-1984

Agricultural Census 1974 <sup>a</sup>			Cattle Survey of 1984			
Size (ha)	Number of Farms	Head of Cattle	Size (ha)	Number of Farms	Surface (ha)	Head of Cattle
< 5	33,330	181,417	< 5	20,854	59,883	132,372
5 to 10	16,383	142,170	5 to 10	16,298	118,823	158,332
10 to 20	13,410	181,004	10 to 20	19,685	282,547	313,751
20 to 50	12,325	309,632	20 to 50	19,131	610,082	546,884
50 to 100	3,988	221,752	50 to 100	7,954	545,129	471,859
100 to 200	1,821	195,491	100 to 200	4,005	538,972	420,541
200 to 500	987	249,514	200 to 400	1,592	404,061	329,303
			400 to 600	438	204,511	139,841
550 to 1,000	246	134,865	600 to 1,000	173	131,719	81,978
> 1,000	148	179,270	> 1,000	170	261,779	99,936
Total	82,638	1,795,115		90,300	3,157,506	2,694,797

<sup>a</sup> There are no data on surface area in the Agricultural Census of 1974.

Source: Ministerio de Economía, 1975. Censo Nacional Agropecuario de 1974; LatinoConsult, S.A. 1984. Diagnóstico de la Ganadería de Honduras.

Table 5. Land Ownership by Size of Farms, 1974

Size (ha)	Quantity (no.)	Amount (%)	Average Surface (ha)	Surface (%)	By Farm (ha)
< 5	124,781	63.9	238,988	9.1	1.9
5 to 10	28,264	14.5	201,274	7.7	7.1
10 to 20	19,220	9.8	262,145	10.2	13.9
20 to 50	15,170	7.8	461,216	17.5	30.4
50 to 100	4,433	2.3	301,228	11.5	67.9
100 to 200	1,971	1.0	266,697	10.1	135.3
200 to 500	1,057	0.5	313,207	11.9	296.3
550 to 1000	276	0.1	183,769	7.0	665.8
> 1000	169	0.1	395,330	15.0	2,339.2
Total	195,341	100.0	269,854	100.0	13.5

Source: Censo Nacional Agropecuario de 1974.

Table 6. Groups, Associates, Area Titled, and Area Arable by Type of Organization at the National Level

Type	No. of Groups	Initial Members	Actual Members	Area Titled (ha)	Area Arable (ha)
Settlements	1,537	45,201	33,201	168,855.76	119,136.62
Cooperatives	462	16,457	13,935	126,586.53	101,391.07
Associate Enterprises	51	2,493	2,249	10,600.90	9,388.00
<b>Total</b>	<b>2,050</b>	<b>64,151</b>	<b>49,540</b>	<b>306,043.09</b>	<b>299,915.69</b>

Source: Departamento de Planificación, INA (through 1985). Resumen Básico de los Grupos Campesinos Beneficiarios de la Reforma Agraria.

- Implement a geographic information system and the infrastructure and budget necessary for training and operations to carry out the recommendations listed above;
- Research thoroughly, and with a multi-disciplinary team, the status and problems of internal agricultural consumption and export, providing appropriate personnel and budget for these studies;
- Strengthen human resources through formal training programs for technicians and specialists in the agricultural sciences and through non-formal training of farmers and ranchers, including women, who play a critical role in agriculture and in cattle production in the country;
- Experiment with and implement integrated agro-silvopastoral and other multiple-use systems, particularly on the more fragile and degraded lands when classified as appropriate for these uses;
- Evaluate the economic, social, and ecological effects of unplanned and spontaneous colonization, principally in the broadleaf mature forests;
- Evaluate the effects of the use of agrochemical products on ecosystems and on human health, and promote alternatives such as integrated pest management and biological control of pests;
- Re-evaluate the agrarian reform process in order to formulate sustainable development policies and promote equity in land concessions, credits, and construction of infrastructure; and
- Continue organizing the rural producers in ways parallel to the development and availability of public and state services.

## FOREST RESOURCES

FAO conducted a national forest inventory in 1964. Since then several local inventories have been made, but the national one has not been updated. In 1986 COHDEFOR estimated the forest cover at 5 million hectares, with 53 percent in broadleaf forests and 47 percent in conifers.

Although Honduras is strongly oriented toward forest industries, the contribution of the forest sector to the gross national product continues to be relatively low. In addition, the decrease in forest cover represents a most serious problem, particularly in the lowland broadleaf forests where the annual destruction reaches 64,500 hectares.

In the pine forests, the annual rate of loss is 15,000 hectares, but the problem is severe because 96 percent of all commercial wood production in the country comes from these forests. Forestry production, especially lumber and pine resin, has diminished considerably in recent years because of the decrease in commercial forest reserves and poor management. In the case of resin, income has decreased as a result of low prices on the international market. Lumber production in 1988 was only 68 percent of 1978 production.

Export of lumber and wood products has decreased from 90 million board feet in 1985 to 74

million in 1988. This decrease results from lower national production, increased internal demand, and transformed secondary industries. The export of secondary products has doubled since 1985, rising to 37.2 million board feet in 1988. This increase stems from appropriate policies in industrialization and in the commercialization of wood and its derivatives; the increase reflects the success of these innovative policies.

Wood for fuel use continues to occupy first place in demand. Estimates of COHDEFOR indicate that production and consumption of fuelwood approach 5 million cubic meters. If to this amount is added industrial fuelwood consumption, the figure reaches 5.6 million cubic meters per year, in comparison with the production of lumber, estimated at 1 million cubic meters.

The problems of the forestry sector include the following:

- (1) Enormous consumption of fuelwood, an important factor in deforestation even though a large part comes from branches of already-degraded woods and from trimming shade trees for coffee. Nevertheless, this consumption underscores the continuing urgency of searching for alternative sources of energy for domestic and light industrial use, an important recommendation of the 1982 Environmental Profile;
- (2) Widespread forest fires, a main cause of forest destruction in Honduras. They affect mainly the regeneration of coniferous forests, although on occasion these fires may have a positive impact on forest ecosystems. The area of intense protection in pine forests was 1.8 million hectares in 1988, whereas the area burned was 52,000 hectares;
- (3) Pests and diseases, principally the pine weevil (*Dendroctonus frontalis*), which causes enormous damage in the forests of the Departments of Yoro, Olancho, Comayagua, and Francisco Morazán;
- (4) Subutilization of raw materials. Several studies have confirmed that wastes left in the forests

after cutting exceed 25 percent. Fortunately, training of technicians to prepare and sell standing timber was initiated in 1989, as was the implementation of a system that includes marking entrance roads and trees for extraction and for measuring. This effort is an important achievement for COHDEFOR;

- (5) Erosion and sedimentation of dams, waterways, and channels caused by traditional forms of forest exploitation. Technical norms are needed for the construction of roads, extraction systems, and cutting methods, to reduce soil degradation and erosion in the middle and low areas of the watersheds; and
- (6) Deterioration of forest quality, caused by selective cutting of only a few species, as is the case in the broadleaf forests in the lowlands; the utilization of unsound trees and those of poor genetic quality in the pine forests; the damage to soils from forest exploitation practices; and the overgrazing of forest lands.

The National School of Forest Sciences (ESNACIFOR) implements and coordinates research activities and provides formal and nonformal training in forest utilization. In research, ESNACIFOR is supported by the National Center of Applied Forest Research (CENIFA), whose purpose is to develop research projects within the priorities of COHDEFOR. These projects include genetic improvement and those projects under way in the Lancetilla Botanical Garden on the Atlantic coast. ESNACIFOR is considered one of the best tropical forest schools in the world.

The Forestry Investment Plan for 1989 includes 12 projects being executed throughout the country in the different forest regions of COHDEFOR. The projects focus on achieving permanence of the forest resource through activities such as protection, research, and forest industry. In addition, the projects train and certify technicians and farmers. The Forest Investment Plan also includes the integration and active participation of the rural populations who live on forest lands to carry out activities that will improve their well-being and income level.

The new policy designed and implemented by COHDEFOR is oriented toward the rural population. Through the perception of direct and indirect benefits, these people may become a key factor in the use and protection of forest resources.

In the last few years, there have been significant changes in forest policy, such as the privatization and commercialization of wood production, that have permitted a reorientation of COHDEFOR. This policy revision has strengthened the social forestry systems, created tributary areas for forest industries, and resulted in sales of standing timber.

Financial backing obtained for the forestry projects has permitted the implementation of these activities related to the new forest policy, in spite of the economic difficulties of COHDEFOR.

## Recommendations

The principal recommendations to improve forest resources and strengthen the integrated management of the forest-water-soil-wildlife system are the following:

- Improve the capacity of the forest inventory system by installing a geographic information system in the National Cadastral Institute;
- Strengthen the administration of COHDEFOR, especially its systems and procedures, personnel administration, and human resources training;
- Review the mechanisms of interinstitutional coordination for all institutions involved with integrated management of renewable natural resources;
- Review Law Decree No. 103, promoting the appropriate reforms concerning the production and commercialization of wood, and establish incentives for reforestation and more rational forest management;
- Institutionalize the sales system of standing timber in the conifer and broadleaf forests and implement a pricing system;

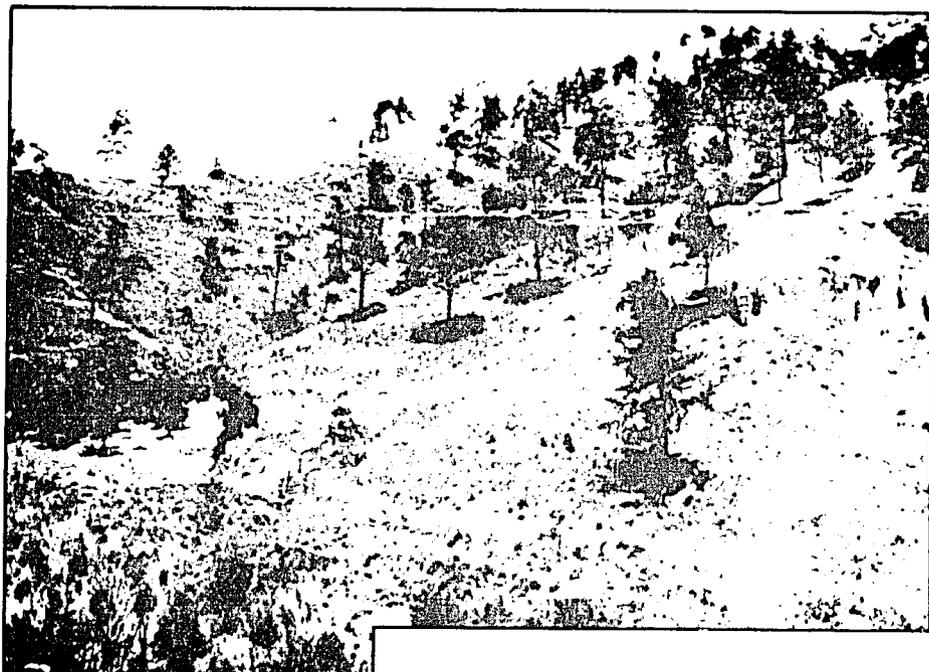
- Create the Forest Guardians and the Register of the Inalienable Public Forest Heritage;
- Define, clearly and precisely, the protected forest zones in accordance with their ecological importance, to promote their conservation with the participation of other state and private institutions; and
- Assume, by COHDEFOR, scientific and institutional leadership; and, in collaboration with General Directorate of Natural Renewable Resources (RENARE), AHE, and other involved institutions, protect and manage the System of National Parks and Equivalent Reserves.

## COASTAL ZONE RESOURCES

In the north, coastal ecosystems of the Caribbean littoral include mangroves, palms, marshes, and ponds. These maintain a varied wildlife and marine fauna. In the ponds, where shrimp and other marine species spend part of their life cycle, a small artisanal fisheries industry is developing. Within the limits of the continental shelf, there are islands and cays surrounded by coral reefs and shrimp and lobster banks that have generated industrial fisheries.

The Honduran southern (Pacific) coast and the Gulf of Fonseca have numerous marshes, ponds, salt marshes, and mangroves. Until 1973 these were used for artisanal fisheries; production of salt, tannins, fuelwood, and wood; and domestic hunting. Since then, mariculture focusing on shrimp emerged, and by 1987 this mariculture had almost reached the production levels of the industrial shrimp fisheries of the whole country.

The activities of fisheries can be divided into three categories: artisanal fisheries, industrial fisheries, and mariculture. At present, artisanal fisheries are in a slump; industrial fisheries are decreasing; and mariculture, in the form of shrimp culture, is growing rapidly in the south but is placing at risk the coastal ecosystems and the social harmony of the region.



Montane pine forest, seriously degraded by overexploitation of timber, by agriculture, and by pastures (photograph by Howard Daugherty)



Lime ovens using wood as fuel, an important factor in the deforestation of Honduras (photograph by Vicente Murphy)

The low ichthyic potential of the Caribbean has inhibited the development of small fishery industries there. To this situation is added the urgent need for appropriate management systems and development projects for small fisheries with qualified personnel and appropriate budgets.

The industrial fisheries fleet is not being managed in a technical or scientific manner. Shrimp production and export have not maintained their early high levels, and the production of lobster fell in 1987 to one of the lowest levels of the decade.

Shrimp culture presents a positive alternative for income generation for the government and as a protein source for the population. Although the fisheries fleet is experiencing decreased yields, shrimp farms are increasing their production. Nevertheless, the accelerated expansion of shrimp farms has occurred without sufficient planning and scientific research. The area already given to concessions or in adjudication, which includes 28,000 hectares, may have already exceeded the threshold of ecological stability, estimated at 20,000 hectares.

Commercial export agriculture in the Caribbean lowlands, based on foreign capital, is considered the most technologically modern in the country. In 1987 there were 113,700 hectares of sugarcane, oil palm, bananas, plantains, guinea bananas, citrus, pineapples, coconuts, and cocoa (in decreasing order of area covered). The main export crops of the southern coast are sugarcane, cotton, melons, cashews, sesame, and watermelons.

Commercial agriculture in the coastal zones brings contaminants to the marshes, which are a critical habitat for shrimp and other species during part of their life cycle. The influx of untreated waste waters from urban centers and local communities exacerbates the problem.

Subsistence agriculture, especially maize and beans, follows the same exploitative pattern throughout the country: clearing, burning, cropping for one to three years, and abandoning the area and searching for another. This pattern results in a marked deterioration of soils. There is also increased cutting of broadleaf forests in the northern zone, associated with colonization of these areas by

farmers from other regions, who lack appropriate experience and technology for the humid tropics.

The use of fuelwood as the principal source of domestic energy is reducing the mangroves on both coasts. More than 500 furnaces use mangrove wood as fuel to extract salt. The ecological effects of the use of fuelwood and construction wood, the cutting of forests, the blocking of water flow and exchange in marshes, and the diversion of waterways by shrimp farms merit scientific investigation.

The ecological changes in the coastal zones—principally in mangroves and marshes, salt marshes, beaches, and ponds—have reduced wildlife habitats, particularly of migratory birds. The excessive exploitation of turtle eggs and the illegal export of many wildlife species are urgent problems that must be addressed.

With support from the Canadian International Development Agency (CIDA), projects on sustainable forest management are being implemented in lowland forests on the Caribbean coast. This is an area of strong agricultural colonization, motivated by the migration of farmers from degraded zones in to the south and southwest areas of the country.

## Socioeconomic Aspects

Artesanal fishermen and their families are generally part of the subsistence-level population in Honduras. High levels of illiteracy are commonplace, as are poor living conditions and lack of access to health and sanitary services, electricity, and potable water. Lack of technology and modern equipment limits the harvest capability of these fishermen, affecting their earning capacity and nutrition. Women are housewives, have small businesses, and practice some agriculture, or they may join their husbands in fishing activities. Women are equal participants in economic activities. Children also participate in the economic activities of the family. Fishermen also practice extensive agriculture and cattle raising (2-10 head).

Illegal and damaging fishing methods are common. Overexploitation of shellfish, especially scallops and mangrove oysters, has caused their

near extinction in the Gulf of Fonseca; unchecked extraction of turtle eggs has significantly decreased the populations of Pacific Ridley (*Lepidochelys olivacea*) and Hawksbill (*Eretmochelys imbricata*) turtles. In the northeastern lagoons, crustaceans (*Callinectes*), fish, and turtles are also diminishing.

In recent years, several commercial mariculture ventures in the south, with land concessions obtained through political power and influence, have fostered the expulsion of fishermen from their traditional fishing areas and routes to the coast. In 1988 fishermen of the southern coast organized the Committee for the Defense and Development of the Flora and Fauna of the Gulf of Fonseca (CODDEFFAGOLF). Its purpose is to promote the rational exploitation of resources and reach a balance among conservation, sustainable development, and social equity. Disagreements among this group, several of the industrial fisheries, and the Ministry of Natural Resources have been the subject of much concern. These disagreements have received considerable attention in the media, raising national awareness of the problem.

## Recommendations

- Evaluate the government and private institutional mechanisms for managing coastal resources; strengthen these mechanisms to provide management that is efficient, integrated, ordered, and productive, and will reduce social conflict;
- Define the legal framework to encompass institutional responsibilities; a system of concessions and cancellations for shrimp farms; and the improvement of systems of quality control, exports, concessions, and taxes;
- Study the need to establish a Fisheries Secretariat to improve the institutional administration and the relationships between the large commercial companies and the local communities, and to coordinate commercial and artisanal production;
- Manage and control the commercial fisheries fleet, following scientific and technical guidelines;
- Implement appropriate and innovative integrated management plans at the regional level in the Southern Zone and the north coast;
- Promote scientific research on renewable natural resources in the coastal zones, through the establishment of a research and extension center in the Gulf of Fonseca and the implementation of a research program in the Río Plátano Biosphere Reserve;
- Certify more technicians, professionals, and scientists by strengthening the appropriate programs in UNAH;
- Analyze thoroughly the ecological and socio-economic effects on the coastal zone of the proposed Choluteca irrigation project;
- Evaluate the feasibility of producing charcoal briquettes to replace fuelwood in domestic and industrial use;
- Designate the management and protection of the Río Plátano Biosphere Reserve and the La Tigra National Park as a priority for government action, to prevent its destruction by colonization and the forest export industry and to ensure the preservation of biological diversity, genetic resources, scientific and touristic value, and the intrinsic worth of wildlife;
- Consolidate other natural coastal ecosystems within the National System of Protected Areas. Of special ecological importance are the coral reefs, the islands and cays, the mangroves, the salt marshes, the swamps and ponds of the north coast and the Mosquitia, and the lagoons and salt marshes of the Pacific littoral; and
- Demand compliance with the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES), signed by the Republic of Honduras.

## **WILDLANDS AND WILDLIFE RESOURCES**

### **Protected Areas**

Honduras enjoys an abundance of biological diversity and in Central America is second only to Costa Rica in the number of species present. Honduras is also characterized by an ample spectrum of natural ecosystems: marine, coastal, terrestrial, and riverine. The Bay Islands and the associated cays and reefs, the Río Plátano Biosphere Reserve, the Cuero y Salado Reserve, the Pico Bonito, and the cloud forests are some examples of the biological and ecological wealth of the country.

The government, in collaboration with NGOs and international development agencies, has made considerable progress in biological conservation efforts. Progress has also been made in the rational use of wildlife and wildlands resources since the publishing of the 1982 Environmental Profile.

The number and total area of national parks and equivalent reserves have grown rapidly. In environmental education, much has been achieved as a result of the quantity and quality of educational programs at the national level and the initiative of joint government and private efforts through a national campaign of environmental awareness.

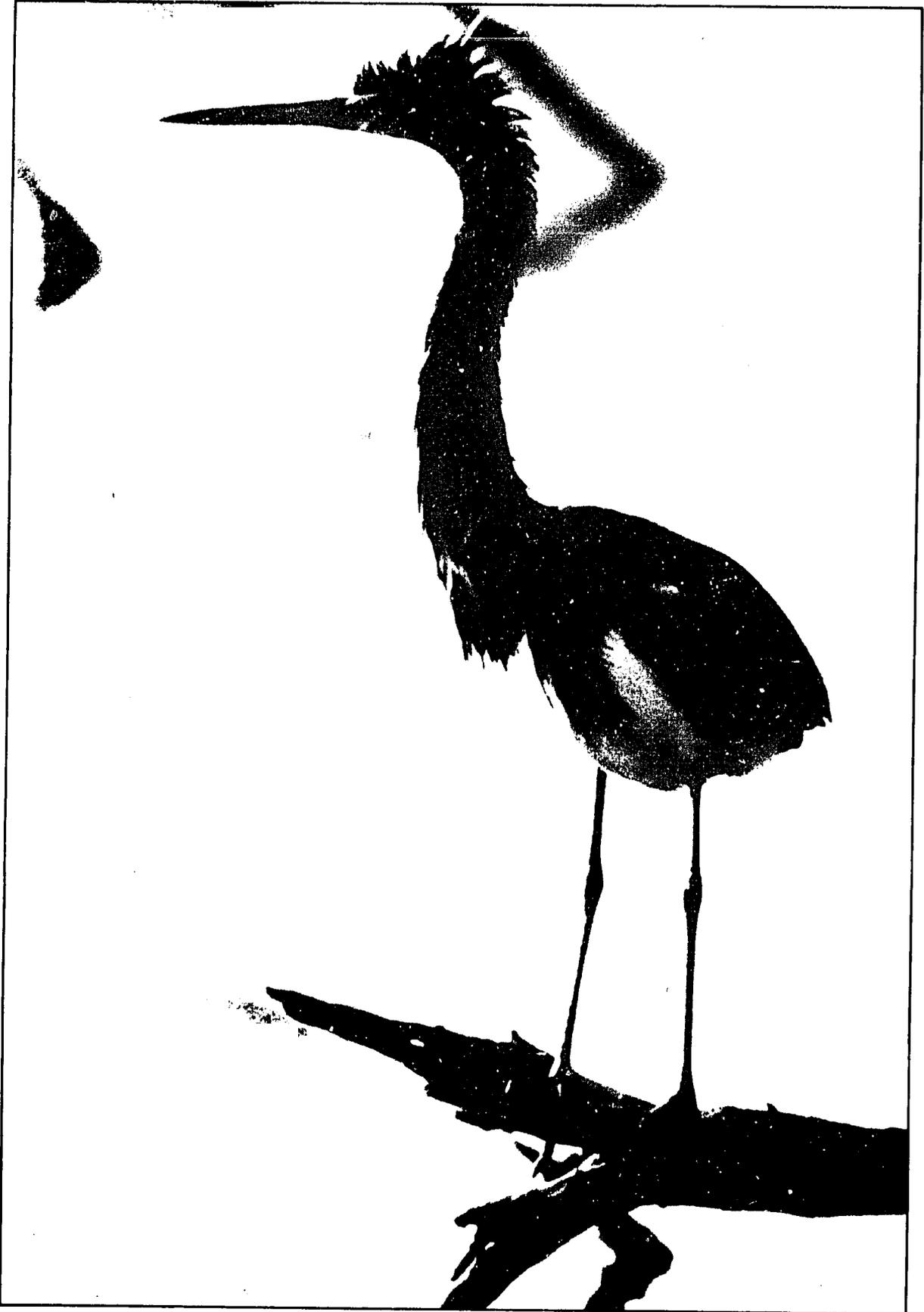
Many technicians and field personnel from conservation NGOs and government institutions have received university or in-service training in the management of protected areas and fauna.

There has been an important increase in support from the international development community to programs involving biological conservation in Honduras; entities such as USAID, the U.S. Peace Corps, CIDA, UNDP, the Government of Holland, WWF, and the International Union for the Conservation of Nature and Natural Resources (IUCN) have been responsible for programs, projects, training, and other collaborative efforts. This assistance reflects worldwide awareness of the shared responsibility among developing and industrialized countries to arrest the destruction of

tropical ecosystems. They are an important world source of forest products, genetic resources for present and future generations, medicines, and ecological services such as hydrological stability. Tropical ecosystems are also a source of learning and inspiration. When intact, they are laboratories to understand sustainable management systems that have supported many traditional cultures for centuries.

The National System of Protected Areas includes, at least in theory, the following objectives by category:

- (a) National Park: to preserve areas of national interest, representative examples of physiographic regions, biotic communities, genetic resources, and endangered species, while promoting recreational, educational, and research activities;
- (b) Wildlife Refuge: to ensure the survival and recovery of rare and endangered populations and habitats; compatible activities are education and research;
- (c) Biological Reserve: to protect and preserve, in their most natural state, the phenomena and processes of ecosystems for scientific research;
- (d) Forest Reserve: to preserve forest, water, and wildlife resources to be exploited in a sustainable and rational manner; compatible uses are recreational and educational activities;
- (e) Cultural Monument: to protect and preserve cultural or historical landmarks and, when possible, to provide opportunities for recreation and education;
- (f) Natural Monument: to protect and preserve natural features of exceptional value or national interest, as well as genetic resources; to provide opportunities for recreation and education;
- (g) Water Production Zone: to ensure the availability and production of water; to protect water quality and related hydrological processes;



Blue heron (*Ardea herodias*) on the coast, a habitat of greatest importance for migratory and resident birds (photograph by John A. Livingston)

- (h) Multiple-Use Area: to maintain and protect land-use capability on the basis of biological sustainability and minimal negative impact on the natural resources of the area;
- (i) Indigenous Reserve: to protect cultures of anthropological interest and to allow ethnic groups to preserve their traditional customs and ways of life; and
- (j) Biosphere Reserve: to promote ecodevelopment for the welfare of the population and for the conservation of the biotic resources of the area while offering opportunities for education and research.

Political factors and personal interest tend to dominate the creation and maintenance of protected areas. It is necessary to establish scientific criteria to ensure that important areas are protected. An organized system is needed to create and manage the protected areas. Many areas present problems in definition of their geographic limits, conceptualization, and objectives. These problems stem from the lack of a conceptual framework to guide wildlands and wildlife policies.

Regarding the protected areas, the planning and development of the Cultural Monument and World Heritage Site of the Copán Ruins are significant achievements. This example of integration of an appropriate legal and institutional framework, sufficient economic resources, motivated and qualified personnel, and scientific research should serve as the model for other ecological sites, protected areas, and wildlands.

The management of most established wildlands areas leaves much to be desired, however. Only four areas (La Tigra, Río Plátano, Cuero y Salado, and Copán) have completed operation plans since 1986, and just three (La Tigra, Cuero y Salado, and Copán) have education and interpretation plans.

## Degradation of Wildlands and Wildlife Resources

Despite important achievements since 1982, the degradation and destruction of wildlands and wildlife have become so acute that Honduras faces a serious ecological problem. The extent and speed of devastation are serious and without precedent in the history of the country. The impact of the devastation in limiting development options in the future is still unrecognized.

The main problems are direct predation of wildlife and destruction of habitats. Of the Central American countries, Honduras is considered the largest wildlife supplier to the international market. Exports have increased from 27 percent in 1979 to 68 percent in 1987. The number of specimens sold rose from 196,403 in 1987 to 330,667 in 1988, discounting illegal exports that leave through Mosquitia, the border with El Salvador, and other places. Legal sales alone have brought the government 1.5 million lempiras, none of which has been reinvested in research or management programs for wildlife.

Black coral (*Anticipates* spp.) is endangered by the deterioration of coral reefs in the Caribbean, the practice of dragnet fishing, and the indiscriminate extraction of coral for jewelry and for international and local commerce. Similar problems have led to the near extinction of some wildlife species; the situation of wildlife in Honduras is the worst in Central America, with the exception of El Salvador (Guevara et al., 1985).

## Environmental Education and Interpretation

The greatest achievement in education and interpretation has been the Cultural Monument and World Heritage Site of the Copán Ruins. This effort includes an interpretation plan, guided and self-guided interpretation, trained guides, and information and interpretation materials. The La Tigra National Park has improved since 1985 with the construction of guided interpretation paths, a self-

guided path and pamphlet, personnel trained in basic interpretation techniques, group management, and visual aids. In addition, two visitor centers have been constructed.

Only very limited development has occurred in the other protected areas of the country. Some activities are being conducted in Lancetilla, Cuero y Salado, Cusuco, and Uyuca.

Environmental education has not always been tied to wildlands, although some are centers for environmental education programs for the surrounding communities located in the buffer zones. Examples include La Tigra; Río Plátano; Cuero y Salado; and some proposed areas such as Punta Sal, Bay Islands, and the Southern Mangroves. The programs are oriented mainly to the users and do not address the interests of potential users or of decision makers.

## Laws and Regulations

The absence of a legal framework is a major area of weakness in the system. In spite of the existence of 51 areas under legal decree for protection, a critical review reveals a basic incongruence: a clear and consistent legal framework covering the creation, management, and protection of the different categories of wildlands is absent. The present framework includes several laws, stating different objectives and responsible institutions—forexample, the creation of a wildland area can be guided by the General Forest Regulations, by Executive Decree, or by an initiative presented to the Legislative Branch. This situation creates confusion regarding budgeting and responsibility for the protection and management of the areas.

Six government institutions are involved in managing wildlands and wildlife in Honduras: RENARE, COHDEFOR, SANAA, AHE, Cuero y Salado Foundation, and the Panamerican Agriculture School. Internationally, support is provided by organizations such as WWF; IUCN; USAID; the United Nations Educational, Scientific and Cultural Organization (UNESCO); and ACDI. In recent years, the activities of NGOs such as AHE have contributed substantially to progress in this area.

## Recommendations

For 25 years, authors of numerous technical reports and specialists at national and international conferences have argued that the country needs legal and institutional instruments, human and financial resources, support from the authorities, and scientific research to consolidate the management of wildlife and wildlands. These specialists have also argued in favor of the provision of resources for the management of a system of national parks and equivalent reserves.

Instead of proposing a new agenda to save the natural heritage of the country and maintain the security of open options for more sustainable development, the following recommendations summarize and update action priorities presented through the years:

- Strengthen the legal framework for the conservation of wildlands and wildlife and the management of protected areas in the country;
- Create an adequate institutional framework for the management of the National Park System and Equivalent Reserves and for their consolidation, incorporating the remaining ecosystems that merit protection because of their diverse values;
- Strengthen the programs for training professional and field personnel;
- Strengthen the programs for increased public awareness of the importance of conservation of protected areas and wildlife, and promote environmental ethics;
- Increase the financial resources from national and international sources to public and private conservation programs;
- Promote the management of protected areas and wildlife as a tool for social development;
- Establish a program for a national biological inventory and a data bank for conservation; and



Deforestation in the pine forests of Guajiquiro caused by slash-and-burn agriculture (photograph by Jim Barborak)



The pine forests in the mountains of Guajiquiro, characterized by their diversity, are of worldwide importance for reforestation and genetic improvement (photo by Jim Barborak)

- Make environmental impact assessments of all development projects mandatory, to include an analysis of the effect on wildlands and wildlife.

## ENVIRONMENTAL POLLUTION

As in many countries of the world, the population of Honduras has established and expanded communities and industries on the basis of water resources and soil productivity. However, these and other basic natural resources have become contaminated with domestic and industrial residues. The natural resources are also contaminated with dangerous quantities of agrochemical products. In some areas of Honduras, the level of environmental contamination presents serious hazards to human health and to the structure and function of ecosystems.

### Water Pollution

Honduras has been preoccupied with meeting water needs for human consumption and for industrial and agricultural activities, without regard for quality or previous treatment. Disposal of residues and waste waters has not been of much concern to the government or the population. As a result, many water sources—surface, underground, and atmospheric—are highly contaminated.

The most affected waters are the rivers that run through the largest cities, given that the waste waters discharge directly into the rivers without any treatment. In the port cities, sewage runs directly into the marshes, bays, and seas, with unknown effects on public health and marine resources.

Heavy consumption has diminished river flow. As a result, concentration of contaminants is increased and the capacity for dilution is decreased. In some cases, the rivers do not run in the summer and only stagnant pools remain in their channels.

There are also cases of contamination of surface and subterranean waters by minerals and toxic substances associated with mine exploitation. One example is Lake Yojoa, which is contaminated with heavy metals.

### Air Pollution

Forest fires and indiscriminate agricultural burning in the dry seasons are the principal causes of air pollution in Honduras. In spite of legislation prohibiting the emission of noxious particles, in practice there is no control of urban industries, heavy machinery, or smoke and noise from vehicles. In addition, the gasoline contains lead. No studies have been made to determine its hazard, which is well documented in more industrialized countries.

Although no quantitative data are available, empirical evidence exists that the air quality has been deteriorating. Acute respiratory infections, aggravated in part by air pollution, occupy first place among the causes of morbidity by transmittable diseases.

### Contamination of Soils

Soil contamination in Honduras results from pesticides and fertilizers in the agricultural areas, mining, oil residues, and contaminants from industrial zones and rural and urban communities.

The pollution of agricultural soils has not been studied seriously. The scientific capacity to conduct these kinds of studies in Honduras is gradually developing. Until the early 1970s, the use of agrochemicals was limited mainly to banana and cotton plantations. Since then, the producers and distributors of agricultural products have intensified the commercial promotion of pesticides and fertilizers. At the same time, the government initiated agricultural extension programs for farmers that included the promotion of pesticides and fertilizers. Nevertheless, no effort has been made to inform the users about the risks of chemical substances and the best way to handle them. The dilutions and measures are not exact, and the products are often mixed without precaution. There is a great need for nonformal education programs on the use and appropriate handling of agrochemicals.

Pesticide use in Honduras has been similar to that in other countries in Central America. Before

1981, organochlorides were used almost exclusively; there is now increased use of organophosphates, which have more rapid biodegradation but are highly toxic.

Although there are no published data to this effect, the soils surrounding mining areas are most likely contaminated with heavy metals, since no adequate controls exist for the disposition of mining residues. The soils from the municipality of Las Vegas, for example, where the El Mochito mine is located, are cultivated with grains, fruit trees, and vegetables. There is a latent danger of contamination by absorption of heavy metals from the soil.

The administration of solid waste services in the country is independently assigned to a number of municipalities. The average service coverage is 60 percent of the urban zones and almost zero in the rural zones. Municipal trucks deposit refuse material in public disposal areas; these, although more appropriately located than in the past, are often not carefully selected in small cities. In large cities, the objective is to locate the disposal areas in sites where drainage patterns and the subsoil appear to be adequate for sanitary landfills, following Pan American Health Organization (PAHO) standards. These landfills cannot be considered sanitary, however, as all kinds of materials are deposited in these sites without monitoring toxic chemicals, viruses, bacteria, or heavy metal content.

## Institutional Aspects

The Honduran constitution sets forth the obligation of the state to provide citizens with a healthy environment. Specifically, concerning the disposal of wastes and refuse, laws and regulations define the duties of government institutions and municipalities, but these laws fail to constitute a clear and consistent policy to guide the use of allocated resources. Each institution sets its own objectives and plans independently, and activities overlap in many cases. As a result, the efficient use of the few resources destined to protect and preserve the environment is limited.

## Recommendations

Although the observations are mainly qualitative, they indicate likely dangers of pollution to waters, soils, air, domestic and wild animals, and humans. The paucity of data and scientific research makes it difficult to assess the magnitude of environmental pollution in Honduras.

For these reasons, the following recommendations are considered priorities in dealing with environmental pollution in the country:

- Implement a system of monitoring, analysis, and evaluation of the principal parameters of environmental quality. This recommendation does not necessarily imply advanced and expensive technology; appropriate technology systems and simple laboratory methods can provide sufficient data to formulate guidelines, limits, and policies. Monitoring should be based on ecological systems rather than on the traditional sectors assigned the different natural resources;
- Promote scientific research through support for programs of the Center for the Study of Contaminant Control (CESCCO), SANAA, and UNAH;
- Improve the human technical, scientific, and professional resources through in-service training in the short term, and advanced education programs in the long term;
- Improve the capacity of decision makers to formulate and implement policies of environmental quality; this effort requires yet another level of information and education;
- Strengthen the coordination and collaboration of institutions, including the private sector as much as possible, in improving environmental quality; and
- Invest government, international technical assistance, and private sector funds in water treatment plants, considering the upper Choluteca River a priority since it supplies Tegucigalpa and is the proposed site for a large irrigation project.

## ENVIRONMENTAL EDUCATION

The achievements in environmental education during 1970-1980 have been among the most significant in mitigating the ecological quandary facing Honduras. Numerous institutions are involved, both government and private, that enjoy strong support from conservation organizations and international development agencies such as USAID, CIDA, WWF, and IUCN.

Honduras, however, has relatively scarce human resources qualified for teaching environmental sciences. This lack of resources is evident in the curricula of different education programs, from primary school to the higher levels.

In 1986 the Secretary of Education signed an agreement of cooperation with COHDEFOR to include public schools and middle-level institutions in community programs for tree nurseries, reforestation, and environmental improvement. Included in the agreement is training in environmental education for teachers and students of some primary and secondary schools.

RENARE, COHDEFOR, and ESNACIFOR give conferences, seminars, and talks to interested groups. The Department of Biology of the UNAH carries out activities on environmental education in different areas of the country, in primary and secondary schools and in higher-level institutions. The Department of Biology has also conducted conferences, workshops with teachers, radio programs, shows, and talks for groups and communities requesting them. The Directorate of Scientific Research of UNAH has promoted environmental education through research and scientific publications and extension talks on ecological studies and other environmental topics.

The most active and influential NGO in environmental education, since its founding in 1979, has been the AHE. It has developed videotapes on conservation themes; directed workshops, seminars, and talks in schools and for organized groups; published and distributed magazines, bulletins, and manuals; and participated in the planning and

management of protected areas and in the protection of wildlands and wildlife.

The U.S. Peace Corps is another organization with strong environmental credentials. It has trained volunteers in natural sciences, health, and education to work in environmental awareness activities. The volunteers have developed manuals of environmental education and have trained teachers in environmental education in a number of localities.

The main government institutions involved in environmental education are the Secretary of Public Education, the Secretary of Natural Resources, the Secretary of Public Health, COHDEFOR, UNAH, ESNACIFOR, and the Teachers College. In all of these institutions, however, there are significant barriers to the effective and systematic development of environmental education. These barriers relate to constraints on budget and personnel.

An area meriting attention is evaluation of the efficacy of the different actions attempted to change the attitudes of people; without this monitoring task, ineffective efforts may remain in place. It would also be useful to strengthen the coordination among the various institutions, adopting and modifying the model of the agreement SEP-COHDEFOR. The First Meeting of Environmental Education, conducted in 1989 under the same USAID/DESFIL contract that helped fund the *Honduras Environmental Profile 1989*, was an important first step in achieving this coordination.

## Recommendations

- Define a common policy and strategy for the organizations interested in environmental education and training in environmental sciences;
- Strengthen the training of teachers and social workers at the local and national level, using formal and informal programs and projects on environmental education;
- Incorporate within the programs and projects actions to increase the awareness of military and civil authorities so that they will participate; and

- Improve the access of teachers and the general public to protected areas and national parks, so people will learn firsthand the value and importance of these areas.

## INSTITUTIONAL AND LEGAL FRAMEWORK

The judicial framework to protect the environment includes general and absolute norms that are part of the judicial order system. Examples of these norms are the constitution, the codes and laws, treaties and other international agreements, regulations and other similar orderings, and technical norms.

The newer guiding principles in environmental laws are based on the idea that protecting the environment is a duty of the state and of the people. All people have a right to a healthy environment, and the state and all citizens have a duty to promote environmentally sound development.

The Honduran constitution, revised in 1982, notes in the articles pertinent to the protection of natural resources, urban space, health, work, education, and culture basic principles and precepts that all secondary laws must respect. Consequently, the constitution allows the intervention of the state to protect those resources and the environment in general. In this way, the constitutional text not only arbitrates the protective function of the state over human health but also articulates judicial behaviors, such as the rational utilization of natural resources and the prevention of environmental degradation.

Yet no true judicial framework exists specifically to control the use, protection, and conservation of the environment or the degradation caused by destruction and pollution. An analysis of the environmental laws also shows great dispersion in a number of laws, decrees, ordinances, and regulations, as well as in public and private institutions specifically involved in this field.

Approximately 37 laws and 420 articles contain environmental guidelines. These are without uniform criteria and do not consider the global and suprasectorial character of the problems. To over-

come this situation, SECPLAN presented to the National Congress in 1988 a law project titled General Law of the Environment. The objective was to promote the ordering of the territory under ecological criteria and to create an appropriate administrative structure. Other government institutions have also presented to Congress similar instruments. These laws indicate the need for increased coordination and collaboration among government institutions representing the different sectors of society that are concerned about the increasing deterioration of the Honduran environment.

Because of the diversity of laws pertaining to the environment, there is considerable disparity in the application of judicial principles and institutional competence. This disparity further promotes intersectorial and interinstitutional conflicts.

## Recommendations

- Adopt a system of coordination to ensure the active participation of concerned institutions; resolve conceptual conflicts and those of assignment of functions; reduce interinstitutional competition; and improve the stability of technical personnel, avoiding the continuous rotations that influence the efficacy and quality of the work;
- Support the formation and training of a group of environmental lawyers to ensure the application of existing laws and promote the development of an appropriate judicial framework;
- Reinforce the actions needed for the approval of the General Law of the Environment in Honduras, taking into account the financial and human resources needed to apply the law in its totality; and
- Create a special technical unit in each appropriate institution, with personnel trained in environmental sciences, to ensure that environmental concerns, relevant discussion, and the rational management of natural resources are incorporated as institutional functions.

## List of Acronyms

ACDI	Agriculture Cooperative Development International
AHE	Honduran Ecological Association
CATIE	Tropical Agricultural Research and Training Center
CENIFA	National Center of Applied Forest Research
CESSCO	Center for the Study of Contaminant Control
CIDA	Canadian International Development Agency
CITES	Convention on International Trade in Endangered Species of Wild Flora and Fauna
CODDEFFAGOLF	Committee for the Defense and Development of the Flora and Fauna of the Gulf of Fonseca
COHDEFOR	Honduran Forestry Development Corporation
CONAMICH	National Commission of Integrated Watershed Management
DEC	Executive Office of Land Registry
DESFIL	Development Strategies for Fragile Lands Project
DRH	Water Resources Division
ENEE	National Electric Energy Company
ESNACIFOR	National School of Forest Sciences
FAO	Food and Agriculture Organization of the United Nations
INA	National Agrarian Institute
IUCN	International Union for the Conservation of Nature and Natural Resources
NGO	Nongovernmental Organization
PAHO	Pan American Health Organization
PRMC	Regional Watershed Management Project
PRODESBA	Integrated Rural Development Program of the Department of Santa Bárbara
RENARE	General Directorate of Natural Renewable Resources
SANAA	National Autonomous Service of Aqueducts and Sewers
SECPLAN	Secretariat of Planning, Coordination and Budget
SEP	Secretariat of Public Education
SRN	Secretariat of Natural Resources
SSP	Secretariat of Public Health
ST	Secretariat of Transportation
UNAH	National Autonomous University of Honduras
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
USAID	United States Agency for International Development
WWF	World Wildlife Fund

## References

Censo Nacional Agropecuario. 1974.

Daugherty, Howard E., ed. 1989. *Perfil Ambiental de Honduras 1989*. Washington D.C.: DESFIL.

Dickinson, J.C., III, ed. 1982. *Honduras: Perfil Ambiental del País, Estudio de Campo*. McLean, Virginia: JRB Associates (AID/SOD/PDC-C-0247), 201 pp.

Encuesta Nacional de Epidemiología y Salud Familiar (ENESF). 1989. Resultados de la encuesta proporcionados por ASHONPLANFA.

Guevara Moran, J. A. et al. 1985. *Perfil Ambiental de El Salvador*. San Salvador: EMTECSA.

Holdridge, L.R. 1962. *Mapa Ecológico de Honduras*. Tropical Science Center, San José, Costa Rica.

Leonard, H.J. 1987. *Recursos Naturales y Desarrollo Económico en Centro América*. San José: CATIE. (Also: *Natural Resources and Economic Development in Central America: A Regional Economic Profile*). International Institute for Environment and Development. New Brunswick: Transaction Books.

Salgado, Ramón. 1988. *Honduras: Estado y Sector Agrícola* (Preliminary Version). Department of Social Sciences, UNAH, Tegucigalpa.

Secretaría de Planificación, Coordinación y Presupuesto, 1988. *Gestión Ambiental en Honduras*. DGPT. Tegucigalpa, Honduras.