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# **AGRICULTURAL POLICY ANALYSIS PROJECT, PHASE II**

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## **EL SALVADOR NATURAL RESOURCE POLICY INVENTORY USAID/ROCAP RENARM PROJECT**

**VOLUME I**

**SYNTHESIS**

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**The views expressed in this report are those of the authors. They do not necessarily  
reflect the views of U.S.A.I.D. or the Government of El Salvador.**

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NATURAL RESOURCE POLICY INVENTORY  
EL SALVADOR

CONTENTS

VOLUME I - SYNTHESIS

|  | Page No. |
|--|----------|
| 1. INTRODUCTION                                      | 1        |
| 2. SUSTAINABLE AGRICULTURE                           | 5        |
| 2.1 Problems   | 5        |
| 2.2 Policies   | 6        |
| 2.2.1 Macroeconomic Policies                         | 6        |
| 2.2.2 Sectoral Policies                              | 7        |
| 2.2.3 Land Tenure                                    | 8        |
| 2.2.4 Research                                       | 8        |
| 2.2.5 Extension                                      | 9        |
| 2.2.6 Irrigation                                     | 9        |
| 2.2.7 Pesticide Management                           | 10       |
| 2.3 Potential Policy Alternatives                    | 10       |
| 2.4 Recommendations For Future Research and Analysis | 11       |
| 3. FORESTRY  | 12       |
| 3.1 Problems   | 12       |
| 3.2 Policies   | 12       |
| 3.2.1 Education                                      | 12       |
| 3.2.2 Forestry Laws and Regulations                  | 13       |
| 3.2.3 Lack of Alternative Sources of Energy          | 13       |
| 3.2.4 Research                                       | 13       |
| 3.2.5 Lack of Incentives                             | 14       |
| 3.3 Potential Policy Alternatives                    | 14       |
| 3.4 Recommendations For Future Research and Analysis | 14       |

|           |  |           |
|-----------|--|-----------|
| <b>4.</b> | <b>WILDLANDS AND BIODIVERSITY</b>                    | <b>16</b> |
|           | 4.1 Problems   | 16        |
|           | 4.2 Policies   | 17        |
|           | 4.2.1 The CITES Convention                           | 17        |
|           | 4.2.2 Budget Procedures                              | 18        |
|           | 4.2.3 CENDEPESCA's Regulations                       | 18        |
|           | 4.2.4 National Parks and Reserves                    | 18        |
|           | 4.2.5 Agrarian Reform                                | 18        |
|           | 4.2.6 Management Policy                              | 19        |
|           | 4.2.7 Lack of Incentives                             | 19        |
|           | 4.2.8 Regulation Lacunae                             | 19        |
|           | 4.3 Potential Policy Alternatives                    | 20        |
|           | 4.4 Recommendations for Future Research and Analysis | 21        |
| <br>      |  |           |
| <b>5.</b> | <b>WATERSHED MANAGEMENT</b>                          | <b>22</b> |
|           | 5.1 Problems   | 22        |
|           | 5.2 Policies   | 23        |
|           | 5.2.1 International Agreements                       | 23        |
|           | 5.2.2 Water Laws and Regulations                     | 24        |
|           | 5.2.3 Lack of Integrated Watershed Management        | 25        |
|           | 5.2.4 National Irrigation Policy                     | 25        |
|           | 5.2.5 Fisheries Regulations                          | 26        |
|           | 5.2.6 Lack of Policies to Regulate the Coastal Zones | 26        |
|           | 5.3 Potential Policy Alternatives                    | 27        |
|           | 5.4 Recommendations For Future Research and Analysis | 27        |
| <br>      |  |           |
| <b>6.</b> | <b>CROSS CUTTING ISSUES</b>                          | <b>29</b> |
|           | 6.1 Problems   | 29        |
|           | 6.2 Potential Policy Alternatives                    | 30        |
|           | 6.3 Recommendations For Future Research and Analysis | 30        |

## 1. INTRODUCTION

The purpose of a natural resource policy inventory is to examine the wide range of policies and institutions affecting resource use decisions. The four problem areas defined in the USAID Central American Natural Resource and Environmental Strategy<sup>1</sup> served as the basis for organizing the natural resource issues in El Salvador. The areas are sustainable agriculture, forestry, wildlands and biodiversity, and watershed management.

Issues were identified within each of the four major themes. The issues for sustainable agriculture were land use, fertility, land tenure, and pesticide management. The issues for forestry were deforestation, alternative use of forest products, reforestation, and forest management. The issues for wildlands and biodiversity were protection of endangered species, biodiversity, park and reserve management, and ecotourism. The issues for watershed management were watershed management itself, water use, water management, water quality, coastal zone management, and fisheries.

Issues that were common to all or several of the major themes included the combined effect of high population density and low levels of education and income, the armed conflict, budgetary constraints, policy lacunae, failure to implement policies, overlapping institutional jurisdiction, and policy conflicts.

A policy inventory has four major components:

1. Identification of policies and regulations of both public and private institutions at regional, macroeconomic, sector and sub-sector levels that affect the natural resource base;
2. Identification of the public and private institutions that make or implement the respective policies and regulations;
3. A preliminary qualitative assessment of the impact of these policies and regulations on each natural resource; and
4. Identification of the main policy alternatives and factors affecting possible policy reform.

Natural resource depletion in El Salvador is largely the result of inappropriate policies, in addition to population pressure and poor management. The present armed conflict has contributed to the problem, but it is not the major cause of environmental degradation. In economic terms, private costs have been less than social costs. Policies need to be adopted to equate private and social costs.

An environmental consciousness should be developed about virtually every policy decision. Too much attention has been focused on development

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<sup>1</sup>Agency for International Development/Bureau for Latin American And the Caribbean, Environmental and Natural Resource Management in Central America: A Strategy for A.I.D. Assistance.

efforts without careful consideration for the environment. Development and environmental preservation are not mutually exclusive. This report is based on the belief that it is feasible to have environmentally sound development, and that many policies can be tied to environmentally sound practices. This policy inventory describes El Salvador's policy environment as a basis for recommending actions, measures, and research ideas that will induce the population to better utilize its natural resource endowment.

Similar studies have been conducted in Guatemala, Honduras, and Belize. Others will be done in Costa Rica, Panamá, and Nicaragua, and one will be done for the entire region. It was not feasible to carry out an exhaustive inventory, given the limited time and resources. The work is thus limited to the major policies and institutions that contribute to natural resource use and management in the country.

The inventory is being financed by the USAID Regional Office for Central American Programs (ROCAP), in coordination with the local USAID mission. The scope and orientation of the work are under the guidance of USAID/San Salvador.

El Salvador has an estimated population of 5.2 million, with an annual growth rate of 1.3 percent in 1980-88.<sup>1</sup> With a total land area of 21,040 square kilometers, the country has the highest population density in the western hemisphere (approximately 246 inhabitants per square kilometer).<sup>2</sup>

Emigration to big cities is accelerating, as in most Latin American countries. About 1 million people live in San Salvador. In 1987, an estimated 44 percent of the total population resided in urban areas.<sup>3</sup>

During the last decade, infant mortality has fallen, the incidence of contagious diseases has declined, and life expectancy has risen. However, the rate of infant mortality due to malnutrition remains one of the highest in Latin America. According to UNICEF, child mortality in El Salvador is, on average, 70 per thousand, varying from 55 in urban areas to 81 in the rural sector.<sup>4</sup>

About 72 percent of the urban population but only 7.7 percent of the rural population has access to running water. Poor sanitary conditions prevail in the rural sector and in marginal areas due to the lack of sanitary services. Improvements in sanitation and public health are necessary to cover the primary

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<sup>1</sup> El Salvador: Country Economic Memorandum. The World Bank, August 14, 1989. The low growth rate of 1.3 percent is due to out migration.

<sup>2</sup> The last census was conducted in 1971.

<sup>3</sup> The World Bank, "World Development Report 1989." Washington, D.C.: The World Bank, 1989. p. 224.

<sup>4</sup> USAID/El Salvador, "El Salvador, Perfil Ambiental, Estudio de Campo." San Salvador, El Salvador: U.S.A.I.D. Contract No. 519-0167-C00-2039-00. Abril 1985.

causes of death, which are diarrhea and respiratory diseases.<sup>1</sup> A shortage of housing is a persistent problem in El Salvador. The earthquake of 1986 exacerbated this situation.

Current figures indicate deterioration in global productivity, increases in a macroeconomic imbalance, and a decline in domestic prices. The growth in GDP was estimated at 2.3 percent in 1989.

Inadequate investment in human resources has increased the difficulty of managing natural resources in El Salvador. Over 80 percent of all farmers were functionally illiterate in 1989.<sup>2</sup> In 1985, only 77 percent of children ages 7 to 15 received school services.<sup>3</sup>

Major economic policy reforms of the present Government include liberalization of trade and the exchange rate, privatization of the banking system, and lifting of price controls. Other measures include budget deficit reduction, control over growth in the money supply, and privatization of functions previously conducted by the Government but typically private business activities, such as coffee and sugar marketing. One of the export taxes on coffee was also eliminated. The Government's plan of action is outlined in the "Plan de Desarrollo Económico y Social 1989-1994."<sup>4</sup> Many of the planned policies have been adopted, but others were postponed.

El Salvador has the smallest percentage of original forest compared to territorial size of any Latin American country. The destruction of the natural resources in El Salvador has accelerated soil erosion. It is estimated that three-quarters of the national territory is exposed to severe erosion conditions and decreasing land productivity.<sup>5</sup>

Runoff during the rainy season has eroded mountains and hills throughout the country. This process is especially noticeable on the poor soils in the north,<sup>6</sup> a rocky and unproductive zone where a large part of the soil cover has vanished.

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<sup>1</sup>Ministry of Public Health and Social Assistance, "1989 Yearbook." San Salvador, El Salvador: Ministry of Public Health and Public Assistance, 1990.

<sup>2</sup>Samuel A. McReynolds, Thomas M. Johnston, Peter H. Gore and Joe D. Francis, "The 1989 El Salvador Agricultural Land Use and Land Tenure Study." Washington, D.C.: National Cooperative Business Center, November 1989. p. 1.

<sup>3</sup>Comisión Nacional de Población, "Política de Población." San Salvador, El Salvador: Comisión Nacional de Población, 1990. p. 5.

<sup>4</sup>Ministerio de Planificación y Coordinación del Desarrollo Económico y Social, *Plan de Desarrollo Económico y Social 1989-1994*. San Salvador, El Salvador: Ministerio de Planificación y Coordinación del Desarrollo Económico y Social, 1989.

<sup>5</sup>Manuel Benítez, "Estrategias para el Desarrollo Ecológico Nacional de El Salvador". Centro de Investigación Tecnológicas y Científicas, San Salvador, Mayo 1989.

<sup>6</sup>USAID/El Salvador, "El Salvador, Perfil Ambiental, Estudio de Campo." San Salvador, El Salvador: U.S.A.I.D. Contract No. 519-0167-C00-2039-00. Abril 1985.

Another problem is the lack of potable water. Currently, the aquifer reserves of the country have problems due to the inadequate retention of rainwater, rapid runoff, and massive destruction of the vegetation.<sup>1</sup>

Population pressure and poor management are the main contributors to ecological degradation. El Salvador's limited natural resources are insufficient to support its growing population given present cultural practices. Half the people live in rural areas, owning or working small farms usually located on fragile soils.<sup>2</sup>

Several decrees, agreements, and treaties regarding natural resources have been approved in El Salvador. However, the lack of resources, diversity and fragmentation of the laws, and limited coordination among implementing institutions have created serious problems in implementation. A single natural resource such as water can be regulated by various laws and administered by several institutions, each with a legitimate interest in the resource.

In short, the ecological crisis in El Salvador is characterized by serious deforestation, accelerated erosion, contamination of water, and extinction of flora and fauna. These conditions have resulted in health problems engendered by pesticides, contaminated water, and declining prospects for sustained agricultural production. The lack of appropriate legislation and little environmental consciousness among Salvadorans contribute to the crisis. At the root of this environmental crisis are the policies that affect natural resources. It is often found that economic productivity and natural resource management are not associated by decision makers. Forested highlands contribute to greater rainfall, increasing the relative humidity. These factors increase river flows, which allows for irrigation in dry seasons, resulting in higher yields and greater crop diversity.

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<sup>1</sup> Ibid, p.4.

<sup>2</sup> USAID. Annex, Environmental and Natural Resource Management in El Salvador.

## 2. SUSTAINABLE AGRICULTURE

The issues in sustainable agriculture are land use, soil fertility, land tenure, and pesticide management.

### 2.1 Problems

El Salvador's problems in sustainable agriculture include the following:

- o The soils are highly eroded and degraded.
- o Forty-six percent of the land area is cultivated at a level above its land capability class, with inappropriate crops and cropping patterns for soil and slope.
- o Thirty percent of the land area is underutilized. Higher yielding crops could be planted in flat, fertile soils. Much land that could be farmed intensively is instead devoted to pasture. Livestock production is done with land extensive methods. A total of 62.5 percent of the irrigated area is under pasture.
- o Some soils are degraded due to the use of inappropriate chemicals, such as extensive use of ammonium sulphate in cotton producing areas.
- o The population density is high at about 246 persons per square kilometer.
- o The extension service does too little for soil conservation. Only 6.5 percent of farmers received technical assistance in 1988.
- o There is no land use planning.
- o Chemical and biological concerns are seldom considered in soil management practices.
- o Nearly 50 percent of farmers have no formal education, and over 80 percent are functionally illiterate.
- o Agricultural output has been declining due to reductions in area cultivated and in productivity. Coffee and cotton are two of the crops most affected.
- o Investments in agriculture have declined during the past decade.
- o Land distribution is highly skewed, forcing farmers to plant

farmers to plant tillage-intensive crops on the hillsides.

- o Farmers have very high arrears, reaching unmanageable levels.
- o Some land owners are insecure about keeping their land.
- o Some beneficiaries of agrarian reform have received land unsuitable for intensive agriculture.
- o Land markets are inefficient, and many farmers lack land titles. The process of obtaining a title is too long and complicated.
- o Many pesticide poisonings are reported in public hospitals.
- o Sporadic testing of limited survey samples have found residues exceeding allowable limits in water, soil, beef, oils, fruits, vegetables, and human tissue.
- o Pesticides are commonly overused and applied at inappropriate times. Safety precautions are disregarded and alternative methods of pest control are little known.
- o Pesticide labeling is inadequate for El Salvador's farmer population.
- o Integrated pest management practices are used on a very limited basis.

## **2.2 Policies**

The major policy categories affecting sustainable agriculture are macroeconomic, sectoral (education, agricultural marketing, and credit) land tenure, research, extension, irrigation, and pesticide management.

### **2.2.1 Macroeconomic Policies**

The main macroeconomic policies affecting sustainable agriculture are the following:

- o **Foreign exchange policy.** Overvaluation of the colón during the past 10 years has been the most negative economic policy affecting sustainable agriculture. This policy implicitly subsidized imported products and implicitly taxed export products. An overvalued colón meant a lower price for the producer of exported goods, and a lower price for locally consumed agricultural products. Imports entered at a relatively lower price, depressing local prices. The present Government has revised this policy.

- o Export taxes. A few commodities have had export taxes. Coffee was especially affected by a coffee export tax of 30 percent of the export price above \$45.00 plus a fixed fee of \$6.45 per quintal. The present Government eliminated the \$6.45, but the 30 percent tax is still a heavy burden on producers faced with low international prices.

### 2.2.2 Sectoral Policies

The most significant sectoral policies affecting sustainable agriculture are education, marketing, agricultural credit, and development of the non-agricultural sectors.

- o Education. The high illiteracy rate is an indicator of the country's education policy. A high illiteracy rate makes extension training more difficult. Without assistance, it is difficult for untrained farmers to adopt the modern agricultural techniques needed to maintain soil productivity and to produce competitively.

Inadequate education is also a problem for agricultural professionals in the country. Most professionals are trained at the mid-level (agronomist or "Perito Agrónomo"). They have learned crop production by the formula method and are not well enough trained in soil fertility to manage crop technologies in different settings.

Attempts have been made to introduce natural resource awareness to school curricula, but resources have not been allocated to train teachers or provide texts and audiovisual equipment.

- o Agricultural Marketing. The policy of centralization of agricultural marketing for certain products, such as coffee, sugar, and cotton, in addition to price controls on other products, has magnified the negative impact of the macroeconomic policies, resulting in lower farm prices. Investments in the agriculture sector were reduced, and farmers were unable to repay their loans. These factors weakened investment in soil fertility maintenance, proper pruning of coffee trees, and other conservation practices.
- o Agricultural Credit. To increase agricultural production, credit was made available to farmers in an unfavorable macroeconomic environment, resulting in low prices that translated into low returns on investment. As a result, farmers were unable to repay their debt. Present circumstances require a tight money supply, which in a highly mortgaged farm sector translates into less credit for agriculture. Without credit, the level of investment is reduced. Farms deteriorate, negatively affecting

agriculture's sustainability.

- o Development of the non-agricultural sector. With such a high population density, the country needs to create jobs in sectors other than agriculture to reduce population pressure on the land. El Salvador has lagged behind other Caribbean Basin Initiative countries in creating favorable conditions for industrial free-port zones. Its incentives for foreign investment have been inferior to those provided by neighbors like Guatemala and Costa Rica. One alternative means of reducing population pressure is to provide attractive jobs in the cities to accelerate rural to urban migration.

### 2.2.3 Land Tenure

The major land tenure policies affecting sustainable agriculture are the set of decrees regulating the agrarian reform of 1980 and the land titling procedures.

- o The agrarian reform of 1980. The agrarian reform process started in 1980. Farms larger than 500 has. were expropriated and assigned to agricultural co-ops, formed for this purpose. Land renters of less than 7 has. were also given the opportunity to buy land they were renting. Landowners of 245 to 500 has. had the option of selling their land.

A large proportion of the population still lives in the rural areas where nearly every family demands a piece of land. This puts pressure on the available land, leading to such practices as the farming of steep erodible soils.

Lack of ownership, which is caused by several factors, has contributed to low levels of investments. The Government has been slow to assign land titles. Organization into cooperatives deprives farmers of a sense of ownership. Their large debt makes them feel they have no stake in the farm. Fearful of losing their lot, many farmers are reluctant to invest in production methods and soil amendments that could make their farming sustainable.

- o Land titling procedures. A significant backlog in land title registration is due to archaic procedures. The backlog constrains efficient operation of the land market. Loan processing slows down as the difficulty of registering an unclear land title is added to the normal burdens of credit procedures.

### 2.2.4 Research

The major problem of agricultural research has been a lack of adequate resources, including the personnel and operating budget associated with the institutional setting of research organizations.

- o Institutional setting. The prevailing policy has been to conduct research in public institutions. Research has been very limited due to inadequate funding and shortages of qualified personnel and equipment. Scientific knowledge is insufficient about sustainable crop production practices for different areas in the country. It is difficult to apply appropriate agricultural practices without such knowledge.

Very little research on pesticide management has been conducted. Little is known of alternative integrated pest management practices for different crops grown in various soil and weather conditions.

There is some indication that the Government intends to promote the privatization of research activities. This could provide a solution to some of the past problems of research.

#### 2.2.5 Extension

The three basic issues in the extension services are limited scope of service, lack of adequate resources, and inadequate personnel training.

- o Scope of the services. Besides having insufficient research results to apply, the extension service has been investing its limited resources in too wide an array of activities. The result has been a decline in adoption of high technology. The use of hybrid corn seed has dropped from 70 percent to 60 percent this year. The proposed new policy of concentrating extension activities in agriculture is much more sensible.
- o Lack of adequate resources. Extension agents lack adequate vehicles and gasoline to perform their job. The number of extension agents needs to be reduced; an adequately equipped smaller group could probably do a better job.
- o Personnel training. Extension service personnel need to be trained in sustainable production practices, so they can transmit them to the farmers.

#### 2.2.6 Irrigation

The major irrigation policies affecting sustainable agriculture are irrigation management and water prices.

- o Irrigation management. Irrigation is managed by several different types of organization in El Salvador. Some districts are private, while some systems are managed by the public sector. The current problems lead to poor returns on irrigation investment, as well as soil erosion due to poor management, both of which detract from sustainable agriculture. Irrigated land could be producing more, and

erosion could be reduced with proper management.

- o Water prices. The underutilization of irrigated areas and deterioration of irrigation systems is due partly to the low prices charged for water. Insufficient revenues are collected to adequately maintain existing systems. Another effect of paying so little is that farmers are not concerned about water conservation. Under this scenario, the returns to irrigation become irrelevant.

### 2.2.7 Pesticide Management

Two main components of government policy that relate to pesticide management are the legal framework and the enforcing institution.

- o Legal Framework. Several laws regulate pesticide use and commerce. They require registration of pesticides every three years. However, no set of defined standards is available in El Salvador. A project of the International Code of Conduct for the Distribution and Use of Pesticides aims to establish standards, however.
- o Institutional setting. The Directorate of Agricultural Defense is in charge of implementing the laws and regulations on pesticide use. However, it lacks the budget to apply adequate controls, the resources to conduct the necessary tests, and the right policies to obtain the resources.

### 2.3 Potential Policy Alternatives

Several policy alternatives are recommended to create an environment conducive to sustainable agriculture. The most important ones are listed here:

- o Continue applying the economic adjustment package of the present Government.
- o Eliminate coffee export taxes.
- o Review credit policies to make access easier for agricultural investment.
- o Invest more resources in education at the rural level. Review education policies. In addition to improving the literacy rate, incorporate environmental education into the curriculum.
- o Approve the proposed soils law.
- o Make credit available for IPM practices along with pesticide purchases.

- o When pesticide use is required, made available resources for the purchase of adequate handling equipment in the loan program.
- o Include in every agricultural project a training module on safe pesticide use and alternative pest management techniques.
- o Improve pesticide labeling requirements so an illiterate person can understand safe application.

#### 2.4 Recommendations for Future Research and Analysis

- o Study alternative ways to finance the country's agricultural research needs. Research is the key to expanding the production possibility frontier.
- o Study alternative ways to make the extension service more effective.
- o Study the financing system for agriculture to determine alternatives for increasing credit access for agricultural production.
- o Study the possibility of a land tax.
- o Study the agrarian reform structure. Its economic and social objectives should be reviewed to determine alternatives.
- o Study alternative mechanisms involved in the process of land title transfer to reduce complicated and slow procedures.
- o Study ways to modify the research policy to conduct more IPM research. Focus on extension where technologies exist and on research where it is needed. Research should be adaptive in nature and designed, developed, and implemented with the participation of extension agents and growers.

### **3. FORESTRY**

The issues in forestry are deforestation, alternative uses of wood, reforestation, and forest management.

#### **3.1 Problems**

- o Population pressure has contributed to the rapid depletion of natural forests in El Salvador. This deforestation took place to satisfy alternative needs for wood (mainly energy), but most significantly, to make room for agricultural production.**
- o El Salvador is the nation of continental tropical America that is most depleted of forest resources. Less than 12 percent of its territory is covered with forest.**
- o As much as 50 percent of the pine forests have been degraded to a point that makes it difficult to classify them as forests.**
- o Forest resources are very little understood in El Salvador. Even though the forest areas are small, the forest resources are rich in variety of species. Reforestation programs have been very limited, and forest resource management does not utilize modern techniques.**
- o Fine quality hardwoods are growing scarce.**
- o Less than 50 percent of the trees planted in reforestation programs have survived.**
- o Objective research in forestry has not been conducted.**

#### **3.2 Policies**

The major policy areas affecting forest resources are education, agricultural development, forestry laws and regulations, lack of alternative sources of energy, research, and lack of incentives.

##### **3.2.1 Education**

Education programs often do not cover environmental issues. Thus, the population does not understand the interactions of forestry with water production and the ecological balance of the entire eco-system. Forestry has been considered an obstacle to the expansion of agricultural areas rather than a valuable resource, complementary to agriculture.

### **3.2.2 Forestry Laws and Regulations**

Several decrees comprise the set of laws and regulations on forestry.

- o Decree 268 of February 8, 1973, the key Forestry Law, is outdated. A regulation has never been written. It designates the Forestry Service at the CENREN of MAG as the implementing institution. However, after MAG was regionalized, jurisdictional problems arose. The thrust of the law should be changed from sanctions to incentives. The law was modified by Decree 458 of October 23, 1973 to exclude the cutting or pruning of coffee trees and their shade trees from the regulations established by the Forestry Law.
- o Decree 418 of July 24, 1986 establishes a stumpage fee of 2.50 colones per tree in forests in saline water. Decree 14 of April 1, 1986 regulates the establishment of salt factories on coastal lands and the use of saline forests in aquaculture.
- o Decree 47 of May 23, 1974 establishes the Soil Protection Zone Chalatenango. Decree 53 of November 17, 1987 establishes the National Park Montecristo. Decree 59 of August 22, 1985 establishes a forestry ban on El Imposible forest. Decree 20 of June 6, 1989 establishes the National Park El Imposible. Decree 124 of June 1, 1984 establishes the Regional Park Bosque de los Péricos.

### **3.2.3 Lack of Alternative Sources of Energy**

Firewood continues to be a major source of energy for rural families and agro-industries. Electricity has not reached large areas of the country. The armed conflict has been a major obstacle to the expansion of the present electricity network. Considerable resources are spent replacing lines and equipment sabotaged by the FMLN. The growing population is consuming increasing amounts of energy, and firewood is the only alternative for many. This contributes to a high rate of deforestation. However, it also serves as an incentive to develop forest plantations. Reforestation using multiple-use trees is one focus of Project MADELEÑA.

### **3.2.4 Research**

Even though El Salvador has many tree species, little is known about their growth in different agro-climatic environments. The dearth of knowledge is a problem for reforestation projects. Neither cost and benefits nor return on investment can be estimated. One alternative is to extrapolate results from other countries, but this is a risky basis for investment alternatives, in addition to the other associated country and business risks. Heavy subsidies may be needed to counteract this risk.

### **3.2.5 Lack of Incentives**

- o Lack of credit is one disincentive. With the lack of knowledge described above, it is logical that the banking system is not going to assume a lending risk in this sector. Thus, no credit lines are available for reforestation.**
- o No subsidy or incentive programs encourage reforestation. Given the small forest area left in El Salvador, social benefits of reforestation are much greater than the private benefits. Thus, subsidies are needed to compensate for the high private costs associated with all the risks involved. Forests are critical to preserve the aquifers and the ecosystem balance which benefit the entire society, not just the investor who reforests.**

### **3.3 Potential Policy Alternatives**

- o Develop a National Environmental Policy, in which the interrelationship of all natural resources is clearly considered.**
- o Define a National Forestry Plan that is objective and practical and includes a description of the research needed to improve the quantity and quality of forests.**
- o Define reforestation for wood production, watershed management, recreation and other uses as a national priority at the highest levels of government.**
- o Establish appropriate long-term, low-interest credits to stimulate reforestation projects throughout the country.**
- o Complement the credit program with additional incentives, such as fiscal deductions and technical assistance, to ensure initial success.**

### **3.4 Recommendations for Future Research and Analysis**

- o Conduct a detailed economic study that quantifies the direct and indirect benefits of forests and forest products in El Salvador.**
- o Carefully study and monitor species growth and behavior in different, representative sites as a basis of production, and economic projections for such purposes as planning and providing credits.**
- o Carefully study the demand for wood and wood products for the national and international markets.**

- o Monitor and measure the role of forests in water production per unit area, in particular in the Salvadoran highlands.**
- o Carefully study financial models that have proved successful in promoting reforestation in other regions of the world and design an appropriate model for El Salvador.**

#### 4. WILDLANDS AND BIODIVERSITY

Four issues were identified in the theme of wildlands and biodiversity: protection of endangered species, biodiversity, park and reserve management, and ecotourism.

##### 4.1 Problems

- o Many neotropical terrestrial animals in Appendix 1 of the CITES convention, specially large vertebrates such as the jaguar and harpy eagle, are already extinct in El Salvador. Habitat destruction is the major cause of extinction in this country.
- o Due to the size of the country, wildland areas are relatively small. The five most important natural areas are El Imposible (5,000 has.), Montecristo (8,000 has.), Nancuchiname (1,200 has.), Barra de Santiago, (2,000 has.), and Los Volcanes (7,000 has.). Only four of these areas have park wardens.
- o The small size of parks and reserves makes it difficult to preserve large species of wild animals. Many animal and possibly plant species such as the jaguar, tapir, and harpy eagle could not be reintroduced even if given absolute protection.
- o There are no basic inventories of El Salvador's plants and animals, except for higher vertebrates and orchids.
- o Little research has been done on wildlife, and very little has been published on the country's biodiversity.
- o No studies provide the information needed to determine the endangered species and the measures required to recover or even protect existing populations. In fact, a basic inventory of native plants and animals in El Salvador has not been taken, except for higher vertebrates and orchids. The biodiversity of the country is rich in tree species. There are about 750 species of trees, 500 species of birds, 900 species of butterflies, and over 800 species of marine fish.
- o School curricula have no formal education programs on biodiversity or endangered species.
- o The sale of endangered species has reduced their population to very low levels. The list of extinct species is growing rapidly. The crocodile, the caiman, the scarlet macaw and the yellow-napped parrot are among the many species that have been reduced to dangerously low populations or even pushed to extinction in El Salvador. Scarlet macaws and wild cats, both

on Appendix 1 of the CITES convention, are still frequently sold on the streets of San Salvador.

- o Hunting and fishing are non-regulated activities.
- o In general, the population at large, both in the private sector and the government, have little awareness of the local biodiversity, nor its economic value and potential. This ignorance facilitates the rapid elimination of the areas in which most of the national biodiversity occurs.
- o In general, the lack of written references on Salvadoran biodiversity is a major obstacle to obtaining a basic knowledge and awareness of its dimensions and value.
- o Protection of natural areas as such is still regarded as competitive with, rather than complementary to, rural and urban development.
- o Ecotourism is very limited. None of the natural areas offer infrastructure for formal and open recreational services.
- o Neighbors of potential major national park sites have sensed a decline in protective measures, and pressures for hunting, fishing with pesticides, wood cutting and other illegal practices have risen sharply.

## **4.2 Policies**

The major policies are the International Convention for the Protection of Endangered Species of Flora and Fauna (CITES convention), budget procedures, CENDEPESCA's regulations, national parks and reserves, agrarian reform, management policy, lack of incentives, a policy void in ecotourism, and lacunae in regulations. The categories for which regulations are lacking include the commerce of wildlife, the management of national parks, and hunting and fishing.

### **4.2.1 The CITES Convention**

El Salvador ratified the CITES convention in 1987, achieving two goals in the process:

- o The role of El Salvador in international smuggling of wildlife was significantly reduced. Shipments of wildlife through the country to obtain Salvadoran status as a means of evading CITES regulations have declined.
- o Equally important, Salvadoran authorities finally obtained a tool to reduce pressure from external demand with its temptingly high prices and to control all shipments of wildlife entering or leaving the country.

#### **4.2.2 Budget Procedures**

This policy has two critical short falls: lack of budget control and low salaries.

- o The National Parks and Wildlife Service, The National Museum of Natural History, and the National Zoo share the problem of having no control over their own budgets. In fact, they do not even write their budgets. General formula prescriptions are undertaken at higher levels, which call for the same budget as the previous year's minus 5 percent and any vacant positions. This policy has reduced the resources of those institutions dangerously below the capacity to carry out minimal responsibilities.
- o Low salaries are a common problem that has reached critical proportions.

#### **4.2.3 CENDEPESCA's Regulations**

- o Resolution 265 of 1990 banned the fishing of dolphins, marine turtles, and lobsters with eggs or below 20 cms. in length. This is a step in the right direction to protect endangered species, if enforced.

The National Parks and Wildlife Service should adopt similar measures to protect endangered species, and define Appendix 3 of the CITES convention. However, enforcement capabilities are limited. It is doubtful whether CENDEPESCA has sufficient muscle to enforce Resolution 265.

#### **4.2.4 National Parks and Reserves**

Several decrees create national parks or reserves.

- o Decree 53 of November 17, 1987 establishes the National Park Montecristo.
- o Decree 20 of June 6, 1989 establishes the National Park El Imposible.
- o Decree 124 of June 1, 1984 establishes the Regional Park Bosque de Los Péricos.

#### **4.2.5 Agrarian Reform**

The agrarian reform of 1980 has been a positive influence affecting the parks and reserves program in El Salvador.

- o More than 19,000 hectares of El Salvador's 34,000 better natural forests were added to national reserves by Phase I. This included almost 50 percent of El Imposible, 80 percent of the San Diego dry forest, and 100 percent of Nancuchiname. In addition, about 5,000 additional hectares of natural areas have been identified since 1984, mostly as small and isolated patches of forest. Many of these have high conservation value as reserves, and all are being formally transferred to MAG for management as conservation areas.

#### 4.2.6 Management Policy

The private sector does not participate in current conservation plans. The implicit idea that areas with potential for conservation must be nationalized is motivating many landowners to "discreetly" alter and even eliminate remnants of natural forest on their land. With so many small areas, government supervision, to say nothing of government management, is quite unfeasible. An alternative plan is needed.

#### 4.2.7 Lack of Incentives

Given government technical and financial limitations, incentives should be provided to private landowners where these areas are located so they will continue to protect them in the national interest. Tax exemptions, technical assistance and other true incentives must be provided as alternatives to government management. Natural areas within agricultural areas provide many benefits. These benefits should be made clear to the landowners. It may be desirable to consider temporary subsidies for initial investments.

#### 4.2.8 Regulation Lacunae

- o The nation has no tourism strategy in which the role of nature and natural resources is clearly defined.
- o No laws or regulations cover the commerce of endangered species, hunting, fishing, or parks management. The lack of which limits the power of authorities to control activities that need regulation to be sustained.

The lack of regulations on the commerce of wildlife has led some municipalities, like San Salvador and La Libertad, to establish local controls over wildlife commerce in their jurisdiction. Without a national law or regulation, the Government lacks the legal instrument to regulate commerce. This is further complicated by the jurisdictional problem created with the decentralization of MAG. NPWS lacks personnel at the regional level to control wildlife commerce.

Hunters and fishermen would benefit from laws and regulations to establish hunting and fishing seasons according to the reproduction and growth

patterns of species. This would make the business or sport of hunting and fishing more sustainable.

- o No laws regulate the management of national parks and reserves. A proposed law for this purpose was drafted in 1980, but no further action was taken. This lack of regulation makes park and reserve management a difficult task. The role of the private sector in parks and reserves management needs to be defined. The private sector could probably manage many parks and reserves better.

#### **4.3 Potential Policy Alternatives**

- o Approve a law to protect and manage wildlife, including regulation of wildlife commerce, hunting, import and export, and protection and recovery of endangered species.
- o Define the CITES Appendix 3.<sup>1</sup>
- o Establish a mixed private enterprise/government administration for the Museum of Natural History.
- o Develop economically viable wildlife production programs for both artisan and commercial purposes.
- o Revise the publications policy, to make the information available more accessible to the entire population.
- o Establish a conservation policy as a national priority.
- o Transfer management of national parks and reserves to private foundations.
- o Alternatively, return administrative authority over parks and reserves to the National Parks and Wildlife Service, providing the necessary funds for basic support.
- o Design a system of incentives for private owners to create parks and reserves.
- o Approve a law for the management of national parks and reserves.
- o Use national parks as instruments of environmental education.

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<sup>1</sup>The CITES Appendix 3 includes plants and animals whose local populations (of a given country) are threatened, usually because of reduced habitat or excessive human pressure.

#### **4.4 Recommendations for Future Research and Analysis**

- o Study ways to organize research on life cycles and environmental requirements of native plants and animals with identified commercial potential and/or those in danger of extinction.**
- o Study ways to collect funds to finance activities for protecting endangered species.**
- o Develop a system to classify natural areas in El Salvador as a basis for conserving them.**
- o Study the economic and social returns of ecotourism in El Salvador.**

## **5. WATERSHED MANAGEMENT**

The country has 590 rivers and streams in a territory covered by 17 major watersheds, some of which are shared with neighboring countries. For management purposes, the country is divided into 10 hydrographic regions.

The major issues in this category are watershed management, water use, water management, water quality, coastal zone management, and fisheries.

### **5.1 Problems**

- o Desertification has already started in critical watersheds.**
- o Watersheds are not managed as units. Several institutions use watershed resources, but no one looks after the entire system.**
- o Management of water resources is inadequate, which results in unfair distribution among users, as well as waste and severe soil erosion.**
- o Water use is inefficient.**
- o Water quality is poor. Much of the country's superficial and underground water is contaminated. The main causes are as follows:**
  - Lack of treatment of domestic and industrial liquid wastes;**
  - Disposal of raw liquid wastes in streams and rivers;**
  - Inadequate controls in the use of chemical products such as fertilizers and pesticides;**
  - Lack of treatment of liquid and solid agro-industrial wastes;**
  - Disposal of raw liquid wastes coming from coffee, sugar cane, sisal, and kenaf mills, tanneries, and other sources;**
  - Urban solid waste disposal on inadequate sites. Runoff washes away the waste, which contaminates streams and rivers; and**
  - Contamination of underground water by percolation of superficial contaminated water from the sources mentioned above.**
- o Limnological studies carried out in El Salvador show that all**

lakes and lagoons are in accelerated eutrophication.

- o Gastrointestinal infections that could be prevented with cleaner water remain a leading cause of death throughout the country.
- o Coastal zones are being destroyed and contaminated.
- o Mangrove forests have been reduced to about 65 percent of their original size. Over 75 percent of remaining mangrove forests are highly deteriorated.
- o Very high turbidity indexes in the coastal water show high contamination and large amounts of fertile soil (up to 500 tons/has./year) carried by rivers into the sea.
- o Very high concentrations of coliforms (up to 1,000 coliforms/100 ml) have been reported at different Salvadoran beaches, mainly because raw municipal sewage effluents are discharged into the sea. The classic "Red Tide" with myriad algae that sweeps the Salvadoran coast from time to time also reveals organic contamination.
- o Pesticides have contaminated mangrove estuaries.
- o Fisheries are being over-exploited. The number of ships fishing shrimp exceeds that recommended for sustainable production.
- o The population of most fish species has dramatically declined, either through over-fishing, illegal trawling to catch shrimp, or failure to implement fishing regulations.
- o Mainland fisheries development is at an incipient stage.
- o Dynamite and poisonous substances are commonly used for fishing in continental waters.

## **5.2 Policies**

The major policy areas affecting watershed management are international agreements with neighboring countries on the management of common watersheds and the Gulf of Fonseca, water laws and regulations, lack of integrated watershed management, national irrigation policy, fisheries regulations, and lack of policies to regulate the coastal zones.

### **5.2.1 International Agreements**

International agreements are an area of utmost importance for the

country. El Salvador's major river, the Lempa, and some of its tributaries originate in Honduras. Other watersheds are shared with Guatemala. However, current treaties are very limited and offer little protection for El Salvador. The existing treaties are the following:

- o Water Limits with Guatemala of August 23 and 27, 1935;
- o The Treaty between El Salvador and Guatemala for Using the Lake Guija;
- o The Peace Treaty with Honduras of October 30, 1980; and
- o The agreement signed with CATIE on watershed protection. A Regional Committee on Watershed Protection, formed by the Central American Countries and CATIE, operates through bilateral agreements between CATIE and each country.

The treaty with Honduras is the most critical one, but it lacks a single reference about shared water use.

Special emphasis should be placed on the Gulf of Fonseca, shared by three countries, which has been in dispute for many years. Present negotiations in the international courts should include a management plan for the future, which would allow for sustainable use of the gulf and avoid future disputes.

#### **5.2.2 Water Laws and Regulations**

Many laws and regulations cover the use and management of water, a subject of numerous studies and seminars. The laws have been revised and analyzed. The review of the legislation revealed that legislation relevant for water management is fragmented. No single law incorporates the different aspects of water management, nor is there one to regulate and control water quality. One product of the analysis was a draft law on irrigation and drainage to be submitted to congress.

The most important existing laws are the following:

- o The Law on the Integrated Use of the Water Resources, Decree 886 of December 2, 1981, along with its Regulation, Decree 144 of March 23, 1982; and
- o Executive Decree 50 of October 16, 1987, which legislates water quality control of waste water disposal and protected zones. Its main purpose is to establish control, avoiding or reducing contamination of water resources.

No policy includes water quality control on irrigation projects. despite contamination levels that affect farmers' and technicians' health, as well as destroy crops and contaminate/erode soils.

Poor management by the private and public sectors results in poor water

quality, as well as misuse and waste of water resources. ANDA should play an essential role in addressing these problems and improving water management. Its pricing and management policies need special attention.

### **5.2.3 Lack of Integrated Watershed Management**

There is no integrated policy on watershed management. Several institutions use the resources of a particular watershed without a master plan on watershed management. ANDA, CEL, and MAG use water for human consumption, energy, and irrigation, respectively, without adequate coordination. No one manages the watershed as a unit.

### **5.2.4 National Irrigation Policy**

The present Government has redefined the national irrigation policy with the objective of promoting optimum use of the resource using appropriate irrigation technology. Also, the policy promotes the intensive and continuous use of irrigated areas to increase agricultural output.

- o The first objective of the irrigation policy is to rehabilitate and/or build appropriate irrigation infrastructure.
- o A second objective is to create the conditions that will allow the optimum use of water for agricultural purposes.
- o Other objectives include introducing irrigation in new areas and training professionals, technicians, and water users to create a culture of irrigated agriculture.
- o The policy seeks to strengthen and promote the organization of water users to achieve efficiency in the management and operation of the water infrastructure.
- o Government policy indicates that the construction of large irrigation infrastructure will continue to be a function of the public sector, shared with the private sector. The public sector will determine the priorities of future investments and absorb the pre-investment cost. Part of the total cost (debt) will be transferred to the users of the irrigation system. Construction will be done through contracts with the private sector.
- o The policy reveals a clear desire to privatize water management for irrigation. It proposes to transfer to the private sector irrigation district management within a three-year period. Likewise, it proposes minor participation in the management of new irrigation projects for a limited time. For large projects the Government will participate for three years, for medium projects, two years, and for small and micro

projects, one year.

#### **5.2.5 Fisheries Regulations**

The main fisheries regulations are the following:

- o The General Law of Fishery Activities, Decree 799, was approved on September 14, 1981. Because no regulation has yet been approved, discrepancies in interpretation and jurisdictional problems have occurred. MAG was decentralized after the law was approved. The law designates CENDEPESCA as the institution responsible. With decentralization, the regional offices were assigned responsibilities for supervising the region, which created a conflict between CENDEPESCA and the regional offices, complicating the application of the mandates of the law.
- o Resolution 265 of 1990 from CENDEPESCA bans the catching of dolphins, sea turtles, and lobsters with eggs or those smaller than 20 cms. in length.

#### **5.2.6 Lack of Policies to Regulate the Coastal Zones**

- o El Salvador does not have a coherent policy to control and protect its coastal zone, except for the Forestry Law, which includes mangroves among the forests to protect and develop. The law allows the cutting of timber from mangroves if a prior permit is issued by the Forestry and Fauna Service. The stumpage fee is 2.50 Colons a log.
- o No policy has been developed on urban recreation and tourism development for beaches and estuaries.
- o No national policy covers flood control at river outflows.
- o No regulation preserves and protects natural coastal habitats of marine wildlife or marine bird shelters.
- o No regulation controls coastal zone contamination from pesticides and fertilizers used for crops such as cotton, watermelon, and cantaloupe.
- o No policies have been developed to prevent or control oil spills or any other marine pollution.
- o No sanitation policies have been developed to prevent fecal contamination from thousands of recreational houses built along Salvadoran beaches. Only two out of four city-ports have operating municipal sewage treatment plants.
- o Sanitation policies have not been expanded to mandate the

proper treatment of industrial, municipal sewage effluent and geothermal CEL raw wastes disposal before discharge into the ocean.

- o No provisions exist to prevent oceanic disposal of radioactive and/or industrial toxic wastes from industrialized countries.

### **5.3 Potential Policy Alternatives**

- o Use the Central America Agreement for the Protection of the Environment to develop actions and programs to better manage watersheds that are part of more than one country.
- o Revise the treaties with Guatemala and Honduras to establish joint management practices for the watersheds and waterways common to more than one nation.
- o Design a policy on integrated watershed management.
- o Approve the proposed irrigation and drainage law.
- o Look at water use alternatives as a means of reaching the optimum level of use for the entire system rather than for individual sectors.
- o Design a policy to stimulate and regulate multiple uses of lakes created by hydroelectric dams.
- o Design a policy to conserve and protect superficial and underground water sources.
- o Develop a policy to protect and conserve water sources for human consumption.
- o Develop a policy on the control and use of rainwater in critical watersheds.
- o Develop a policy on the management of rainwater in urban areas to be integrated into watershed management. Uncontrolled drainage causes the largest alterations of natural watersheds.
- o Establish uniform water quality standards for the entire country.
- o Review the water quality testing policy and investment procedures to provide testing laboratories for the three regions of the country: West, Central and East.
- o Review the sanctions system to make it practical in application.

- o Review ANDA's water fees to include financing of municipal waste water treatment plants.
- o Review irrigation fees to include water quality and maintenance financing.
- o Issue a coastal zone protection policy for the country as soon as possible.
- o Define the research policies to determine actions needed to stimulate the recovery and preservation of the coastal zone.
- o Promote an ecological treaty with Honduras and Nicaragua to preserve and protect the Gulf of Fonseca coastal zone.
- o Adhere to international treaties prohibiting dumping radioactive or industrial toxic wastes into the country's territorial waters.
- o Reduce the number of fishing boat licenses.

#### 5.4 Recommendations for Future Research and Analysis

- o Study alternative organizational schemes to manage the major watersheds.
- o Study alternative methods of organization to assure adequate coordination among institutions using water for different purposes.
- o Study alternatives ways to centralize water quality control in a single unit.
- o Study policies on standards to systematically test water quality on rivers, lakes, lagoons, underground water, and the coastal zones.
- o Study funding alternatives for privatizing the technology generation and transfer functions of CENDEPESCA.
- o Study the potential for establishing a regionally supported coastal and marine research center.

## 6. CROSS CUTTING ISSUES

Issues common to all or several of the major themes include the effects of the war, a large population with widespread illiteracy and poverty, inadequate and centralized budgets, gaps between policy formulation and implementation, policy voids, overlaps in institutional jurisdiction, and conflicting policies.

### 6.1 Problems

Planning for the future is difficult in a country with a 10 year old war that makes survival the most pressing issue. People are afraid to invest given the eventuality of losing everything, including their own lives. Wide-scale destruction of roads, bridges, power stations, buses, cotton mills, factories, and other infrastructure continues. The Government itself has been forced to reduce investment in infrastructure, human development, and social programs. Confusion, opportunism, influence peddling, and abuse of authority are common problems in the midst of military conflict.

Proper management of natural resources is especially difficult in El Salvador, where the high population density puts heavy demands on natural resources, a problem aggravated by widespread poverty, high illiteracy and minimal awareness of environmental issues.

Inadequate and centralized budgets are an issue throughout the Government in El Salvador. In MAG, salaries comprise about 90 percent of the budget, and fuel, another 5 percent, leaving only about 5 percent for operations. The same situation occurs in every ministry and decentralized institution. Good technicians have left the Government and some have left the country due to low salaries. Thus, the supervision of pesticide use, water, water quality, fisheries, and other areas is inadequate due to lack of resources.

Another cross-cutting issue is the gap between policy formulation and implementation, a crucial problem in El Salvador. Laws are written with excellent intentions, but implementation leaves much to be desired. The Directorate of Agricultural Defense lacks the personnel to enforce the laws regulating pesticides. The Forestry Service is unable to enforce the mandates of the Forestry Law. CENDEPESCA lacks the resources to enforce the Fisheries Law. For other laws, including those on forestry and fisheries, regulations have never been written, making implementation difficult due to conflicting interpretations.

The problems of implementation are related, in some instances, to inadequate budgets, and in others to the Government's lack of political will. On the other hand, many regulations are difficult to apply in a country immersed in armed conflict.

Policy voids are observed in most areas. No specific policies cover soil fertility and land use according to soil classes. In pesticide use the country tends to follow other countries' standards, although it is in the process of developing its own pesticide standards. No set standards regulate forest

management. Commerce in endangered species is not regulated. Knowledge about the country's biodiversity is lacking. A coherent set of policies on biodiversity has not been developed. Watershed management is not clearly defined. Coastal zones are not regulated.

The problem of institutional jurisdiction is most severe in the management of critical watersheds. No institution has responsibility for managing an entire watershed, even though several institutions use watershed resources. Jurisdictional conflict is also a serious problem at MAG.

Policy conflicts are another major problem. Adequate coordination and consensus on common goals has not been achieved.

## **6.2 Potential Policy Alternatives**

- o Decentralize institutions that can generate their own resources, giving them complete independence, a well-qualified board of directors, and a set of policies that will help them succeed.
- o Invest heavily in development alternatives to provide jobs for the people whose current occupation and source of income is the war.
- o Launch an aggressive education program to reduce the illiteracy rate and educate the population on environmental issues.

## **6.3 Recommendations for Future Research and Analysis**

- o Study alternative ways to generate resources for the decentralized institutions proposed above.

# **AGRICULTURAL POLICY ANALYSIS PROJECT, PHASE II**

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## **EL SALVADOR NATURAL RESOURCE POLICY INVENTORY USAID/ROCAP RENARM PROJECT**

**VOLUME II**

**THE INVENTORY**

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## **ABSTRACT**

The A.I.D. Regional Office for Central American Programs (ROCAP) has funded this study of policies affecting the management of natural resources in El Salvador. It is one in a series of Central American country case studies conducted under the Regional Environmental and Natural Resource Management Project (RENARK).

Volume I of this report is a non-technical synthesis of the results and conclusions of the El Salvador Natural Resource Policy Inventory. The problems, policies, and potential policy alternatives for each of the four major themes are reviewed and recommendations for future research and analysis are presented. In addition, issues that cut across two or more of the major themes are reviewed.

In Volume II, the political, economic and social factors that influence the adoption and implementation of natural resource management policies in El Salvador are analyzed, along with the interactions among institutions involved in the policymaking process. The key issues and problems within each of the theme areas are explored in detail. The major conclusions and policy recommendations of the study are presented in the final chapter.

## ACKNOWLEDGEMENTS

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Besides the main authors, several technicians contributed valuable drafts on specific issues in their areas of expertise. Ing. Fidel A. Ramos drafted sections on watershed management, water use, and water management. Ing. Ricardo Hernández drafted sections on coastal zone management and fisheries. Ing. Rafael Rubio collaborated on water quality. Dr. Gelio Guzmán drafted a section on agroclimatic issues as they relate to sustainable agriculture. Dr. Rafael Serrano Cáceres analyzed the major laws affecting natural resources in El Salvador. Ing. Roberto Dennys reviewed land use and sustainable agriculture, and Ing. Roberto Figueroa provided valuable information on forestry. The main authors and these professionals provided all the information and analyses contained in the report.

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## EXECUTIVE SUMMARY

The purpose of a natural resource policy inventory is to examine the wide range of policies and institutions affecting resource use decisions. An agenda for more detailed research is developed from the analysis. The four problem areas defined in the USAID Central American Natural Resource and Environmental Strategy<sup>1</sup> served as the basis for organizing the natural resource issues in El Salvador. The areas are sustainable agriculture, forestry, wildlands and biodiversity, and watershed management. Issues and policies were identified by a literature review and extensive interviews.

Issues were identified within each of the four major themes. For sustainable agriculture the issues were land use, fertility, land tenure, and pesticide management. In forestry the issues were deforestation, alternative use of forest products, reforestation, and forest management. For wildlands and biodiversity the issues were protection of endangered species, park and reserve management, ecotourism, and biodiversity. For watershed management the issues were watershed management itself, water use, water management, water quality, coastal zone management, and fisheries.

Issues that cut across all or several of the major themes included the combined effect of high population density, low levels of education, widespread poverty, the armed conflict, budgetary constraints, gaps between policy formulation and implementation, overlaps in institutional jurisdiction, policy lacunae, and conflicting policies.

The high population density puts greater pressure on natural resources in El Salvador than in the rest of Central America, causing considerable degradation of the natural resources. Land is overused, underused and misused. Soils are eroded and degraded. Reported pesticide poisonings are high. Land markets are inefficient, and land title registration is a long tedious process.

The land area covered in forest has been reduced to about 6 percent of the territory. El Salvador may have over 800 species of trees, yet forest destruction is still a problem. No adequate incentives have been developed for reforestation. Forest management is inefficient.

The loss of habitat and the growing human population are threatening the remaining fauna. Endangered species are sold in the streets. Extinct species are growing rapidly in number. Parks and reserves are too small to sustain habitats for some of the larger species. Few regulations protect endangered species. Regulations on park and reserve management are inadequate. There are no incentives to develop ecotourism.

Water erosion is severe. There are no integrated watershed management programs. Several institutions use the water resources, but no

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<sup>1</sup>Agency for International Development/Bureau for Latin American And the Caribbean, *Environmental and Natural Resource Management in Central America: A Strategy for A.I.D. Assistance.*

institution is concerned with protecting the watershed as a unit. Water laws are obsolete. Coastal zones are deteriorating. Fisheries are being overexploited. Institutions are ill equipped in budget and personnel. In many cases, policies are formulated but not implemented, and in other cases policies simply have not been developed. Overlapping institutional jurisdiction is another problem. Some policies conflict with each other.

Policies analyzed within each theme and issue were classified as transnational or regional, and macroeconomic, sectoral, or specific. Transnational or regional policies address Central America regional concerns, or matters beyond the region, as with CITES. Macroeconomic policies address aspects of the entire economy, such as monetary and fiscal policies. Sectoral policies address issues relevant to a sector of the economy such as health, education, or agriculture. Specific policies address a particular issue.

Each policy was analyzed for its impact on natural resources. Although policies have short-term impacts on certain national issues, most also affect natural resources over the long term. The dichotomy of present versus future benefits is a serious political and technical dilemma. Politicians face pressures from a population fighting the effects of extreme poverty, whose principal problem is basic survival. Politicians, however, also represent wealthy and powerful constituents whose abuse of the environment for short-term economic gain often outweighs long-term considerations of the impact of decisions on the environment. Further, support of short-term solutions may result in immediate employment of the poorest members of society. It becomes difficult for congress to legislate for conservation when it entails sacrificing benefits for the poor or for those with the power to remove incumbents from office. In this situation, government policy analysts have to evaluate the returns of alternative projects competing for scarce resources. Unfortunately, present methodologies of project evaluation do not consider the effects on natural resource. The result is a preference for projects and policies that increase the "value added," even if it mean a loss to the country's natural resource endowment.

Even when El Salvador's Government is able to design and adopt favorable natural resource policies, it lacks the resources for implementation. Budgetary resources to invest in natural resource conservation projects are limited or nonexistent. International donors could play a major role in providing technical and financial assistance to help the Government and the private sector adopt and implement appropriate policies and investment projects.

At the regional level, it is critical for El Salvador to pay attention to bilateral and multinational agreements with neighboring countries, especially the management of the Lempa River watershed. The Lempa River and its major tributaries originate in Honduras. The Central American Commission for the Environment and Development could play an important role in this issue. Similarly, joining with Honduras and Nicaragua to protect and develop the Gulf of Fonseca is a major priority.

Overvaluation of the colón, trade restrictions, price controls, and high budget deficits were macroeconomic policies detrimental to natural resources and sustainable agriculture. The present Government has been revising these

policies and should continue with its macroeconomic package of trade and market liberalization. Termination of the coffee export tax is especially important.

Education policies need to be revised to reduce the high rates of illiteracy. The study of natural resources should be included in the curriculum. Agricultural schools should teach natural resource management. Radio programs are good alternatives for the older generation. The military should also include natural resource courses in their training programs.

The institutions that deal with research or natural resource programs have inadequate budgets and the limitations inherent in a centralized budget system. These include CENTA, ISIC, CENDEPESCA, the Museum of Natural History, and others. It would be difficult to adequately fund these institutions considering the Government's present budgetary pressures, as other problems generally take priority. One alternative is to transfer the management of these institutions outside the centralized government budgetary and administrative systems, making them autonomous by special decree. Privatization of certain functions is another alternative. Funding could be sought from several sources. An export fee for which the Government acts as collection agent could be one alternative. This is a good option for ISIC in coffee. Other sources could be government transfers and international and private donations. The Deinenger Park is an example of a project created through private donations. Specific studies need to be conducted to determine the most feasible alternative in each case.

The extension service policy needs revision to improve its effectiveness. Cost per farmer could be an indicator, along with increased production and use of sustainable agricultural practices. Extension agents need training in natural resource issues, focusing on agriculture and natural resource management.

Irrigation potential has not been utilized, and irrigated areas are underutilized. Agricultural production could be significantly increased and sustainability improved by increasing the efficiency of the present systems and expanding the irrigated areas. Laws affecting irrigation need revision, investments must be made in irrigation infrastructure, and management of irrigation systems needs improvement.

The use of pesticides has declined as the area planted in cotton declined. Pesticides remain important, particularly with respect to the high value horticultural exports. Improvements are needed in research, training, and control. More research is needed in integrated pesticide management practices. Extension agents need training in the effects of pesticides and pesticide handling, and especially in integrated pest management practices. This knowledge needs to be transmitted to the producers. The effectiveness of pesticides should be tested before they are approved. A residue testing policy needs to be developed, along with the funding to implement it. The Agricultural Defense Department needs strengthening with resources adequate for proper control and supervision.

The major reason for deforestation has been the expansion of agriculture. Deforestation is occurring even on land that should be under permanent tree cover and on some of the agrarian reform holdings. Forests have

also been a major source of firewood. Less significant uses have been furniture and house construction. The high rate of deforestation has been so detrimental that in some areas desertification has begun.

Policies in the forestry sector need special attention. The Forestry Law needs revision to incorporate more incentives. Alternative energy sources should be provided to reduce the pressure on forests as sources of firewood. The reforestation programs need expansion into firewood production. Research policies need revision to emphasize the production characteristics of tree species from an economic viewpoint. Reforestation subsidies are needed. Social benefits of reforestation are much greater than private benefits.

Policies are needed on wildlands and biodiversity, including a law for the protection and management of wildlife. Appendix 3 of CITES needs to be defined. Incentives are needed to create private parks and reserves. A law is necessary to regulate the management of national parks and reserves. Management of national parks and reserves could be better done by private foundations. International assistance could be especially helpful in this area.

Water quality needs improvement. Poor water quality results in high costs of medical treatment and high infant mortality. Stricter regulations are needed on the disposal of sewage and industrial wastes. Sewage treatment plants are needed. Nature does not have the capacity to degrade residues and bacterial infection at the present rate of waste generation.

Policies are needed to improve management of watersheds. The proposed irrigation and drainage law needs to be approved to update existing legislation. Water resources need to be treated in an integrated manner. Institutions that use water resources must coordinate their efforts. Coastal zone protection policies are also needed.

Fisheries policies require special review. The number of licenses allotted for shrimp fishing boats should be reduced. Fishing for different species should be programmed and regulated by season according to spawning and growth behavior, which would benefit fishermen as the industry becomes sustainable. Research is needed to determine some of these parameters, and develop alternative management methods. Inland fisheries production needs to be researched. Incentives are needed to develop this growing industry.

Finally, a peaceful settlement of the present armed conflict would be the most beneficial policy for natural resources. People would gain confidence to invest in the economy. Jobs would be created to convert fighters from both sides into productive individuals whose work would increase the nation's wealth. A strong development program should be launched to create industries in the cities and reduce population pressure on natural resources. An aggressive educational program is needed to educate the population on natural resource issues.

NATURAL RESOURCE POLICY INVENTORY  
EL SALVADOR

CONTENTS

VOLUME II. ANALYSIS

|  | Page No. |
|--|----------|
| ABSTRACT   | i        |
| ACKNOWLEDGEMENTS                                       | ii       |
| EXECUTIVE SUMMARY                                      | iii      |
| LIST OF EXHIBITS                                       | xi       |
| ACRONYMS   | xiii     |
| <br>   |          |
| 1. INTRODUCTION  | 1        |
| 1.1 Organization of the Report                         | 1        |
| 1.2 Demographic, Historic and Economic Background      | 2        |
| 1.3 Natural Resource Situation                         | 5        |
| <br>   |          |
| 2. SUSTAINABLE AGRICULTURE                             | 16       |
| 2.1 Land Utilization and Soil Fertility                | 16       |
| 2.1.1 Policy Framework                                 | 22       |
| 2.1.2 Institutional Framework                          | 28       |
| 2.1.3 Analysis   | 32       |
| 2.1.4 Potential Policy Alternatives                    | 39       |
| 2.1.5 Recommendations For Future Research and Analysis | 39       |
| 2.2 Land Tenure  | 41       |
| 2.2.1 Policy Framework                                 | 43       |
| 2.2.2 Institutional Framework                          | 46       |
| 2.2.3 Analysis   | 48       |
| 2.2.4 Potential Policy Alternatives                    | 51       |
| 2.2.5 Recommendations For Future Research and Analysis | 52       |
| 2.3 Pesticide Management                               | 52       |
| 2.3.1 Policy Framework                                 | 53       |
| 2.3.2 Institutional Framework                          | 55       |
| 2.3.3 Analysis   | 58       |
| 2.3.4 Potential Policy Alternatives                    | 60       |
| 2.3.5 Recommendations For Future Research and Analysis | 61       |

|           |   |           |
|-----------|---|-----------|
| <b>3.</b> | <b>FORESTRY</b>   | <b>62</b> |
|           | 3.1 Policy Framework                                      | 64        |
|           | 3.2 Institutional Framework                               | 66        |
|           | 3.3 Analysis  | 67        |
|           | 3.4 Potential Policy Alternatives                         | 73        |
|           | 3.5 Recommendations For Future Research and Analysis      | 74        |
| <br>      |   |           |
| <b>4.</b> | <b>WILDLANDS AND BIODIVERSITY</b>                         | <b>76</b> |
|           | 4.1 Protection of Endangered Species and Biodiversity     | 76        |
|           | 4.1.1 Policy Framework                                    | 78        |
|           | 4.1.2 Institutional Framework                             | 79        |
|           | 4.1.3 Analysis  | 80        |
|           | 4.1.4 Potential Policy Alternatives                       | 88        |
|           | 4.1.5 Recommendations For Future Research and Analysis    | 88        |
|           | 4.2 Park And Reserve Management, and Ecotourism           | 89        |
|           | 4.2.1 Policy Framework                                    | 91        |
|           | 4.2.2 Institutional Framework                             | 92        |
|           | 4.2.3 Analysis  | 93        |
|           | 4.2.4 Potential Policy Alternatives                       | 97        |
|           | 4.2.5 Recommendations For Future Research and Analysis    | 98        |
| <br>      |   |           |
| <b>5.</b> | <b>WATERSHED MANAGEMENT</b>                               | <b>99</b> |
|           | 5.1 Watershed Management, Water Use, and Water Management | 99        |
|           | 5.1.1 Policy Framework                                    | 104       |
|           | 5.1.2 Institutional Framework                             | 109       |
|           | 5.1.3 Analysis  | 112       |
|           | 5.1.4 Potential Policy Alternatives                       | 114       |
|           | 5.1.5 Recommendations For Future Research and Analysis    | 115       |
|           | 5.2 Water Quality   | 115       |
|           | 5.2.1 Policy Framework                                    | 118       |
|           | 5.2.2 Institutional Framework                             | 118       |
|           | 5.2.3 Analysis  | 120       |
|           | 5.2.4 Potential Policy Alternatives                       | 121       |
|           | 5.2.5 Recommendations For Future Research and Analysis    | 121       |
|           | 5.3 Coastal Zone Management and Fisheries                 | 121       |
|           | 5.3.1 Policy Framework                                    | 125       |
|           | 5.3.2 Institutional Framework                             | 127       |
|           | 5.3.3 Analysis  | 130       |
|           | 5.3.4 Potential Policy Alternatives                       | 132       |
|           | 5.3.5 Recommendations For Future Research and Analysis    | 133       |

|            |   |            |
|------------|---|------------|
| <b>6.</b>  | <b>CROSS CUTTING ISSUES</b>                             | <b>134</b> |
|            | 6.1 The Problem   | 134        |
|            | 6.2 Potential Policy Alternatives                       | 136        |
|            | 6.3 Recommendations For Future Research and Analysis    | 137        |
| <b>7.0</b> | <b>SUMMARY AND CONCLUSIONS</b>                          | <b>139</b> |
|            | 7.1 Sustainable Agriculture                             | 140        |
|            | 7.1.1 Macroeconomic Policies                            | 140        |
|            | 7.1.2 Education   | 141        |
|            | 7.1.3 Agricultural Marketing                            | 141        |
|            | 7.1.4 Agricultural Credit                               | 141        |
|            | 7.1.5 Land Tenure                                       | 141        |
|            | 7.1.6 Research  | 142        |
|            | 7.1.7 Extension   | 142        |
|            | 7.1.8 Irrigation  | 142        |
|            | 7.1.9 Pesticides Management                             | 143        |
|            | 7.1.10 Recommended Policy Alternatives                  | 143        |
|            | 7.1.11 Recommendations For Future Research and Analysis | 144        |
|            | 7.2 Forestry  | 144        |
|            | 7.2.1 Education   | 145        |
|            | 7.2.2 The Forestry Law                                  | 145        |
|            | 7.2.3 Lack of Alternative Sources of Energy             | 145        |
|            | 7.2.4 Research  | 145        |
|            | 7.2.5 Lack of Incentives                                | 145        |
|            | 7.2.6 Potential Policy Alternatives                     | 146        |
|            | 7.2.7 Recommendations For Future Research and Analysis  | 146        |
|            | 7.3 Wildland and Biodiversity                           | 147        |
|            | 7.3.1 The CITES Convention                              | 147        |
|            | 7.3.2 CENDEPESCA's Regulations                          | 147        |
|            | 7.3.3 Regulation Lacunae                                | 148        |
|            | 7.3.4 Potential Policy Alternatives                     | 148        |
|            | 7.3.5 Recommendations For Future Research and Analysis  | 149        |
|            | 7.4 Watershed Management                                | 149        |
|            | 7.4.1 International Bilateral Agreements                | 150        |
|            | 7.4.2 Water Laws and Regulations                        | 150        |
|            | 7.4.3 Management of Water Resources                     | 150        |
|            | 7.4.4 Fisheries Regulations                             | 150        |
|            | 7.4.5 Potential Policy Alternatives                     | 151        |
|            | 7.4.6 Recommendations For Future Research and Analysis  | 152        |
|            | 7.5 Cross Cutting Issues                                | 152        |
|            | 7.5.1 Potential Policy Alternatives                     | 154        |
|            | 7.5.2 Recommendations For Future Research and Analysis  | 154        |

**APPENDIX**

|          |   |            |
|----------|---|------------|
| <b>A</b> | <b>SCOPE OF WORK</b>  | <b>155</b> |
| <b>B</b> | <b>GUIDELINES FOR CONDUCTING A NATURAL RESOURCE POLICY INVENTORY</b>    | <b>156</b> |
| <b>C</b> | <b>INTERVIEWS CONDUCTED AND POTENTIAL CONTACTS FOR FURTHER RESEARCH</b> | <b>160</b> |
| <b>D</b> | <b>REFERENCES</b>   | <b>162</b> |

## LIST OF EXHIBITS

| EXHIBIT NO. |  | PAGE NO. |
|-------------|--|----------|
| 1.1         | Map of El Salvador   | 8        |
| 1.2         | Major Economic Indicators  | 9        |
| 2.1         | Description of Land Capability Classes   | 18       |
| 2.2         | Land Classes, 1981   | 20       |
| 2.3         | Patterns of Land Use, 1970 to 1987/88  | 20       |
| 2.4         | Area Planted For Some Major Crops, 1986-1986   | 23       |
| 2.5         | Policies Related to Land Use and Soil Fertility by Type, 1990  | 25       |
| 2.6         | Institutions Involved in Land Use and Soil Fertility by Type of Policy, 1990                           | 29       |
| 2.7         | Potential Land Use, 1990   | 42       |
| 2.8         | Number of Farms and Area Harvested, By Size, 1971  | 42       |
| 2.9         | Number of Farms and Area by Form of Land Tenure, 1988  | 44       |
| 2.10        | Policies Related to Land Tenure by Type, 1990  | 45       |
| 2.11        | Institutions Involved in Land Tenure Policies, By Type of Policy, 1990                                 | 47       |
| 2.12        | Policies Related to Pesticide Management by Type, 1990   | 54       |
| 2.13        | Institutions Involved in Pesticide Management, by Type of Policy, 1990                                 | 56       |
| 5.1         | Map of the Hydrographic Regions  | 100      |
| 5.2         | Policies Related to Watershed Management, Water Use, and Water Management by Type, 1990                | 105      |
| 5.3         | Hydrographic Regions in El Salvador, 1990  | 108      |
| 5.4         | Institutions Involved in Watershed Management, Water Use, and Water Management by Type of Policy, 1990 | 111      |
| 5.5         | Institutions Involved in Water Quality, By Type of Policy, 1990  | 119      |

**EXHIBIT NO.**

**PAGE NO.**

|            |  |            |
|------------|--|------------|
| <b>5.6</b> | <b>Policies Related to Fisheries and Coastal Zone Management<br/>by Type, 1990</b>                 | <b>126</b> |
| <b>5.7</b> | <b>Institutions Involved in Fisheries and Coastal Zone<br/>Management, by Type of Policy, 1990</b> | <b>128</b> |

## ACRONYMS

|                   |  |
|-------------------|--|
| <b>ANDA</b>       | Administración Nacional de Acueductos y Alcantarillado (National Administration of Potable Water and Sewage)   |
| <b>APA</b>        | Asociación de Proveedores Agrícolas (Association of Agricultural Suppliers)                                    |
| <b>ARENA</b>      | Alianza Republicana Nacionalista (Nationalist Republican Alliance)   |
| <b>BFA</b>        | Banco de Fomento Agropecuario (Agricultural Fomentation Bank)  |
| <b>CABEI</b>      | Central American Bank for Economic Integration   |
| <b>CATIE</b>      | Centro Agronómico Tropical de Investigación y Enseñanza (Tropical Agronomic Center for Research and Training)  |
| <b>CCAD</b>       | Comisión Centroamericana de Ambiente y Desarrollo (Central American Commission of Environment and Development) |
| <b>CCAN</b>       | Consejo Consultivo Agrícola Nacional (National Agricultural Consultative Council)                              |
| <b>CCAS</b>       | Consejo Consultivo Agrícola Sectorial (Sectoral Agricultural Consultative Council)                             |
| <b>CDG</b>        | Centro de Desarrollo Ganadero (Livestock Development Center)   |
| <b>CEL</b>        | Comisión Ejecutiva del Río Lempa (Executive Commission of the Lempa River)                                     |
| <b>CENCAP</b>     | Centro de Capacitación Agropecuaria (Agricultural Training Center)   |
| <b>CENDEPESCA</b> | Centro de Desarrollo Pesquero (Center for Fisheries Development)   |
| <b>CENREN</b>     | Centro de Recursos Naturales (Natural Resources Center)  |
| <b>CENTA</b>      | Centro de Tecnología Agrícola (Agricultural Technology Center)   |
| <b>CENTREX</b>    | Centro de Trámite de Exportaciones e Importaciones (Center for Exports and Imports Procedures)                 |
| <b>CEPA</b>       | Comisión Ejecutiva de Puertos (Port Authority Executive Commission)  |
| <b>CITES</b>      | International Convention for the Protection of Endangered Species of Flora and Fauna                           |
| <b>COC</b>        | Comité de Organización Campesina (Farm Organization Committee)   |

|                 |  |
|-----------------|--|
| <b>DDA</b>      | <b>Dirección de Defensa Agropecuaria (Directorate of Agricultural Defense)</b>   |
| <b>DGEA</b>     | <b>Dirección General de Economía Agropecuaria (General Directorate of Agricultural Economics)</b>                              |
| <b>DGRD</b>     | <b>Dirección General de Riego y Drenaje (General Directorate of Irrigation and Drainage)</b>                                   |
| <b>DIVAGRO</b>  | <b>Proyecto de Diversificación Agrícola (Agriculture Diversification Project)</b>  |
| <b>ENA</b>      | <b>Escuela Nacional Agrícola (National Agricultural School)</b>  |
| <b>EPA</b>      | <b>Environmental Protection Agency</b>   |
| <b>FAO</b>      | <b>Food and Agriculture Organization of the United Nations</b>   |
| <b>FUSADES</b>  | <b>Fundación Salvadoreña para el Desarrollo Económico y Social (Salvadoran Foundation for Economic and Social Development)</b> |
| <b>FINATA</b>   | <b>Financiera Nacional para Tierras Agrícolas (National Financial Institute for Agricultural Lands)</b>                        |
| <b>GDP</b>      | <b>Gross Domestic Product</b>  |
| <b>GOES</b>     | <b>Government of El Salvador</b>   |
| <b>ICO</b>      | <b>International Coffee Organization</b>   |
| <b>IDB</b>      | <b>Interamerican Development Bank</b>  |
| <b>IMF</b>      | <b>International Monetary Fund</b>   |
| <b>IPM</b>      | <b>Integrated Pest Management</b>  |
| <b>ISIC</b>     | <b>Instituto Salvadoreño de Investigaciones Cafetaleras (Salvadoran Institute for Coffee Research)</b>                         |
| <b>ISTA</b>     | <b>Instituto Salvadoreño de Transformación Agraria (Salvadoran Institute of Agrarian Transformation)</b>                       |
| <b>ISTU</b>     | <b>Instituto Salvadoreño de Turismo (Salvadoran Tourism Institute)</b>   |
| <b>ITIC</b>     | <b>Instituto Tropical de Investigaciones Científicas (Tropical Institute of Scientific Research)</b>                           |
| <b>IUCN</b>     | <b>International Union for the Conservation of Nature and Natural Research</b>   |
| <b>MADELEÑA</b> | <b>Proyecto Cultivo de Arboles de Uso Múltiple (Multiple Use Trees Project)</b>  |

|                   |  |
|-------------------|--|
| <b>MAG</b>        | <b>Ministerio de Agricultura y Ganadería (Ministry of Agriculture and Livestock)</b>   |
| <b>META</b>       | <b>Programa de Mejoramiento de Tierras Agrícolas (Agricultural Land Improvement Program)</b>   |
| <b>MIPLAN</b>     | <b>Ministerio de Planificación y Coordinación del Desarrollo Económico y Social (Ministry of Planning and Coordination of Economic and Social Development)</b> |
| <b>NMNH</b>       | <b>Museo Nacional de Historia Natural (National Museum of Natural History)</b>   |
| <b>MSPAS</b>      | <b>Ministerio de Salud Pública y Asistencia Social (Ministry of Public Health and Social Assistance)</b>   |
| <b>NPWD</b>       | <b>Departamento de Parques y Vida Silvestre (National Parks and Wildlife Department)</b>   |
| <b>NPWS</b>       | <b>Servicio de Parques y Vida Silvestre (National Parks and Wildlife Service)</b>  |
| <b>OEDA</b>       | <b>Oficina Especializada del Agua (Specialized Water Office)</b>   |
| <b>OIRSA</b>      | <b>Organización Internacional Regional de Sanidad Agrícola (International Regional Organization for Agricultural Health)</b>                                   |
| <b>OSPA</b>       | <b>Oficina Sectorial de Planificación Agrícola (Agriculture Sector Planning Office)</b>  |
| <b>PERA</b>       | <b>Proyecto Planificación y Evaluación de la Reforma Agraria (Agrarian Reform Planning and Evaluation Project)</b>   |
| <b>ROCAP</b>      | <b>U.S.A.I.D. Regional Office for Central American Programs</b>  |
| <b>SIADES</b>     | <b>Sociedad de Ingenieros Agrónomos de El Salvador (Society of Agronomic Engineers of El Salvador)</b>   |
| <b>UNDP</b>       | <b>United Nations Development Program</b>  |
| <b>U.S.A.I.D.</b> | <b>United States Agency for International Development</b>  |
| <b>WWF</b>        | <b>World Wildlife Fund</b>   |

## 1. INTRODUCTION

Natural resource depletion in El Salvador is largely the result of inappropriate policies. The continuing armed conflict has contributed to the problem but is not the major cause of environmental degradation. In economic terms, private costs have been less than social costs. Policies need to be adopted to equalize private and social costs.

In some cases a policy is appropriate but the implementation mechanisms do not function adequately. Processes and measures must be instituted to assure that when policies are adopted, they are actually implemented.

There is a need to develop an environmental consciousness about virtually every policy decision. Too much attention has been focused on development efforts without careful consideration for the environment. However, development and environmental preservation are not mutually exclusive. This report is based on the belief that it is feasible to have environmentally sound development and that many policies can be tied to environmentally sound practices. The report employs a policy inventory to provide a clear idea of El Salvador's policy environment and to recommend actions, measures, and research ideas that will induce the population to better utilize its natural resource endowment.

Similar studies have been conducted in Guatemala, Honduras, and Belize, and will be carried out in Costa Rica, Panamá, and Nicaragua, as well as for the region as a whole. The title uses the word inventory, which implies a comprehensive list. However, it is not feasible to carry out an exhaustive effort, given limited time and resources. The work is thus limited to the major policies and institutions that contribute to natural resource use and management in the country. Policies can be formal (laws, decrees, resolutions, and regulations) or informal (de facto). The study treats both kinds of policies, according to their impact on the natural resources.

The A.I.D Regional Office for Central American Programs (ROCAP) is financing the inventory in coordination with the local USAID mission. The scope and orientation of the work is under the guidance of USAID/San Salvador.

This introduction briefly reviews the demographic, historic, and economic background of the country, as well as the present natural resource situation. It begins by describing the organization of the report.

### 1.1 Organization of the Report

The abstract summarizes the contents of the report. The executive summary provides an overview of the major findings. Following this introduction, Chapters 2 to 5 present the inventory of policies and institutions of the four major themes: sustainable agriculture, forestry, wildlands and biodiversity, and watershed management.

This organization accommodates specific interests of readers who do not

want to go through the entire report to look into their areas of interest.

The four chapters, which cover the major themes, are organized by issues selected according to the priorities and conditions in El Salvador. Each issue section describes the current conditions, followed by the policy framework and the institutional framework. A description of the policies and institutions is followed by an analysis of the way they affect the issue in question. A presentation of the potential policy alternatives is followed by recommendations for future research and analysis.

Chapter 6 discusses issues common to all or most of the four major themes, following the same structure as the others. Chapter 7 presents a summary and conclusions of the major findings.

Several appendices have been included at the end of the report. These contain the scope of work, guidelines for conducting a natural resource policy inventory, a list of the interviews conducted and potential contacts for further research, and a list of the references consulted.

## 1.2 Demographic, Historic and Economic Background

The population of El Salvador is estimated at 5.2 million, with an annual growth rate of 1.3 percent for 1980-88.<sup>1</sup> With a total land area of 21,040 square kilometers, the country has the highest population density in the Western hemisphere (approximately 246 inhabitants per square kilometer).<sup>2</sup>

Urbanization is accelerating as in most Latin American countries. About 1 million people live in San Salvador. In 1987, it was estimated that 44 percent of the total population was located in urban areas.<sup>3</sup>

During the last decade, infant mortality has fallen, contagious diseases have declined, and life expectancy has risen. However, the rate of infant mortality due to malnutrition remains one of the highest in Latin America. According to UNICEF, child mortality in El Salvador is on average 70 per thousand, varying from 55 in urban areas to 81 in the rural sector.<sup>4</sup>

About 72 percent of the urban population has access to running water. However, only 7.7 percent of the rural sector enjoys this benefit. Poor sanitary conditions prevail in the rural sector and in marginal areas due to the lack of sanitary services. Improvements in sanitation and public health are necessary

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<sup>1</sup>El Salvador: Country Economic Memorandum. The World Bank, August 14, 1989. The low growth rate of 1.3 percent is due to out migration.

<sup>2</sup>The last census was conducted in 1971.

<sup>3</sup>The World Bank, World Development Report 1989, Washington, D.C., The World Bank, 1989, pg. 224.

<sup>4</sup>USAID/El Salvador, "El Salvador, Perfil Ambiental, Estudio de Campo." San Salvador, El Salvador: U.S.A.I.D. Contract No. 519-0167-C00-2039-00. April 1985.

to reduce the incidence of diarrhea and respiratory disease--the primary causes of death.<sup>1</sup> The housing deficit has been a persistent problem, exacerbated by the earthquake of 1986.

In 1978, 51 percent of detached houses lacked potable water; in the rural area, it was 78 percent. Only 49 percent of homes had electricity, and in the rural areas, only 18 percent. The housing deficit in the rural area was 362,735, increasing to 421,606 by 1983.<sup>2</sup>

El Salvador's original inhabitants, the Pipiles, who descended from the Nahuatl and Mayan nations, had a close relationship with nature, permitting a sound balance between human beings and the natural environment. At the beginning of the colonial period, their population was around 250,000, but was reduced to about 50,000 in a very short time by the Spanish conquerors.

El Salvador was originally covered with diverse vegetation scattered in different ecological zones. Pine and oak woods grew in the north, extended tropical forest in the central hills and valleys, abundant conifers in the highlands, deciduous species on the shorelands, and abundant mangroves in the wetlands.

Before the colonial period, the inhabitants shared the territory and goods available. However, with colonization and the introduction of indigo, sugar cane, and basic grains farming, the Spaniards forced the Pipiles to abandon their lands and move to areas with difficult living conditions which were not conducive to traditional agriculture. This policy set in motion the beginning of ecological degradation in El Salvador.

Independence was achieved in 1821 after 300 years of Spanish domination. Independent Salvadorans inherited a highly centralized decision making system which remains in force today.

After the successful introduction of coffee around 1830, the Indians were deprived of their remaining land. In 1882, a special decree abolished the traditional Indian ejidos land tenure system.

As the 20th century began, El Salvador experienced an array of political, economic, social, and ecological changes. The world economic depression at the end of the 1920s affected the prices of coffee, sugar cane, and other goods. The population grew to almost 1 million inhabitants. The government and public administration were characterized as corrupt and inefficient.

The long period of military regimes started in 1931 with the coup d'etat headed by General Maximiliano Martinez. Military dictatorships persisted

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<sup>1</sup> Ministry of Public Health and Social Assistance, "1989 Yearbook." San Salvador, El Salvador: Ministry of Public Health and Public Assistance, 1990.

<sup>2</sup> Comisión Nacional de Población, "Política de Población." San Salvador, El Salvador: Comisión Nacional de Población, 1990. p. 6.

until 1979, when the present armed conflict started. A small number of families held economic and military sway, controlling the country's affairs and obtaining the bulk of its financial and social benefits. For the majority of the population, however, the health, education, and housing, and other social benefits were not even remotely adequate.<sup>1</sup>

During the 1960s and 1970s provision of health, education, and other social services improved somewhat. However, population pressure and the increased concentration of wealth and income led to serious social and political tensions, setting the stage for the present military conflict. Consequently, economic, political, social, and ecological management activities have suffered heavily. A new constitution was approved in 1983,<sup>2</sup> and the first civilian government in more than 50 years was elected in 1984.<sup>2</sup>

Successive governments carried out several reforms to address social inequities in the 1979-81 period. These included the nationalization of banks, initiation of agrarian reform, and full state control of export marketing. During the period of 1980-82, public sector finances deteriorated (the deficit averaged 10.7 percent of GDP), reflecting growing expenditures for both agrarian reform and defense. In addition, external imbalances worsened, terms of trade deteriorated, and export volume dropped to 27 percent. The violence and economic disarray led to a 21 percent drop in per capita income from 1979 to 1981. Other contributors to poor economic performance were massive capital flight, an increase in unemployment to over 25 percent, and the large exodus of professional talent.<sup>3</sup>

During the period of 1983-85, improvements and constraints continued. Total consumption and private investment recovered, sales taxes increased, the fiscal situation improved, and stronger economic management led to a recovery in private investment. However, demand pressures led to an increase in inflation from 13 percent in 1983 to 22 percent in 1985.<sup>4</sup>

In addition, medium and long-term external debt increased from US\$ 0.7 billion in 1980 to US\$ 1.8 billion in 1987. Even though the Government in 1986 undertook an economic program which included a 100 percent devaluation of the official exchange rate, an increase in the interest rates, and a new, less protective common external tariff, the situation did not markedly improve.<sup>5</sup>

On October 10, 1986 a major earthquake hit San Salvador, contributing to a serious disruption of economic activity and public administration. Losses

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<sup>1</sup>Hugo Guerra y Guerra, "Ecological Crisis in El Salvador, A National Challenge". Duke University, North Carolina, May 1990. Pg. 7

<sup>2</sup>Asamblea Nacional Constituyente, Constitución Política de El Salvador, San Salvador, 1983.

<sup>3</sup>The World Bank, Trends in Developing Economies, Washington, D.C. The World Bank, 1989, p.135

<sup>4</sup>Ibid, p. 135.

<sup>5</sup>Ibid.

were estimated at \$1 billion, and reconstruction expenditures were largely financed by foreign assistance. In 1987, inflation fell to 25 percent mainly due to tighter monetary policies.<sup>1</sup>

With a GDP growth of less than 1 percent and little reduction in inflation, the economic performance of 1988 was very disappointing. In addition, unfavorable weather conditions resulted in crop losses, especially in coffee, and a rapid decline in public sector investment exacerbated the situation.

Current figures indicate deterioration in global productivity and an increase in macroeconomic imbalance, as well as a decline in domestic prices. It is estimated that a 2.3 percent growth in GDP was achieved in 1989.

Investment in human resources has been inadequate, increasing the difficulty of managing natural resources. Over 80 percent of all farmers were functionally illiterate in 1989.<sup>2</sup> In 1985, only 77 percent of the children ages 7 to 15 received school services.<sup>3</sup>

During the Presidential elections of March 1989, Alfredo Cristiani of the ARENA party defeated the incumbent administration. ARENA also gained control of the National Assembly, the judiciary, and many municipal governments. This new Government is committed to supporting a large, free enterprise economic policy and making major changes and reforms.

Major economic policy reforms of the present Government include liberalization of trade and the exchange rate, privatization of the banking system, and lifting of price controls. Other measures include budget deficit reduction, control over the growth of the money supply, and privatization of functions previously carried out by the government, but which are typically private sector activities, such as coffee and sugar marketing. The Government also eliminated one of the export taxes on coffee. The Government's plan of action is outlined in the "Plan De Desarrollo y Social 1989-1994."<sup>4</sup> Many of the planned policies have been adopted, but others have been postponed due to increased political pressures following the military offensive of November 1989.

### 1.3 Natural Resource Situation

Precolonial El Salvador was characterized by a diverse vegetative

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<sup>1</sup>Ibid, p. 136.

<sup>2</sup>Samuel A. McReynolds, Thomas M. Johnston, Peter H. Gore and Joe D. Francis, "The 1989 El Salvador Agricultural Land Use and Land Tenure Study." Washington, D.C.: National Cooperative Business Center, November 1989. p. i.

<sup>3</sup>Comisión Nacional de Población, "Política de Población." San Salvador, El Salvador: Comisión Nacional de Población, 1990. p. 5.

<sup>4</sup>Ministerio de Planificación y Coordinación del Desarrollo Económico y Social, Plan de Desarrollo Económico y Social 1989-1994. San Salvador, El Salvador: Ministerio de Planificación y Coordinación del Desarrollo Económico y Social, 1989.

cover, a natural resource endowment that is rapidly disappearing. The extensive pine and oak forests in the north were destroyed to make way for cattle and indigo production. This resulted in heavy erosion of soils and the extinction of several species of fauna and flora.

The destruction of perennial broadleaf forest located in the central valley followed. A wide variety of coniferous and liquidambers were then demolished. Thereafter, the production of grains, sugar cane, and coffee was introduced in these areas, with negative ecological effects. An exception was the land used for coffee plantations which developed new forest due to the demand for additional shade trees for optimal development. The development of a supporting forest cover also provided stability for some of the fauna living in the area and helped to preserve soil and water tables.

Natural resources were also destroyed on El Salvador's coastal plains. During the 1950s, cotton became the next agricultural export crop developed in the country, due to high world demand, the suitability of coastal soils for cotton production, and the abundant cheap labor. A systematic ecological degradation began with elimination of evergreen forest, the construction of new roads, and the heavy application of pesticides. El Salvador set a world record for indiscriminate use of pesticides and other agro-chemicals per cultivated unit.<sup>1</sup>

Mangroves were the next target of ecological destruction, the victim of the demand for timber and firewood, the exploitation of aquaculture, the establishment of salineras, and new urbanization on the coast. The loss of the mangroves eliminated a special habitat where a valuable biological cycle of the marine fauna takes place.

El Salvador has less original forest compared to its territorial size than any other country in the Americas. Due to the destruction of natural resources, soil erosion has accelerated. An estimated three-quarters of the national territory is exposed to severe erosion, which is decreasing land productivity.<sup>2</sup>

During the rainy season, runoff has eroded mountains and hills throughout the country but especially the northern area where soils are poor. This region is at present a rocky and unproductive zone where the soil cover has largely vanished.<sup>3</sup>

Another problem is the lack of potable water. Currently, the aquifer reserves of the country face a serious crisis, due to their limited capacity to

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<sup>1</sup>Manuel Benítez, "Estrategias para el Desarrollo Ecológico Nacional de El Salvador" Centro de Investigaciones Tecnológicas y Científicas. San Salvador, Mayo 1989.

<sup>2</sup>Manuel Benítez, "Estrategias para el Desarrollo Ecológico Nacional de El Salvador". Centro de Investigación Tecnológicas y Científicas, San Salvador, Mayo 1989.

<sup>3</sup>Ana Carolina Martínez Cruz, "Situación Ecológica en El Salvador y Alternativas de Solución" August 1989, p.4.

absorb rainwater, rapid runoff, and massive destruction of the vegetation.<sup>1</sup>

At present, population pressure and poor management are the main contributors to ecological degradation. El Salvador's limited natural resources are insufficient to support its growing population given present cultural practices. Half the people live in rural areas, owning or working small farms usually located on fragile soils.<sup>2</sup> Unsound economic and environmental practices have resulted in part from the inadequate public and private services to the majority of the farmers.

Forests were originally cleared for agricultural purposes. However, the principal cause of deforestation in recent years has been the need for firewood.

Finally, another important factor is legislation related to natural resources. Several decrees, agreements, and treaties have been approved in El Salvador. However, diversity of legislation, fragmentation of laws, and lack of resources and coordination among implementing institutions have created serious problems. A single natural resource such as water may be regulated by different laws and administered by several institutions, each with a legitimate interest in the resource.

In short, the ecological crisis in El Salvador consists of serious deforestation, accelerated erosion, contaminated water, and extinction of flora and fauna. These conditions have resulted in health problems and declining prospects for sustained agricultural production. The lack of appropriate legislation and low level of environmental consciousness among Salvadorans exacerbates the crisis. At the root of this environmental crisis are the policies that affect natural resources.

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<sup>1</sup> Ibid, p.4

<sup>2</sup> USAID. Annex, Environmental and Natural Resource Management in El Salvador.



EL SALVADOR - NATURAL RESOURCE POLICY INVENTORY

Exhibit 1.2 Major Economic Indicators

| Description                                   | Units of Measuremet | Amount  |
|---|---------------------|---------|
| Population (mid-1987)                         | Millions            | 4.9     |
| Area  | Thousand Km2        | 21.0    |
| GNP per capita 1987                           | US\$                | 860.0   |
| GNP per capita Av. annual growth rate 1965-87 | Percent             | (0.4)   |
| Average annual inflation rate (1965-80)       | Percent             | 7.0     |
| Average annual inflation rate (1980-87)       | Percent             | 16.5    |
| Life expectancy at birth 1987                 | Years               | 62.0    |
| Ave. annual growth rate GDP 1965-80           | Percent             | 4.3     |
| Ave. annual growth rate GDP 1980-87           | Percent             | (0.4)   |
| Ave. annual growth Agriculture 1965-80        | Percent             | 3.6     |
| Ave. annual growth rate Agriculture 1980-87   | Percent             | (1.6)   |
| Ave. annual growth rate Industry 1965-80      | Percent             | 5.3     |
| Ave. annual growth rate Industry 1980-87      | Percent             | 0.0     |
| Ave. annual growth rate Manufacturing 1965-80 | Percent             | 4.6     |
| Ave. annual growth rate Manufacturing 1980-87 | Percent             | (0.3)   |
| Ave. annual growth rate Services, etc 1965-80 | Percent             | 4.3     |
| Ave. annual growth rate Services, etc 1980-87 | Percent             | 0.2     |
| GDP 1965                                      | Million US\$        | 800.0   |
| GDP 1987                                      | Percent             | 4,750.0 |
| Distribution of GDP                           |                     |         |
| Agriculture (1965)                            | Percent             | 29.0    |
| Agriculture (1987)                            | Percent             | 14.0    |
| Industry (1965)                               | Percent             | 22.0    |
| Industry (1987)                               | Percent             | 22.0    |
| Manufacturing (1965)                          | Percent             | 18.0    |
| Manufacturing (1987)                          | Percent             | 17.0    |
| Services, etc (1965)                          | Percent             | 49.0    |
| Services, etc (1987)                          | Percent             | 64.0    |
| Value added in agriculture 1970               | Million US\$        | 292.0   |
| Value added in agriculture 1987               | Million US\$        | 656.0   |
| Cereal imports 1974                           | 1000 MT             | 75.0    |
| Cereal imports 1987                           | 1000 MT             | 182.0   |
| Food aid in cereals 1974-75                   | 1000 MT             | 4.0     |
| Food aid in cereals 1986-87                   | 1000 MT             | 227.0   |
| Fertilizer consumption 1970                   | 100 gms. plant      | 1,043.0 |
| Fertilizer consumption 1986                   | nutrient/Ha. A.L.   | 906.0   |
| Average Annual Energy Growth Rate             |                     |         |
| Energy Production (1965-80)                   | Percent             | 9.0     |
| Energy Production (1980-87)                   | Percent             | 3.5     |
| Energy Consumption (1965-80)                  | Percent             | 7.6     |
| Energy Consumption (1980-87)                  | Percent             | 1.6     |

| Description  | Units of Measuremet | Amount |
|--|---------------------|--------|
| Energy consumption per capita 1965                             | Kilgms. oil equiv.  | 140.0  |
| Energy consumption per capita 1987                             | Kilgms. oil equiv.  | 218.0  |
| Energy imports of merchandise exports 1965                     | Percent             | 5.0    |
| Energy imports of merchandise exports 1987                     | Percent             | 14.0   |
| Value added in manufacturing 1970                              | Million US\$        | 194.0  |
| Value added in manufacturing 1986                              | Million US\$        | 612.0  |
| Earnings per employee growth rate 1970-80                      |                     | 2.4    |
| Gross output per employee 1970 (1980=100)                      | Index               | 71.0   |
| Gross output per employee 1984 (1980=100)                      | Index               | 89.0   |
| Gross output per employee 1985 (1980=100)                      | Index               | 87.0   |
| <b>Average Annual Grwth Rate of Consumption and Investment</b> |                     |        |
| General Government Consumption (1965-80)                       | Percent             | 7.0    |
| General Government Consumption (1980-87)                       | Percent             | 3.2    |
| Private Consumption etc. (1965-80)                             | Percent             | 4.1    |
| Private Consumption etc. (1980-87)                             | Percent             | (0.7)  |
| Gross Domestic Investment (1965-80)                            | Percent             | 6.6    |
| Gross Domestic Investment (1980-87)                            | Percent             | 0.1    |
| <b>Distribution of GDP for:</b>                                |                     |        |
| General government consumption 1965                            | Percent             | 9.0    |
| General government consumption 1987                            | Percent             | 1.0    |
| Private consumption, etc. 1965                                 | Percent             | 79.0   |
| Private consumption, etc. 1987                                 | Percent             | 81.0   |
| Gross domestic investment 1965                                 | Percent             | 15.0   |
| Gross domestic investment 1987                                 | Percent             | 14.0   |
| Gross domestic savings 1965                                    | Percent             | 12.0   |
| Gross domestic savings 1987                                    | Percent             | 8.0    |
| Exports of goods & nonfactor services 1965                     | Percent             | 27.0   |
| Exports of goods & nonfactor services 1987                     | Percent             | 19.0   |
| Resource balance 1965  | Percent             | (2.0)  |
| Resource balance 1987  | Percent             | (6.0)  |
| <b>Share of total household consumption 1980-85</b>            |                     |        |
| Food total   | Percent             | 33.0   |
| Food, cereals and tubers                                       | Percent             | 12.0   |
| Clothing and footwear  | Percent             | 9.0    |
| Gross rents, fuel and power. (Total)                           | Percent             | 7.0    |
| Gross fuel and power   | Percent             | 2.0    |
| Medical care   | Percent             | 8.0    |
| Education  | Percent             | 5.0    |
| Transport and communication. Total                             | Percent             | 10.0   |
| Transport and communication. Motor cars                        | Percent             | 1.0    |
| Other consumption. Total                                       | Percent             | 28.0   |
| Other consumer durables  | Percent             | 7.0    |

| Description   | Units of<br>Measuremet | Amount |
|---|------------------------|--------|
| <b>Government Expenditures as Percent of Total Expenditures</b> |                        |        |
| Defense 1972  | Percent                | 6.6    |
| Defense 1987  | Percent                | 26.8   |
| Education 1972  | Percent                | 21.4   |
| Education 1987  | Percent                | 17.1   |
| Health 1972   | Percent                | 10.9   |
| Health 1987   | Percent                | 7.4    |
| Housing, amenities, social sec. & welfare 1972                  | Percent                | 7.6    |
| Housing, amenities, social sec. & welfare 1987                  | Percent                | 4.7    |
| Economic services 1972  | Percent                | 14.4   |
| Economic services 1987  | Percent                | 13.8   |
| Other 1972  | Percent                | 39.0   |
| Other 1987  | Percent                | 30.2   |
| Total expenditure (% of GNP 1972)                               | Percent                | 12.8   |
| Total expenditure (% of GNP 1987)                               | Percent                | 12.4   |
| Overall surplus/deficit of GNP 1972                             | Percent                | (1.0)  |
| Overall surplus/deficit of GNP 1987                             | Percent                | (0.4)  |
| <b>Total current revenue - Tax revenue</b>                      |                        |        |
| Taxes on income profit & capital gain 1972                      | Percent                | 15.2   |
| Taxes on income profit & capital gain 1987                      | Percent                | 21.4   |
| Social security contributions 1972                              | Percent                | 0.0    |
| Social security contributions 1987                              | Percent                | 0.0    |
| Domestic taxes on goods & services 1972                         | Percent                | 25.6   |
| Domestic taxes on goods & services 1987                         | Percent                | 41.1   |
| Taxes on international trade & transactions 1972                | Percent                | 36.1   |
| Taxes on international trade & transaction 1987                 | Percent                | 26.1   |
| Other taxes 1972  | Percent                | 17.2   |
| Other taxes 1987  | Percent                | 5.6    |
| Nontax revenue 1972   | Percent                | 6.0    |
| Nontax revenue 1987   | Percent                | 5.8    |
| Total current revenue of GNP 1972                               | Percent                | 11.6   |
| Total current revenue of GNP 1987                               | Percent                | 11.6   |
| <b>Monetary holdings, broadly defined:</b>                      |                        |        |
| Ave. annual nominal growth rate 1965-80                         | Percent                | 14.3   |
| Ave. annual nominal growth rate 1980-87                         | Percent                | 18.3   |
| Ave. outstanding of GDP 1965                                    | Percent                | 21.6   |
| Ave. outstanding of GDP 1980                                    | Percent                | 28.1   |
| Ave. outstanding of GDP 1987                                    | Percent                | 31.5   |
| Ave. annual inflation (GDP deflator) 1980-87                    | Percent                | 16.5   |
| Merchandise trade Exports 1987                                  | Million US\$           | 634.0  |
| Merchandise trade Imports 1987                                  | Million US\$           | 975.0  |
| Average annual growth rate Exports 1965-80                      | Percent                | 2.4    |
| Average annual growth rate Exports 1980-87                      | Percent                | (4.6)  |
| Average annual growth rate Imports 1965-80                      | Percent                | 2.7    |
| Average annual growth rate Imports 1980-87                      | Percent                | (0.7)  |
| Terms of trade (1980=100) 1985                                  |                        | 96.0   |
| Terms of trade (1980=100) 1987                                  |                        | 75.0   |

| Description   | Units of Measurement | Amount  |
|---|----------------------|---------|
| <b>Share of merchandise imports for:</b>                                    |                      |         |
| Food 1965   | Percent              | 15.0    |
| Food 1987   | Percent              | 12.0    |
| Fuels 1965  | Percent              | 5.0     |
| Fuels 1987  | Percent              | 8.0     |
| Other primary commodities 1965  | Percent              | 4.0     |
| Other primary commodities 1987  | Percent              | 4.0     |
| Machinery and transport equipment 1965                                      | Percent              | 28.0    |
| Machinery and transport equipment 1987                                      | Percent              | 20.0    |
| Other manufactures 1965   | Percent              | 48.0    |
| Other manufactures 1987   | Percent              | 56.0    |
| <b>Share of merchandise exports for:</b>                                    |                      |         |
| Fuels, minerals, and metals 1965  | Percent              | 2.0     |
| Fuels, minerals, and metals 1987  | Percent              | 3.0     |
| Other primary commodities 1965  | Percent              | 81.0    |
| Other primary commodities 1987  | Percent              | 66.0    |
| Machinery and transport equipment 1965                                      | Percent              | 1.0     |
| Machinery and transport equipment 1987                                      | Percent              | 3.0     |
| Other manufactures 1965   | Percent              | 16.0    |
| Other manufactures 1987   | Percent              | 28.0    |
| Textiles and clothing 1965  | Percent              | 6.0     |
| Value of imports of manufactures by origin 1967                             | Million US\$         | 1.0     |
| Value of imports of manufactures by origin 1987                             | Million US\$         | 89.0    |
| <b>Current account balance :</b>  |                      |         |
| After official transfer 1970  | Million US\$         | 9.0     |
| After official transfer 1987  | Million US\$         | 127.0   |
| Before official transfer 1970   | Million US\$         | 7.0     |
| Before official transfer 1987   | Million US\$         | (196.0) |
| Net direct private investment 1970  | Million US\$         | 4.0     |
| Net direct private investment 1987  | Million US\$         | (41.0)  |
| Gross international reserves 1970   | Million US\$         | 64.0    |
| Gross international reserves 1987   | Million US\$         | 413.0   |
| Gross intl. reserve of import coverage 1987                                 | In months            | 3.7     |
| <b>Net disbursement of Official Development Assistance from all sources</b> |                      |         |
| During 1981   | Million US\$         | 167.0   |
| During 1982   | Million US\$         | 218.0   |
| During 1983   | Million US\$         | 290.0   |
| During 1984   | Million US\$         | 261.0   |
| During 1985   | Million US\$         | 345.0   |
| During 1986   | Million US\$         | 341.0   |
| During 1987   | Million US\$         | 426.0   |
| Per capita 1987   | US\$                 | 86.4    |
| As % of GNP 1987  | Percent              | 9.0     |

| Description  | Units of<br>Measuremet | Amount  |
|--|------------------------|---------|
| Long term debt public & publicly guaranteed 1970         | Million US\$           | 88.0    |
| Long term debt public & publicly guaranteed 1987         | Million US\$           | 1,597.0 |
| Long term debt private nonguaranteed 1970                | Million US\$           | 88.0    |
| Long term debt private nonguaranteed 1987                | Million US\$           | 70.0    |
| Use of IMF credit 1970                                   | Million US\$           | 7.0     |
| Use of IMF credit 1987                                   | Million US\$           | 6.0     |
| Short term debt 1987                                     | Million US\$           | 89.0    |
| Total external debt 1987                                 | Million US\$           | 1,762.0 |
| Disbursements public & publicly guaranteed 1970          | Million US\$           | 8.0     |
| Disbursements public & publicly guaranteed 1987          | Million US\$           | 120.0   |
| Disbursements private nonguaranteed 1970                 | Million US\$           | 24.0    |
| Repayment principal public & publicly guat. 1970         | Million US\$           | 6.0     |
| Repayment principal public & publicly guat. 1987         | Million US\$           | 106.0   |
| Repayment principal private nonguaranteed 1970           | Million US\$           | 16.0    |
| Repayment principal private nonguaranteed 1987           | Million US\$           | 14.0    |
| Net flow public & publicly guaranteed 1970               | Million US\$           | 2.0     |
| Net flow public & publicly guaranteed 1987               | Million US\$           | 14.0    |
| Net flow private nonguaranteed 1970                      | Million US\$           | 8.0     |
| Net flow private nonguaranteed 1987                      | Million US\$           | (14.0)  |
| <b>Total long-term debt disbursed &amp; outstanding:</b> |                        |         |
| During 1970  | Million US\$           | 176.0   |
| During 1987  | Million US\$           | 1,667.0 |
| As % of GNP 1970   | Percent                | 17.3    |
| As % of GNP 1987   | Percent                | 36.0    |
| Total interest payment on long-term debt 1970            | Million US\$           | 9.0     |
| Total interest payment on long-term debt 1987            | Million US\$           | 76.0    |
| <b>Total Lon-Term Debt Service</b>                       |                        |         |
| As a % of GNP 1970                                       | Percent                | 3.1     |
| As a % of GNP 1987                                       | Percent                | 4.2     |
| As a % of export goods & services 1970                   | Percent                | 12.0    |
| As % of export goods & services 1987                     | Percent                | 21.0    |
| <b>External public debt outstanding &amp; disbursed:</b> |                        |         |
| During 1970  | Million US\$           | 88.0    |
| During 1987  | Million US\$           | 1,597.0 |
| Of GNP 1970  | Percent                | 8.6     |
| Of GNP 1987  | Percent                | 34.5    |
| Interest payments on external public debt 1970           | Million US\$           | 4.0     |
| Interest payments on external public debt 1987           | Million US\$           | 74.0    |
| Debt service of GNP 1970                                 | Percent                | 0.9     |
| Debt service of GNP 1987                                 | Percent                | 3.9     |
| Debt service exports of goods & serv. 1970               | Percent                | 3.6     |
| Debt service export of goods & serv. 1987                | Percent                | 19.4    |

| Description   | Units of<br>Measuremet | Amount  |
|---|------------------------|---------|
| <b>External public borrowing:</b>                     |                        |         |
| Commitments 1970                                      | Million US\$           | 12.0    |
| Commitments 1987                                      | Million US\$           | 221.0   |
| Average interest rate 1970                            | Percent                | 4.7     |
| Average interest rate 1987                            | Percent                | 5.1     |
| Average maturity 1970                                 | Years                  | 23.0    |
| Average maturity 1987                                 | Years                  | 26.0    |
| Average grace period 1970                             | Years                  | 6.0     |
| Average grace period 1987                             | Years                  | 7.0     |
| Public loans with var. int. rates of pub. debt 1987   | Percentage             | 5.7     |
| <b>Average annual growth of population :</b>          |                        |         |
| During 1965-80  | Percent                | 2.7     |
| During 1980-87  | Percent                | 1.2     |
| During 1987-2000                                      | Percent                | 2.1     |
| <b>Population</b>                                     |                        |         |
| During 1987   | Millions               | 5.0     |
| During 2000   | Millions               | 6.0     |
| During 2025   | Millions               | 10.0    |
| Hypothetical size of statonary population             | Millions               | 15.0    |
| Current birth rate per 1000 population 1965           | Per 1000               | 47.0    |
| Current birth rate per 1000 population 1987           | Per 1000               | 36.0    |
| Crude death rate per 1000 population 1965             | Per 1000               | 14.0    |
| Crude death rate per 1000 population 1987             | Per 1000               | 8.0     |
| Percent of Women of childbearing age 1965             | Percent                | 44.0    |
| Percent of Women of childbearing age 1987             | Percent                | 45.0    |
| Total fertility rate 1965                             | Total                  | 6.7     |
| Total fertility rate 1987                             | Total                  | 4.9     |
| Total fertility rate 2000                             | Total                  | 3.8     |
| Married women childbearing age using contr. 1987      | Percent                | 48.0    |
| Population per physician 1984                         |                        | 2,830.0 |
| Population per nursing person (1965)                  |                        | 1,300.0 |
| Population per nursing person (1984)                  |                        | 930.0   |
| Daily calorie supply 1965                             | Per capita             | 1,859.0 |
| Daily calorie supply 1986                             | Per capita             | 2,160.0 |
| Babies with low birth weights 1985                    | Percent                | 15.0    |
| <b>Percentage of age group enrolled in education:</b> |                        |         |
| Primary total 1965                                    | Percent                | 82.0    |
| Primary total 1986                                    | Percent                | 70.0    |
| Secondary total 1965                                  | Percent                | 17.0    |
| Secondary total 1986                                  | Percent                | 24.0    |
| Tertiary total 1965                                   | Percent                | 2.0     |
| Tertiary total 1986                                   | Percent                | 14.0    |

| Description  | Units of Measurement | Amount |
|--|----------------------|--------|
| Share of households income, by percentile groups of households during 1976-77: |                      |        |
| Lowest 20 percent  | Percent              | 5.5    |
| Second quintile  | Percent              | 10.0   |
| Third quintile   | Percent              | 14.8   |
| Fourth quintile  | Percent              | 22.4   |
| Highest 20 percent   | Percent              | 47.3   |
| Highest 10 percent   | Percent              | 29.5   |
| Urban population of total population 1965                                      | Percent              | 39.0   |
| Urban population of total population 1987                                      | Percent              | 44.0   |
| Urban pop. average annual growth rate 1965-80                                  | Percent              | 3.2    |
| Urban pop. average annual growth rate 1980-87                                  | Percent              | 1.9    |
| Urban population in largest city 1960  | Percent              | 26.0   |
| Urban population in largest city 1980  | Percent              | 22.0   |
| Life expectancy at birth female 1965   | Years                | 56.0   |
| Life expectancy at birth female 1987   | Years                | 67.0   |
| Life expectancy at birth male 1965   | Years                | 52.0   |
| Life expectancy at birth male 1987   | Years                | 58.0   |
| Births attended by health staff 1985   | Per cent             | 35.0   |
| Maternal mortality 1980  | Per 100,000 l.b.     | 74.0   |
| Infant mortality 1965  | Per 1000 l.b.        | 122.0  |
| Infant mortality 1987  | Per 1000 l.b.        | 59.0   |

Source: The World Bank, "World Development Report 1989." USA: Oxford University Press, 1990. pp. 164-226.

## 2. SUSTAINABLE AGRICULTURE

The term "sustainable agriculture" is associated with farming practices that maintain or enhance soil productivity. However, in the context of this report, sustainable agriculture is also associated with the appropriate use of land at the highest productivity possible without degrading it. The best way to protect land is through preservation in national parks. However, land must also feed and provide resources to a growing population. This need is most critical in a country with a high population density like El Salvador.

Thus, one must examine not only soil conservation, but also land capabilities. Maximizing the use of land while maintaining its productivity will increase income, thus contributing to reduction of population pressures on the scarce natural resources. For example, a highly productive piece of pastureland that is being grazed extensively is probably being misused. That same piece of land would yield higher benefits if planted with a high-yielding, labor-intensive cash crop. Besides generating a greater return to the economy, it would contribute to a more equitable income distribution.

Forestry, water management, and biological diversity are also integral parts of sustainable agriculture. However, given their importance, they are treated in separate chapters. The issues relevant to sustainable agriculture have been grouped into land utilization and soil fertility, land tenure, and pesticide management.

Policies can be formal (laws, decrees, resolutions, and regulations) or informal (de facto). The study treats both kinds of policies, according to their impact on the natural resources. In the theme of sustainable agriculture defacto policies predominate over formal ones. This is so because in sustainable agriculture there are more dynamic policies that change continuously, such as macroeconomic policies.

### 2.1 Land Utilization and Soil Fertility

Land use capability is defined as the most intensive use that a piece of land can sustain continuously without being degraded. This capability can then be compared with actual land use to determine whether a particular piece of land is being degraded through overuse or could be utilized more intensively. Both situations occur in El Salvador. The first (overuse), estimated to occur on over 46 percent of the land area in El Salvador, causes direct degradation. The second (underuse) characterizes about 30 percent of the land area. While ostensibly contributing to land conservation, it also favors overall deterioration. Low use of high capability soils contributes to a decline in the income of the entire population. In addition, small farmers are forced to deforest the land and farm on steep hills in the absence of alternative employment.

The U.S. Soil Conservation Service developed a "land use capability classification" that has been adapted in many countries, including El Salvador. Soils have been divided into capability classes broadly defined from Class I to

Class VIII. The first four are suited for cultivation, while the last four are not. Land considered suitable for cultivation is workable. Class I land has the widest range of possibilities and can be farmed easily. The use of land in the other classes is progressively more restricted because of permanent limitations.<sup>1</sup>

This soil classification system does not consider climatic factors. Temperature, wind, rainfall, and other climatic factors also limit land use. Thus, agro-climatic zones must be established that integrate the soil classes with climate data to determine homogeneous areas for cultivation purposes. This has not been done in El Salvador.

Studies by non-agriculturists commonly assume that land use can be easily shifted from one commodity to another. However, an analysis of soil classes indicates that this conclusion is unfounded. Exhibit 2.1 has been included to provide a description of soil classes. Exhibit 2.2 provides a breakdown of land classes in El Salvador. They indicate that 34 percent (690,000 hectares) of the land in El Salvador is suitable for cultivation, and 66 percent (1.3 million hectares) is not.

Actual land use in El Salvador generally corresponds well to land capability classes (Exhibit 2.3). However, many areas are planted with unsuitable crops, even though the global figures indicate otherwise. Note the shifts in land use from 1978/79 to 1987/88, after the war began. Area in crops dropped from 668,000 hectares to 593,000. Area in livestock increased from 522,000 hectares to 573,000.

The 1985 "Perfil Ambiental-Estudio de Campo de El Salvador" indicated that forests occupied land in Classes V, VI and VII. Furthermore, the study indicated that some Class VIII land was used for extensive grazing and primitive cropping of corn and sorghum. Most coffee was planted in land Classes III, IV, VI and VII, and some in Classes I and II.<sup>2</sup>

The physical and chemical properties of soils required for sustainable agriculture depend on soil topography, soil characteristics, and climatic factors. Soil degradation processes induced by climate include land slides, water and wind erosion, soil salinization, chemical degradation (lixiviation, acidification), physical degradation (structural changes, soil compacting), and biological degradation. Chemical degradation can be a consequence of contamination with residues of agricultural control activities, such as the addition of inadequate fertilizers and pesticides.

Soil management in a hot humid climate as in El Salvador is a very difficult task. Many physical, chemical, and biological activities occur very rapidly.

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<sup>1</sup>J.H. Stallings, *Soil Conservation*. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1957. p. 427.

<sup>2</sup>USAID/El Salvador, "El Salvador, Perfil Ambiental, Estudio de Campo." San Salvador, El Salvador: U.S.A.I.D. Contrato No. 519-0167-C-00-2039-00. Abril 1985.

EL SALVADOR - NATURAL RESOURCE POLICY INVENTORY

Exhibit 2.1. Description of Land Capability Classes

| Class                               | Description  |
|-------------------------------------|--|
| <b>Soils Suited For Cultivation</b> |  |
| I                                   | Soils in Class I have no, or only slight, permanent limitations or risks of damage. They are very good. They can be cultivated safely with ordinary good farming methods. The soils are deep, productive, easily worked, and nearly level. They are not subject to overflow damage. However, they are subject to fertility and puddle erosion. Class I soils used for crops need practices to maintain soil fertility and soil structure. These practices involve use of fertilizers and lime, cover and green manure crops, crop residues, and crop rotations.  |
| II                                  | Class II consists of soils subject to moderate limitations in use. They are subject to moderate risk of damage. They are good soils. They can be cultivated with easily applied practices. Soils in Class II differ from soils in Class I in a number of ways. They differ mainly because they have gentle slopes, are subject to moderate erosion, are of moderate depth, are subject to occasional overflows, and are in need of drainage. Each of these factors requires special attention. These soils may require special practices such as soil-conserving rotations, water-control devices, or special tillage methods. They frequently need a combination of practices.  |
| III                                 | Soils in Class III are subject to severe limitations in use for cropland. They are subject to severe risks or damage. They are moderately good soils. They can be used regularly for crops, provided they are planted to good rotations and given the proper treatment. Soils in this class have moderately steep slopes, are subject to more severe erosion, and are inherently low in fertility. Class III soil is more limited or subject to greater risks than Class II. These limitations often restrict the choice of crops or the timing of planting and tillage operations. These soils require cropping systems that produce adequate plant cover. The cover is needed to protect the soil from erosion. It also helps preserve soil structure. Hay or other sod crops should be grown instead of cultivated row crops. A combination of practices is needed to farm the land safely. |
| IV                                  | Class IV is composed of soils that have very severe permanent limitations or hazards if used for cropland. The soils are fairly good. They may be cultivated occasionally if handled with great care. For the most part, they should be kept in permanent hay or sod. Soils in Class IV have unfavorable characteristics. They are frequently on steep slopes and subject to severe erosion. They are restricted in their suitability for crop use. They should usually be kept in hay or pasture, although a grain crop may be grown once in five or six years. In other cases, the soils may be shallow or only moderately   |

Exhibit 2.1. Description of Land Capability Classes, Continued.

| Class | Description   |
|-------|---|
|       | deep, low in fertility, and on moderate slopes. These soils should be in hay or sod crops for long periods. Only occasionally should they be planted to row crops.  |
|       | <b>Soils Not Suited For Cultivation</b>   |
|       | The soils in the last four classes are not suited for cultivation. They should be kept in permanent vegetation where possible.  |
| V     | Soils in Class V should be kept in permanent vegetation. They should be used for pasture or forestry. They have few or no permanent limitations and not more than slight hazards. Cultivation is not feasible, however, because of wetness, stoniness, or other limitations. The land is nearly level. It is subject to only slight erosion by wind or water if properly managed. Grazing should be regulated to keep from destroying the plant cover.  |
| VI    | Class VI soils should be used for grazing and forestry, and may have moderate hazards when in this use. They are subject to moderate permanent limitations, and are unsuited for cultivation. They are steep, or shallow. Grazing should not be permitted to destroy the plant cover. Class VI land is capable of producing forage or woodland products when properly managed. If the plant cover has been destroyed, the soil's use should be restricted until cover is re-established. As a rule Class VI land is either steeper or more subject to wind erosion than Class IV. |
| VII   | Soils in Class VII are subject to severe permanent limitations or hazard when used for grazing or forestry. They are steep, eroded, rough, shallow, droughty, or swampy. They are fair to poor for grazing or forestry, and must be handled with care. Where rainfall is ample, Class VII land should be used for woodland. In other areas, it should be used for grazing. In the latter case, strict management should be applied.   |
| VIII  | Soils in Class VIII are rough even for woodland or grazing. They should be used for wildlife, recreation, or watershed uses.  |

Source: J. H. Stallings, *Soil Conservation*. Englewood Cliffs, N. J.: Prentice - Hall, Inc. 1957. pp. 427-431.

EL SALVADOR - NATURAL RESOURCE POLICY INVENTORY

Exhibit 2.2. Land Classes, 1981.

| Land Class   | Area             |             | Sub-Totals       |                | Observations               |
|--------------|------------------|-------------|------------------|----------------|----------------------------|
|              | Has.             | %           | Has.             | %              |                            |
| I            | 13,733           | 0.67%       |                  |                |                            |
| II           | 105,986          | 5.18%       |                  |                |                            |
| III          | 237,471          | 11.60%      |                  |                |                            |
| IV           | 332,861          | 16.26%      | 690,050          | 33.71%         | Suited for Cultivation     |
| V            | 45,585           | 2.23%       |                  |                |                            |
| VI           | 200,996          | 9.82%       |                  |                |                            |
| VII          | 856,644          | 41.85%      |                  |                | Not Suited for Cultivation |
| VIII         | 253,587          | 12.39%      | 1,356,812        | 66.29%         |                            |
| <b>Total</b> | <b>2,046,862</b> | <b>100%</b> | <b>2,046,862</b> | <b>100.00%</b> |                            |

Source: USAID/EL SALVADOR, El Salvador, Perfil Ambiental, Estudio de Campo." San Salvador, El Salvador: U.S.A.I.D. Contrato No. 519-0167-C-00-2039-00. Abril 1985. p. 53.

Exhibit 2.3 Patterns Of Land Use, 1970 to 1987/88 (Has.)

| Description                   | 1970           | 1977/78        | 1978/79        | 1987/88        |
|-------------------------------|----------------|----------------|----------------|----------------|
| <b>CROP AGRICULTURE</b>       | <b>631.9</b>   | <b>656.1</b>   | <b>668.4</b>   | <b>592.9</b>   |
| Annual crops                  | 428.7          | 385.9          | 407.5          | 343.6          |
| Semi-permanent crops          | 38.7           | 52.2           | 42.4           | 44.9           |
| Permanent crops               | 164.5          | 218.0          | 218.5          | 204.4          |
| <b>LIVESTOCK</b>              | <b>664.9</b>   | <b>522.4</b>   | <b>522.4</b>   | <b>573.8</b>   |
| Improved pastures             | 114.6          | 129.8          | 131.8          | 160.7          |
| Natural pastures              | 550.4          | 393.6          | 390.6          | 413.1          |
| <b>FORESTLAND</b>             | <b>250.3</b>   | <b>250.0</b>   | <b>260.9</b>   | <b>249.1</b>   |
| <b>NON-AGRICULTURAL LANDS</b> | <b>552.9</b>   | <b>666.6</b>   | <b>652.4</b>   | <b>688.1</b>   |
| <b>TOTAL</b>                  | <b>2,100.0</b> | <b>2,095.1</b> | <b>2,104.1</b> | <b>2,103.9</b> |

Note: The non agricultural lands include lands with agricultural potential that are abandoned or never were used, as well as lands with no agricultural potential. In 1987/88, it was estimated that only 14.4% of the non-agricultural lands had no agricultural potential.

Source: Ministerio de Agricultura: Direccion General de Economia Agropecuaria; Oficina Sectorial de Planificacion Agropecuaria: y el Centro de Recursos Naturales

From: Mirna Lievano and Roger D. Norton, "Food Imports, Agricultural Policies and Agricultural Development in El Salvador, 1960-1987." Report submitted to USAID/El Salvador Washington D.C.: Robert R. Nathan Associates, June 1988.

Thus, land use and soil management are key elements in maintaining the productivity of soils. In El Salvador, inadequate land use and soil management have been the greatest contributors to soil degradation.

Land has been misused both through inappropriate crops for the type of soil and slopes and inappropriate cropping patterns and practices for the soil and slope conditions.

The reasons for the inappropriate use of land are as follows:

- o Population pressure over the limited land base of El Salvador;
- o Highly skewed land distribution, forcing small farmers into planting tillage-intensive crops on the hillsides;
- o Inadequate extension services to educate these farmers about appropriate crop and cultivation practices for different soil types;
- o Inadequate policies affecting the farm gate price (price paid to farmers differs from the "real price" in economic terms); and
- o Lack of land use planning.

According to soil fertility experts, soils are poorly managed in El Salvador. The physical characteristics are studied, but chemical characteristics are seldom considered objectively, and biological aspects are usually ignored.

Nearly 50 percent of farmers in El Salvador have no formal education, over 80 percent are functionally illiterate, and only 6.5 percent received technical assistance in 1988.<sup>1</sup> The low levels of education and technical assistance explain some of the soil degradation and erosion observed in El Salvador.

Even though the area in pastureland has increased, livestock production accounted for 12.4 percent of the decline in agriculture output.<sup>2</sup> Pasture is found both in areas that can be farmed intensively and areas that are suited only for pasture. However, livestock production is still carried out using extensive land use patterns, because it is cheap, requires little technology and effort, and is less vulnerable to sabotage (a frequent problem during the 10-year war). Unfortunately, it is also very wasteful of land resources and has low productivity, requiring even less labor than intensive practices. A total of

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<sup>1</sup>Samuel A. McReynolds, Thomas M. Johnston, Peter H. Gore, and Joe D. Francis, "The 1989 El Salvador Agricultural Land Use and Land Tenure Study." Washington, D.C.: National Cooperative Business Center, November 1989. p. i.

<sup>2</sup>Mirna Liévano de la Torre and Roger D. Norton, "Food Imports, Agricultural Policies and Agricultural Development in El Salvador, 1960-1987." Report submitted to USAID/El Salvador. Washington D.C.: Robert R. Nathan Associates. June 1988. p. 2-15.

62.5 percent of the irrigated area is under pasture.<sup>1</sup> Most of the area under irrigated pasture probably could be dedicated to other more productive crops.

Besides livestock, the two major commodities that contributed to a decline in agricultural output were cotton, which dropped 40 percent, and coffee which dropped 35 percent (Exhibit 2.4).<sup>2</sup> Coffee has declined from a high of 265,800 manzanas in 1982 to 234,000 in 1986, and cotton from 150,000 manzanas to 18,000 in 1988/89.<sup>3</sup> Rice planted was reduced from 24,000 manzanas in 1980 to 16,700 in 1987/88.<sup>3</sup>

In addition to the reduction in area planted or harvested, coffee yields have been reduced from 13.5 quintals per manzana in 1985 to 10.8 quintals in 1989. Coffee production went from 3.2 million quintals in 1985 to 2.5 million in 1989, revealing the negative impact of policies on coffee investments.<sup>4</sup>

As indicated by Liévano and Norton (1988), macroeconomic and sectoral policies are responsible for the performance of the agricultural sector. They also point out that new agricultural investment has dropped sharply in El Salvador.

Two additional aspects of land use rarely considered in El Salvador are complementarity and efficiency--that is, the role of forests and protected watersheds that allow for irrigation in the dry season when the highest yields are obtained. Efficient use of land is seldom considered for credits, tax exemptions, and other incentives, which leads to poor land management and inappropriate investments.

In summary, the major land use and soil fertility issues in El Salvador are low productivity in the agricultural and livestock sector, a decline in agricultural investment, and land used for other than its optimal use.

### 2.1.1 Policy Framework

Many policies contribute to the present state of land use and soil fertility in El Salvador. Some are external in nature (transnational), but most

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<sup>1</sup>Dirección General de Riego y Drenaje, "Diagnóstico de la Situación Actual del Riego en El Salvador". Presentado ante el, "Seminario Para la Revisión de La Situación Jurídica del Riego en El Salvador," celebrado en San Salvador del 3 al 4 de abril, 1990.

<sup>2</sup>Mirna Liévano de la Torre and Roger D. Norton, "Food Imports, Agricultural Policies and Agricultural Development in El Salvador, 1960-1987." Report submitted to USAID/El Salvador. Washington D.C.: Robert R. Nathan Associates. June 1988. p. 15

<sup>3</sup>Data for latter years are taken from Ministerio de Agricultura y Ganadería, Dirección General de Economía Agropecuaria, "Anuario de Estadísticas Agropecuarias 1988-1989." San Salvador, El Salvador: MAG, Edición 28.

<sup>4</sup>Banco Central de Reserva de El Salvador, "Presupuesto Monetario 1990." San Salvador, El Salvador: Working Document.

**EL SALVADOR-NATURAL RESOURCE POLICY INVENTORY**

**Exhibit 2.4 Area Planted For Some Major Crops, 1967-1986,**

**(thousand manzanas)**

| Year | Coffee | Cotton | Sugar<br>cane | Corn  | Beans | Rice | Sor-<br>ghum | Sesame | Tobacco | Kenaf |
|------|--------|--------|---------------|-------|-------|------|--------------|--------|---------|-------|
| 1967 | 206.0  | 67.8   | 37.1          | 270.9 | 42.9  | 40.0 | 148.4        | 2.9    | 1.2     | 2.3   |
| 1968 | 206.0  | 75.0   | 37.4          | 285.4 | 45.3  | 39.0 | 162.5        | 7.4    | 0.9     | 3.3   |
| 1969 | 206.0  | 81.6   | 34.8          | 276.8 | 45.9  | 15.3 | 162.6        | 2.1    | 1.1     | 3.7   |
| 1970 | 207.0  | 92.8   | 35.0          | 298.2 | 51.2  | 17.0 | 177.4        | 1.9    | 1.6     | 2.7   |
| 1971 | 209.0  | 88.3   | 41.4          | 298.9 | 56.4  | 20.9 | 180.0        | 2.2    | 1.8     | 3.0   |
| 1972 | 212.0  | 111.9  | 47.7          | 298.8 | 56.9  | 15.7 | 186.4        | 1.5    | 1.7     | 2.5   |
| 1973 | 217.0  | 127.3  | 49.5          | 289.4 | 64.2  | 13.6 | 170.0        | 2.7    | 1.5     | 2.8   |
| 1974 | 217.0  | 130.7  | 46.6          | 302.9 | 76.0  | 15.9 | 182.0        | 2.0    | 2.4     | 2.0   |
| 1975 | 220.0  | 128.2  | 56.6          | 351.2 | 78.5  | 24.2 | 189.1        | 4.1    | 2.6     | 3.6   |
| 1976 | 224.0  | 115.9  | 50.1          | 334.5 | 75.5  | 19.7 | 178.5        | 3.5    | 2.8     | 3.1   |
| 1977 | 239.0  | 122.8  | 50.8          | 349.8 | 75.1  | 17.8 | 188.8        | 2.4    | 2.8     | 3.2   |
| 1978 | 265.8  | 150.1  | 60.4          | 379.9 | 74.8  | 19.9 | 195.4        | 5.3    | 3.4     | 4.0   |
| 1979 | 265.8  | 127.8  | 50.7          | 394.1 | 79.0  | 21.1 | 205.0        | 4.8    | 3.7     | 0.9   |
| 1980 | 265.8  | 112.9  | 45.0          | 417.3 | 73.6  | 24.0 | 170.7        | 18.7   | 3.4     | 0.6   |
| 1981 | 265.8  | 78.6   | 41.0          | 396.6 | 71.3  | 19.8 | 165.0        | 17.5   | 3.4     | 0.9   |
| 1982 | 265.8  | 70.7   | 45.3          | 341.0 | 79.4  | 16.0 | 170.0        | 15.0   | 3.5     | 0.7   |
| 1983 | 251.0  | 70.2   | 48.0          | 344.9 | 80.4  | 18.0 | 158.0        | 5.8    | 3.7     | 0.7   |
| 1984 | 246.1  | 55.0   | 58.4          | 347.8 | 82.5  | 21.9 | 166.0        | 5.8    | 3.7     | 0.7   |
| 1985 | 239.1  | 49.5   | 56.3          | 361.9 | 82.8  | 24.7 | 163.4        | 5.8    | 3.9     | 0.8   |
| 1986 | 234.2  | 25.6   | 59.1          | 368.0 | 87.0  | 17.2 | 171.5        | 6.7    | 3.9     | 0.8   |

Source: Central Bank of Reserve

From: Mirna Lievano and Roger D. Norton, "Food Imports, Agricultural Policies and Agricultural Development in El Salvador, 1960-1987." Report Submitted to USAID/ El Salvador. Washington D.C.: Robert R. Nathan Associates, June 1988.

are internal. Only the major policies affecting land use are mentioned here.

Exhibit 2.5 summarizes the policies affecting land use and soil fertility issues. The analysis section synthesizes the major policies affecting land use in El Salvador. They have been organized into transnational, macroeconomic, sectoral, and specific categories.

Transnational and regional policies extend beyond the territorial frontier, as in the case of the International Coffee Agreement. This policy has influenced world coffee prices and to some extent limited the expansion of coffee areas in El Salvador.

Another major international influence on land use is the financing policies of international organizations. The International Monetary Fund (IMF), the World Bank, and the Interamerican Development Bank (IDB), for example, have imposed policy conditionalities on the disbursement of funds. These financing policies have affected the country's macroeconomic policies. Due to the financing of questionable projects in the past, the country is immersed in large debts. The total external debt of El Salvador was \$1.7 billion in 1987. Of this amount, \$1.6 billion was long-term debt, with a yearly interest payment of \$76 million. The interest payments alone represented 4.2 percent of GNP and 21 percent of total exports of goods and services in 1987.<sup>1</sup> This drain and liability limits the country's capacity to invest in development projects.

In the conflict that has dominated the last 10 years of El Salvador's history, policies of some foreign governments and international organizations have had an important influence on relocating people affected by the war. Especially important have been the policies of the United Nations High Commission for Refugees, which has helped thousands of people relocate in neighboring countries. At present the Commission is investing in projects to bring these people back to El Salvador and provide them with productive employment.

Macroeconomic policies are directed to the economy in general and are classified into monetary, fiscal, and trade. The present Government outlined its economic policy in the document, "Plan de Desarrollo Económico y Social 1989-1994" (Economic and Social Development Plan 1989-1994).<sup>2</sup> The plan consists of a policy package with two global objectives: "(1) to create the conditions to achieve a robust and sustained economic growth; and (2) to increase the welfare and quality of life for the entire population, especially those who live in extreme poverty."<sup>3</sup> El Salvador's previous Government nationalized the entire banking system. The present Government is in the process of privatizing it and

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<sup>1</sup>The World Bank, "World Development Report 1989." Washington, D.C.: Oxford University Press, 1990. Table 23.

<sup>2</sup>Ministerio de Planificación y Coordinación del Desarrollo Económico y Social, Plan de Desarrollo Económico y Social 1989-1994. San Salvador, El Salvador: Ministerio de Planificación y Coordinación del Desarrollo Económico y Social.

<sup>3</sup>Ibid, p.1.

**EL SALVADOR - NATURAL RESOURCE POLICY INVENTORY**

**Exhibit 2.5 Policies Related to Land Use and Soil Fertility, by Type, 1990.**

| <b>Type of Policy</b>                   |                                       |                             |  |
|---|---------------------------------------|-----------------------------|--|
| <b>Transnational</b>                    | <b>Macroeconomic</b>                  | <b>Sectoral</b>             | <b>Specific</b>  |
| - <b>International Coffee Agreement</b> | - <b>Monetary - Money Supply</b>      | - <b>Price Policy</b>       | - <b>Parks and Reserves</b>  |
| - <b>Sugar quotas</b>                   | - <b>Monetary - Credit</b>            | - <b>Price band</b>         | - <b>Decree 89 of 9-63, Regulation of the cotton crop</b>                  |
| - <b>Subsidies in other countries</b>   | - <b>Monetary - Foreign Exchange</b>  | - <b>Development Policy</b> | - <b>Decree 207 of 11-8-78 Reform to the regulation of the cotton crop</b> |
| - <b>Investment projects</b>            | - <b>Fiscal - Budget Deficit</b>      | - <b>Population Policy</b>  |  |
| - <b>Policy dialogue</b>                | - <b>Fiscal - Property Tax</b>        | - <b>Education policy</b>   |  |
|   | - <b>Fiscal - Export Taxes</b>        | - <b>Research</b>           |  |
|   | - <b>Trade - Export Promotion Law</b> | - <b>Extension</b>          |  |
|   |                                       | - <b>Ag Development</b>     |  |
|   |                                       | - <b>Rural Roads</b>        |  |

adopting measures to increase internal savings and provide stability in the monetary system. The measures include modification and simplification of interest rates, improvement of the loan portfolio, improvement of the supervisory capacity of the regulatory institutions, and simplification of liquidity requirements.

A major stabilizing measure is a reduction in the growth of the money supply. A tight money supply reduces credit availability to higher risk activities such as agriculture. However, the Government has adopted measures to provide credit lines to agricultural products at subsidized interest rates. Interest rates for agricultural loans vary from 17 to 22 percent a year. Annual inflation is estimated at above 20 percent. There are intentions to increase interest rates, but politics has constrained Government actions, especially since the military offensive in November 1989.

The Government is in the process of liberalizing the foreign exchange market, allowing market forces to determine prices. Exchange offices were authorized to begin operation on July 1, 1990, which has contributed to reducing the exchange rate to about 7.70 colones per U.S. dollar.

Fiscal policies are often used to correct the difference between private and social costs or economic externalities. However, they have not been considered in designing the fiscal policies in El Salvador.

The complex economic and social problems of the country have contributed to the war, which has used a large proportion of government income. Operating with large deficits, the Government has reduced credit availability for private investment. It has also put pressure on foreign exchange stability.

Trade policies on procedures, tariffs, taxes, and foreign exchange conversion have been restrictive and skewed against agriculture. Nominal and effective protection rates for agriculture and industry indicated that unequal and excessive tariffs protected industrial production, while agricultural production was subject to negative protection rates.<sup>1</sup> The Government also intervened directly in the commerce of certain commodities, such as coffee.

The Government is adopting a new trade policy to establish conditions for free trade of exports by the private sector along with a simplification of export procedures. The 1989-94 Government plan says, "The trade policy will be oriented towards providing simple, uniform and transparent systems through a gradual reduction of tariffs, customs procedures, payment systems, regulations and other trade barriers."<sup>2</sup>

An export promotion law provides incentives for exporters through exemptions on both import duties and income and capital gains taxes. The size

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<sup>1</sup>USAID, "Statement of Work for an Assessment of the Impact of Recent Policy Changes on Agriculture in El Salvador." San Salvador, El Salvador: USAID/El Salvador.

<sup>2</sup>Ministerio de Planificación y Coordinación del Desarrollo Económico y Social, "Plan de Desarrollo Económico y Social 1989-1994." San Salvador, El Salvador, 1989. p.11.

of the exemption varies according to the percent of production exported. The higher the percent of exports, the higher the exemption.

Sectoral policies are those directed toward a sector in general, such as agriculture or education. In agriculture the policies that most influence land use and soil fertility apply to price, research, extension, and agricultural development.

Agriculture price policies were skewed to supporting consumers at the expense of producers, since prices of major agricultural products were controlled. Controls kept prices below the relative international prices. The present Government has eliminated some price controls and established a price band mechanism for basic grains to reduce seasonal price fluctuations. However, the band is tied to international price fluctuations.

The research policy has been very flexible, with both the public and private sectors conducting research. Various specialized institutions conduct public sector research although CENTA does most of the agriculture production research and ISIC does most of the research on coffee. There are more research results on export crops (cotton, sugar cane, and coffee) than on food crops for local consumption (corn, bean, rice, and sorghum). CENTA also produces seed for certain crops and supervises the certification process for seed produced by private firms.<sup>1</sup>

The Government wants to change this flexible policy by privatizing most of the research activities and giving CENTA administrative independence. It also contemplates modifying the activities of CENTA to make research its only mandate, eliminating other functions. CENTA would thus conduct research on all crops and disciplines related to the sector.

In the past the extension policy has been to teach producers all aspects of rural development, including production, health orientation, education, and community affairs. The new policy is to limit the functions of the extension agents to providing technical assistance on crop production and animal husbandry only.

The agriculture development policy has been to address the producer as a person, with the MAG coordinating actions to address all the producer's needs. This is being changed so the MAG will take care of the needs of agriculture research and extension. Other institutions will coordinate rural development.

Article 118 of the Constitution of El Salvador states, "The State will adopt population policies with the objective of assuring a greater well being for the entire population of the country."

The present Government defines its population policy in the document "Política de Población" (Population Policy), written by the National Population Commission, as "the set of measures designed by the State, with the purpose of

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<sup>1</sup>MAG-IICA, "Lineamientos Básicos Para El Mejoramiento del Sistema Nacional de Investigación." San Salvador, El Salvador: MAG-IICA, Mayo 1990. p. 7.

harmonizing the national demographic evolution with the conditions and requirements of the development process and promote the person and its family nucleus, to participate in an equitable form in the responsibilities and benefits of this development."

The policy measures and implementation strategy include population and health; population and the family; spatial distribution and migration; population, education and communication; population and the work force; and population and the environment.

Infrastructure construction policy has varied according to availability of funds and project design. The armed conflict has imposed limitations on the construction and maintenance of infrastructure. Roads and bridges have been destroyed, buses burned, and private businesses vandalized. The level of destruction and lack of adequate investments in the last 10 years have had a significant impact. An infrastructure sector assessment done for USAID/El Salvador identified a total of \$2.3 billion in infrastructure investment needs through the year 2000.<sup>1</sup> This assessment states that of the 7,820 km. of unpaved rural roads, 62 percent are in poor condition, 21 percent in satisfactory condition, and only 17 percent in good condition. The policy is to provide maintenance over construction of new roads. The major priority is to make roads accessible under wet as well as dry conditions.

For irrigation projects a master plan delineates the actions through the year 2000. The policy is to invest in facilities to expand the irrigated areas where economically feasible. MAG is also developing a policy for irrigated agriculture.

The land use and soil fertility policies are those directed to using land for a particular purpose. In El Salvador, the only specific land use policies are the laws creating the national parks and reserves and the regulations on the cotton crop. The Government is drafting a soils law to present to Congress.

### 2.1.2 Institutional Framework

Many public, private, and international institutions analyze, design, influence, and administer natural resource related policies and their impact on sustainable agriculture in El Salvador. In this study, the institutions are identified according to the policies analyzed above--transnational, macro, sectoral, and specific policies. Exhibit 2.6 summarizes these institutions within each category.

One outcome of the Central American Presidential Commission was the creation of the Central American Presidential Commission for the Environment and Development (CCAD). The Ministers of Agriculture or Natural Resources for each

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<sup>1</sup>Tech International, Inc., Louis Berger International, Inc. and Edificaciones Choussy, S.A. de C.V., "Infrastructure Sector Assessment." Draft Final Report, Volume I, Summary Report. San Salvador, El Salvador: U.S.A.I.D., November 15, 1990. p. 1.

EL SALVADOR - NATURAL RESOURCE POLICY INVENTORY

Exhibit 2.6 Institutions Involved in Land Use and Soil Fertility Policies, by Type of Policy, 1990.

| Transnational/Regional  | Macroeconomic  | Sectoral  | Specific   |
|---|--|---|--|
| - Central American Presidential Commission for The Environment and Development (CCAD) | - The Central Bank of Reserve  | - Ministry of Public Works-Geo-Technical Research           | - MAG-Center For Natural Resources                           |
| - Ministry of External Relations  | - The Banking System   | - Ministry of Education                                     | - MAG-Center for Agricultural Techonology                    |
| - U.S. Agency for International Development (U.S.A.I.D.)                              | - Foreign Exchange Offices   | - National Population Commission                            | - MAG-Center for Livestock Development                       |
| - IMF   | - Ministry of Finance  | - Salvadoran Demographic Association                        | - MAG-General Directorate of Irrigation and Drainage         |
| - The World Bank  | - Ministry of Economy  | - Ministry of Public Health And Social Assistance           | - MAG-General Directorate of Rural Development               |
| - Interamerican Development Bank  | - Ministry of Planning and Coordination of Economic and Social Development | - Inter-Ministerial Commission for the Livestock Problem    | - MAG-Advisory Committee on Technology Transfer              |
| - International Coffee Organization   |  | - MAG-National Agricultural Consultative Council            | - Salvadoran Ecological Foundation                           |
| - World Meteorological Organization   |  | - MAG-Sectoral Agricultural Consultative Council            | - Salvadoran Ecological Movement                             |
| - U.N. Environmental Program  |  | - MAG-Agricultural Sector Planning Office                   | - Salvadoran Association for Conservation of the Environment |
| - Food and Agriculture Organization of the U.N. (FAO)                                 |  | - MAG-General Directorate of Agricultural Economics         | - Society of Agronomic Engineers of El Salvador (SIADES)     |
| - U.N. Development Program (UNDP)   |  | - Institute of Supply Regulations                           | - Association of Earth Firends                               |
| - World Food Program  |  | - Salvadoran Institute for Coffee Research                  | - Teclena Foundation for the Environment                     |
|   |  | - Salvadoran Foundation for Economic and Social Development | - Montecristo Foundation                                     |
|   |  |   | - Tree Friends   |

country serve on this commission. The Minister of Agriculture of El Salvador was appointed as its first president. The Commission addresses environmental issues common to more than one of the Central American countries.

The Ministry of External Relations is the official diplomatic channel of El Salvador for dealing with external affairs, including foreign governments and international institutions. It participates in negotiating policies that affect the use of natural resources in El Salvador.

The U.S. Agency for International Development (USAID) is the U.S. Government body in charge of civilian aid. It influences land use and soil fertility policies through project financing, as well as through policy dialogue with the GOES.

The International Monetary Fund (IMF) has played an important role in recent years by imposing policy conditions for loan approval. It has insisted on policies that directly and indirectly affect land use and soil fertility including adjustment of the exchange rate, revision of the interest rate, reduction of the budget deficit, elimination of price controls, and trade liberalization. The World Bank and the Interamerican Development Bank (IDB) have also played an important role in these policies by imposing the same kinds of conditions.

The U.N. Development Programme (UNDP) and the Food and Agriculture Organization of the U.N. (FAO) have financed development projects in agriculture. The World Meteorological Organization has provided technological assistance and cooperation in agrometeorology, and the World Food Programme has provided food donations.

The International Coffee Organization (ICO) administers the International Coffee Agreement. This agreement has had an influence on the coffee policy of the country, affecting land use.

The Central Bank of Reserve formulates the monetary policies, implemented through the banking system. More recently the foreign exchange offices are also participating in the implementation of foreign exchange policy.

The Ministry of Finance designs and implements the fiscal policy, in coordination with the Ministry of Planning and Coordination of Economic and Social Development (MIPLAN) and the Ministry of Economy. The latter is in charge of the trade policy.

The Ministry of Education designs and implements the education policies. It also manages some of the natural resources. The ministry has recently been promoting education on natural resources at the primary, secondary and college levels.

The National Population Commission is responsible for the country's population policy. The Salvadoran Demographic Association is a private institution that provides family planning services. The Ministry of Public Health and Social Assistance has family planning services within the services of Prenatal, Child Care and Nutrition.

The Ministry of Agriculture and Livestock (MAG) is responsible for the agriculture sector policies, and the Ministry of Public Works for the construction of rural roads.

The Ministry of Agriculture has five institutional levels: 1) policy decision making; 2) advisory; 3) support; 4) implementation; and 5) decentralized.

At the policy decision making level are the Minister, the National Agricultural Consultative Council (CCAN), and the Sectoral Agricultural Consultative Council (CCAS).

The CCAN is formed by all the executives of the agricultural sector, including the decentralized institutions and the private sector. Its objective is to facilitate decision making on issues affecting the agricultural sector. In this sense it is an organ that formulates policy, including the resolution of conflicts.

The CCAS is formed by the executives of the centralized units of the MAG. Its objective is to facilitate decision making on issues affecting the MAG. This council formulates policies within the ministry.

At the advisory level the ministry has the Agriculture Sector Planning Office (OSPA), the Legal Department, the Audit Department, and the General Directorate of Agricultural Economics.

OSPA is a key element in the policy analysis of agriculture related issues. It is the technical arm of the ministry in charge of analyzing the impact of policy alternatives and proposing policy changes to the minister.

The General Directorate of Agricultural Economics is in charge of generating, analyzing, and publishing agricultural statistics, agricultural marketing research, and crop forecasts. It also conducts special studies on production and marketing of agricultural products and inputs.

The support units are the General Management Office and the Directorate of Communications.

The centralized implementing units are the Center for Agriculture Technology (CENTA), the Center for Livestock Development, the Center for Fisheries Development (CENDEPESCA), the Center for Natural Resources, the General Directorate of Irrigation and Drainage, the General Directorate of Agricultural Defense, and the General Directorate of Rural Development. The General Directorate of Rural Development has an Advisory Committee on Technology Transfer and four Regional Management Offices.

CENTA is in charge of researching, developing, and publishing applied agricultural technologies. The objective of the Center for Livestock Development is to increase the production of food from animal sources through research on animal husbandry and veterinary medicine.

The Center for Natural Resources has the objective of researching

techniques for the conservation, development, and rational use of the country's natural resources. It also transfers these findings to the regions.

The Directorate of Agricultural Defense prevents the entrance into the country and propagation of diseases harmful to agriculture and livestock in coordination with the General Directorate of Rural Development and the Regional Management Offices of MAG.

The Directorate of Rural Development conducts training for professional staff and provides extension services for the rural sector. It also contributes to the consolidation and development of agrarian reform.

The Advisory Committee on Technology Transfer is made up of one expert from each of the implementing units (CENTA, CDG, CENDEPESCA, CENREN, and DGRD). Its objective is to coordinate research activities of the centralized units with the General Directorate of Rural Development.

The institutions listed in Exhibit 2.6 under specific policies are all public and private organizations responsible for policy implementation. Special mention should be made of the Salvadoran Foundation for Economic and Social Development (FUSADES). It has been very influential in economic and agricultural policies through the publication of studies. It has also provided qualified individuals for management functions in the Government. In addition, it operates programs on export promotion and crop diversification that have significantly affected land use patterns and intensity.

### 2.1.3 Analysis

This section follows the same organization as the first two sections. It analyzes how policies and institutions affect land use and soil fertility, starting with transnational or regional policies and followed by macroeconomic, sectoral, and land use policies.

Four main aspects of policy analysis relate to land use and soil fertility: 1) the impact on farmers' education level of incorporating soil conservation practices in their technological production packages; 2) the impact on relative prices which stimulates investment in production activities to maintain soil productivity; 3) the availability of credit to invest in soil conservation practices or subsidies for soil amendment practices; and 4) the impact on investment to improve soil conservation practices.

One international policy that directly affects land use is the International Coffee Agreement. This agreement has used the quota system in the past to maintain a target price. The idea of a quota has affected decisions on the expansion of cultivated areas. Coffee outside the quota has to be stored or sold to non-member countries, an important limitation in the past. In recent years, other internal policies have been responsible for reducing the coffee area harvested as will be discussed later.

One other international policy affecting land use and soil fertility in El Salvador has been the protectionism of industrialized nations toward their

own farmers. Industrialized countries have been subsidizing their farmers, which results in surpluses of some grains and milk being dumped in developing nations. The local farmer has had to compete with imported subsidized products, in addition to dealing with distortions created by local macroeconomic policies. Another example is the U.S. sugar quota system, which has contributed to having more land in sugar than El Salvador would have without quotas. For grains the Government is adopting a price band scheme, which includes a tariff on grain imports to offset the effect of industrialized nations' subsidies for their producers.

Milk presents an interesting situation that is typical in developing nations. Milk production subsidies are common in European countries, which donate their production surpluses to developing countries, including El Salvador. Donated milk enters the commercial channels and competes with locally produced milk. Milk is considered a basic food staple; thus, politicians welcome these donations as a way to maintain low prices while increasing availability. This situation depresses livestock development in the country, eventually reducing both herds and investments for improvements. Rising inflation worsens the situation and continues the cycle. Milk producers make studies and present their case. Politicians (influenced by consumers) reply that the producers are inefficient and their cost of production is too high. The unfortunate reality is that the day will come when milk donations disappear. Then, the country will have to spend far more foreign exchange to import expensive milk. By then the herds will have been reduced and reestablishing good milk herds will take many years. A cow's gestation period is about nine months, and scientists have not found a way to get more than one heifer per year. No one sells their best cows, and a herd can be improved only through the slow process of breeding.

Both macroeconomic policies (except for credit) and agricultural price policies affect relative prices. As relative prices of agricultural products are reduced, farmers lose their incentive to invest in replacing the extracted nutrients or adopting soil conservation practices.

Under pressure from international organizations, the Government has indicated its intent to modify El Salvador's major economic policies to achieve stability and sustained economic development.

The macroeconomic policies affecting land use and soil fertility are monetary, fiscal, and trade policies. All have a direct impact on the price received by the farmer. Farm gate prices determine profitability, a major indicator of land use decisions at the farm level.

The major monetary policies affecting the natural resource base in El Salvador are the money supply, tied to the credit policy, and the foreign exchange policy. The monetary policy is designed and approved by the Monetary Board and implemented by the Central Bank of Reserve through the banking system. The foreign exchange rate is determined by demand and supply. However, there are two distinct operators in the system: the commercial banks and the foreign exchange offices. The Monetary Board and the Central Bank of Reserve have complete control over the money supply and partial control over the other two major policies that affect the natural resource base.

The banking system, consisting of 14 banks including two development banks, was nationalized in 1984. The present Government is taking steps to privatize it again, beginning with a process of mergers and acquisition. Privatization is due to the weak financial condition of certain banks that have been close to bankruptcy.

The Central Bank and the banking system control credit policies, including interest rates, payment schedules, warranty requirements, disbursement procedures, fees, and other requirements such as insurance.

In an effort to control inflation and improve the foreign exchange rate, monetary authorities have been forced to adopt a tight money supply policy. This restricts credit availability, particularly for higher risk investments such as agriculture. Besides being risky, agriculture provides a very low return to banks due to the absence of the more profitable collateral activities such as compensatory balances, letters of credit, and commissions generated from handling foreign exchange.

This liquidity crunch restricts long-term credit more than short-term loans. Bankers become eager to recover their funds and increase their liquidity. Also this gives them the opportunity to adjust the terms to more recent conditions, increasing their returns.

Credit availability is an important determinant of land use. As long-term credit becomes scarce, farmers are unable to invest in crops with long-term returns, such as coffee, macadamia nuts, cocoa, and palm oil. These investments are needed to prune trees, replace nutrients, adopt conservation measures, control the spread of disease, and replace dying trees--measures that are the equivalent of capital stock replacement in a factory. Without credit, farmers are unable to maintain the productive capacity of their farms. However, some of these crops are better for certain land classes than short-term cash crops that require more tillage. In addition, as credit becomes scarce, farmers plant crops that have lower investment requirements, even though yields and returns are lower. This process of reduction in investment in agriculture has been documented by Liévano and Norton (1988).<sup>1</sup>

The Government has also recently absorbed the arrears of agriculture co-ops and collective farms of the agrarian reform. This measure is detrimental to the environment in that it invites people to default on their loans. Their perception of a loan as income requiring little attention to conservation measures is thus confirmed. This contributes to fertility loss and soil degradation.

On the other hand, the present scarcity of credit resources provides an excellent opportunity to enforce conservation measures and improve land use patterns. If the Government is willing to subsidize interest rates, the subsidy

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<sup>1</sup>Mirna Liévano de la Torre and Roger D. Norton, "Food Imports, Agricultural Policies and Agricultural Development in El Salvador, 1960-1987." Report submitted to USAID/El Salvador. Washington, D.C. Robert R. Nathan Associates, June 1988.

could be used to enforce conservation practices and better land use. Each disbursement can be tied to certain technological practices.

Foreign exchange policies are critical in determining the price of traded commodities. An overvalued currency leads to a tendency to produce non-traded goods over traded ones because farmers receive a higher relative price for non-traded goods.

As the present Government liberalized the foreign exchange rate, traded goods received a higher relative price, contributing to a shift in land use patterns from non-traded to traded commodities. Also, more investment can be made in traded goods.

The foreign exchange liberalization scheme has included authorization of exchange offices. These will contribute to more competition in the market, reducing the intermediation spread traditionally charged by the commercial banks.

Coffee exports have been treated differently in the foreign exchange liberalization process. Coffee exports receive only part of the foreign exchange generated at the free market rate, with the other part paid at 5.00 colones per dollar.

The Government's new fiscal policy, oriented toward reducing the budget deficit, includes a government employee salary freeze. This measure contributes to the further loss of the already scarce professionals qualified to work on environment related institutions and issues. It also limits the investment resources available to preserve or improve the natural resource base.

Even though an effort is being made to reduce the deficit, the Government has reduced the coffee export tax. This measure enables coffee farmers to receive a better price, but it is not on the same terms as other crops, affecting coffee production negatively. The Government eliminated only the fixed \$6.45 export tax per quintal but maintained the higher variable rate of 30 percent over the price of \$45.00, which is probably one of the highest coffee export taxes in the world. Most countries are eliminating coffee export taxes.

Coffee is El Salvador's major export commodity. This crop provides an excellent cover, contributing to soil and water conservation. Past foreign exchange policies, along with export taxes, penalized coffee production. This contributed to a decline in coffee harvested due to low investments and reductions in area planted. Both measures are detrimental to resource conservation. When the farmer does not invest in his farm, conditions deteriorate, soil erosion increases, and fertility drops dramatically.

In El Salvador the energy problem aggravates the soil problem. A large proportion of energy comes from firewood. As coffee prices received by farmers decline, the firewood income becomes more important. Coffee plantations provide firewood from the shade trees and the coffee plants themselves. Cutting both in excess of recommendations contributes to a reduction of tree cover far beyond that required for sustainable agriculture and soil conservation.

If a farmer decides to substitute other crops for his coffee, he usually chooses tillage-intensive crops, which is worse than reducing investment or excessive pruning. Coffee is usually planted at high altitudes on steep slopes. A short cycle crop provides a good income for the first harvest, but yields usually decrease progressively, and non-economical returns are reached in a short time.

A revision of the present policies of foreign exchange discrimination toward coffee and elimination of the export tax, along with a good coffee renovation project would allow the country to recuperate and even surpass its production levels in a few years. That the country still produces coffee under the present policy framework is an excellent indicator of its competitiveness in the world market. El Salvador has a history of relatively high export quotas and a coffee recognized for its high quality. Increased production would draw attractive returns even if quotas are reinstated.

Coffee production is highly labor-intensive. About 55 percent of the cost of production is in labor. Most of the labor is needed for harvesting, which is done by hand. Increased production would generate a significant amount of work that could absorb the growth in labor supply.

The labor supply will increase faster once the fighting is over in El Salvador. Besides the natural growth in labor supply, refugees from camps in Honduras and other countries will return demanding work. One stipulation of the peace negotiations is that the military force must be reduced. Former soldiers will also be demanding work. Expanded coffee production could provide work for many of these people. Otherwise, soil degradation will continue as Salvadorans put pressure on the limited available land.

In the past El Salvador's trade policy had a negative impact on land use by penalizing export products and subsidizing imported agricultural goods. The emphasis was on providing cheap food to the urban population. Basic grains were imported with overvalued currency and without duties. This reduced the farm GAT prices, which discouraged farmers from producing these commodities.

The Government has revised this policy and is adopting measures to liberalize trade. Paperwork is being reduced, and a scheme is being developed to protect farmers from unfair competition stemming from subsidies to producers in industrialized nations.

A price band target scheme has been designed to reduce crop cycle fluctuations in farm gate prices. To reduce excessive fluctuations, the new scheme imposes a variable tariff on imported grain that fluctuates if farm gate prices reach pre-determined levels.

Stable prices eliminate one source of risk in agriculture, contributing to better land use patterns and investment in soil conservation measures. Thus, the present Government's pricing policy is to let market forces determine prices. The Government is also eliminating the negative effect of subsidies on foreign competition by capturing the subsidy through tariffs. In this way the entire population benefits from external subsidies without hurting the local farmer.

The prices of certain commodities such as cotton, seed, sugar, lard, margarine, and vegetable oil, are still controlled. Low prices help reduce investment levels in these activities, with subsequent reductions in production. With low investments, land deteriorates and soil fertility diminishes.

The education policies in El Salvador have not considered significantly the rural population, as the statistics demonstrate. A rural population with low levels of education has very little knowledge of the impact of poor practices on soil fertility. Nearly 50 percent of the producers have no formal education, and over 80 percent are functionally illiterate.<sup>1</sup> In any case, school curricula do not cover agricultural or environmental subjects. Moreover, radio programs do not teach people about conservation. Radio, however, could be a valuable means of disseminating information on these issues, since a high percentage of Salvadorans listens to the radio.

Research activities have been very limited due to inadequate funding. The research institutions lack enough researchers with sufficient training and support equipment. Operating budgets are inadequate. This limits the technological frontier in an increasingly competitive market.

CENTA, for example, has been operating with insufficient budgets. The Ministry of Finance sets prices for its services. Soil samples are analyzed at no charge. Extension agents send samples and the analysis is performed but no one picks up the results. The seed certification program charges only nine colones per analysis of a batch of 200 quintals or less, which does not cover even their variable cost. The set of cards placed on each bag is free, and the only charge is for the security clip (40 cents of colones each). Fruit trees are sold at six colones each, except for orange trees which are five colones. These are budded trees in bags in good standing condition for transplant. They probably cost twice that much.

The failure to impose adequate charges curtails the budget for other activities. It also hinders the development of the private sector to provide these goods and services.

Ninety-two percent of CENTA's limited budget is devoted to salaries, and 5 percent to fuel, leaving only 3 percent for operations. Salaries are low, which has resulted in CENTA's losing between 8 and 10 percent of the original personnel with higher degrees from foreign universities.

Seed is produced mostly by private producers. CENTA's role is to supervise the operation and provide the certification service. Seed prices are established by the National Seed Commission, which is formed by the director of CENTA, the agricultural economics director, one producer representative, and one representative of agrarian reform.

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<sup>1</sup>Samuel A. McReynolds, Thomas M. Johnston, Peter H. Gore and Joe D. Francis, "The 1989 El Salvador Agricultural Land Use and Land Tenure Study." Washington, D.C.: National Cooperative Business Center, November 1989.  
p. i.

The new policy is to concentrate the limited available resources on food crops produced by small farmers and consumed locally. The research needed for export crops will be left to the private sector. This sounds logical, but in the long run it will reduce the country's competitiveness. International agricultural production technologies are changing rapidly. Countries are becoming more protective of their knowledge, and more advanced technologies of biological engineering are now patented.

Research results should be considered a public commodity with higher social benefits than costs. However, private benefits are often higher than private costs. The private sector as a whole can pay for research, but it needs the government as a collection agency. For example, coffee research could be financed by the private sector. The Government could collect a fee at export to finance the research, since individual farmers would not contribute voluntarily. This would require a law establishing how much to direct toward research. Farmers would have access to research results.

The extension policy of the past was to cover all aspects of the farmer's needs, from agricultural production to education and community affairs. One result was a mediocre level of technology transfer. MAG has 87 extension agencies throughout the country, but the extension service lacks the logistic support and the staff to provide adequate coverage. According to CENTA's director, the reduction in the use of hybrid corn seeds from 70 percent in the past to 60 percent this year reveals the poor quality of extension services. Farmers are using second and third generation seeds that could degenerate and produce very low yields.

The new extension policy of concentrating efforts on agricultural technology transfer is sensible, but more funding will be needed to provide effective coverage. With a high illiteracy rate at the farm level, extension services need to be intense and direct to be effective. Creative funding methods are needed to provide good agents, training, vehicles, and materials. Ingenious funding methods should be designed to finance this activity.

One critical aspect of the extension service is the training of extension agents. Agriculture is becoming very technical. Most of the extension agents were trained in crop production by formula. Each activity is performed according to the season, without considering soil variability, climate, and other factors. Extension agents also lack adequate training in soil management. Most of the extension agents have only intermediate training in agriculture. At this level very little is taught about natural resource management practices such as soil fertility and climatic interactions. This deficiency is aggravated by the low education level of farmers who do not understand the damage caused by misapplied modern agricultural techniques. It explains the wide fluctuations of yields and the deterioration of soils due to poor management. Certain soils in El Salvador have already been degraded by applying nitrogen in the form of ammonium sulphate over a period of 20 years. As a result, the structure of the soil has changed and nutrients are no longer available.

Unfortunately, non-agriculturists commonly believe that farm production is an easy task that follows a set formula. One could use the analogy of the medical doctor and the nurse. The nurse knows how to perform routine tasks, but

the doctor is the one trained to diagnose. An agricultural professional is trained to do the diagnosis and the technician (high school or intermediate school graduate) can perform the routine tasks. As with the MD, the agricultural professional needs the assistance of specialists to solve complex situations, such as special soil management or pathology problems.

Soil amendments are subsidized in many industrialized nations. The social benefits of soil amendments are greater than private benefits, and private benefits are usually lower than private costs. There are no soil conservation projects in El Salvador to subsidize soil amendments and soil conservation practices such as terracing and construction of drainage where needed.

In summary, the major policy issues affecting land use and soil fertility in El Salvador are the foreign exchange policy, the coffee export tax, real availability of credit for agriculture, price controls over certain commodities, the agricultural research and extension policies, lack of a soil law, and lack of a soil conservation policy.

#### **2.1.4 Potential Policy Alternatives**

- o Review credit policies to make access easier for agricultural investment;**
- o Review the pricing policies of CENTA services;**
- o Continue applying the economic adjustment package of the present Government;**
- o Eliminate coffee export taxes;**
- o Review the milk pricing policy;**
- o Establish a requirement to conduct environmental impact assessments for all projects;**
- o Invest more resources in education at the rural level;**
- o Design a soil amendment project to subsidize farmers who adopt the recommended practices; and**
- o Approve the proposed soils law.**

#### **2.1.6 Recommendations For Future Research And Analysis**

- o Study the effects of policies on land use;**
- o Study alternative ways to finance the agricultural research needs of the country. Research is the way to expand the production possibility frontier.**

- o Study alternative ways to make the extension service more effective;**
- o Conduct a detailed study of the cotton sector to determine why area planted has been sharply reduced and prepare guide on policy alternatives;**
- o Study alternatives for increasing coffee production;**
- o Study the financing system for agriculture to determine alternatives for increasing credit availability for agricultural production;**
- o Study the possibility of a land tax; and**
- o Design a soil characterization project to delineate agro-climatic homogeneous areas that would require similar soil conservation measures.**

## 2.2 Land Tenure

Land tenure is a very important issue in natural resource management. Tenure policies can result in inefficient, uneconomical, and environmentally harmful uses of land. Three basic aspects of land tenure are treated in this section: land distribution, land ownership, and land markets. A skewed land distribution with a large proportion of a dense population living in rural areas is detrimental to a country's soils. Landless farmers are forced to cultivate marginal soils that erode easily and rapidly lose their productivity.

Land ownership is important to agriculture investments. A farmer will invest for long-term returns if he owns the land and is sure of keeping it. In a country where land ownership is unclear or farmers fear losing their land, land deteriorates rapidly. Investment in agriculture is low. Banks are reluctant to lend because of the lack of a good collateral. Soils get eroded and degraded due to a failure to keep the farm in good condition and invest in improvements.

If the land markets are imperfect, deterioration also occurs. Imperfections in the land market are due to several causes, including lack of land titles, and cumbersome land transfer procedures. In these situations banks are also reluctant to lend and farmers are reluctant to invest. A farmer has little incentive to invest in a property that might not sell. With low investment levels, the land deteriorates.

El Salvador has a territory of 2,104,100 has. including islands, bays, lakes, roads, and other areas unsuitable for agriculture (Exhibit 2.7). The last agriculture census, completed in 1971, reported 69 percent of the land as "Land in Farms." The census described land tenure structure in five categories: in property, when the owner has the property title; leasing with purchase option, when the producer has formalized a purchase option contract; leasing, when the producer pays for only the use of the land; colonato, where permanent workers in haciendas receive a small salary and/or plot of land on which to subsist; and "other forms" combining the rest.

Exhibit 2.8 shows the distribution of land before the 1980 Agrarian Reform. Among the 270,868 farms, only 19.5 percent of the total farmed area belonged to farmers with 5 has. or less. This small area, however, included 87 percent of the farms in El Salvador, if a land holding less than 2 has. is considered a farm. Farms having more than 100 has. comprised 38.7 percent of the total area, but represented under 1 percent of all farms.

Coffee has been the most important activity of the economy since the 1800s. With the introduction of this product, Salvadoran land tenure structure started to change. The eidos and haciendas were the two main forms of land tenure. Eidos, were commonly farmed by the Indian communities planting basic grains. Haciendas, privately owned, produced export crops such as indigo, sugar cane, and coffee. In 1882, a decree abolishing communal ownership was established to favor coffee farmers. Thus, land ownership passed to a small group and land pressure ensued.

According to a study by the United Nations, the number of persons with access to land increased from 12 percent to 40 percent of the rural population

**EL SALVADOR - NATURAL RESOURCE POLICY INVENTORY**

**Exhibit 2.7 Potential Land Use, 1990.**

| Description                               | Area<br>(Has.)   | Percent        |
|---|------------------|----------------|
| Agriculture                               | 856,379          | 40.70%         |
| Livestock                                 | 103,955          | 4.94%          |
| Forestry                                  | 759,770          | 36.11%         |
| Not Suitable for Agriculture or Livestock | 341,437          | 16.23%         |
| Area Under Water                          | 42,559           | 2.02%          |
| <b>Total</b>                              | <b>2,104,100</b> | <b>100.00%</b> |

Source: Ministry of Agriculture and Livestock, "Plan Quinquenal de Desarrollo Agrario y Pesquero 1985-198." San Salvador, El Salvador: MAG/OSPA. pp. 30-31.

**Exhibit 2.8 Number of Farms and Area Harvested, By Size, 1971.**

| Farm Size<br>(Has.) | No. of Farms   |                | Area             |                |
|---------------------|----------------|----------------|------------------|----------------|
|                     | Units          | Percent        | (Has.)           | Percent        |
| Less than 2         | 191,527        | 70.71%         | 151,326.1        | 10.42%         |
| 2 to 4.9            | 43,414         | 16.03%         | 131,984.6        | 9.09%          |
| 5 to 9.9            | 15,598         | 5.76%          | 110,471.9        | 7.61%          |
| 10 to 49.9          | 16,150         | 5.96%          | 342,429.7        | 23.59%         |
| 50 to 99.9          | 2,238          | 0.83%          | 154,164.2        | 10.62%         |
| 100 to 500          | 1,739          | 0.64%          | 342,877.6        | 23.62%         |
| Larger than 500     | 202            | 0.07%          | 218,640.9        | 15.06%         |
| <b>TOTAL</b>        | <b>270,868</b> | <b>100.00%</b> | <b>1,451,895</b> | <b>100.00%</b> |

Source: DIGESTYC, "Third Agricultural Census, 1971.

between 1960 and 1975. However, El Salvador has had the highest ratio of landless families in relation to total population in Latin America.<sup>1</sup>

High land concentration has been one of the major social inequities in the country, setting the stage for the agrarian reform of 1980. With implementation of the agrarian reform process, large farms were expropriated and continued their operations as large cooperatives (226,961 has.). Parcels of less than 7 has. were assigned to renters, providing them with land titles (62,503 has.)<sup>2</sup>. According to PERA, the beneficiaries within the reform sectors are 81,403 producers (six members per family producer equal a total of 488,418 people) owning 18.4 percent of the agricultural land of the country. On the other hand, the amount of land not affected by the agrarian reform is 1,223,785 has. This area represents 81.61 percent of the total and belongs to 270,216 producers. Exhibit 2.9 presents forms of land tenure in 1988.

In 1987, 86 percent of the country's agriculture produce was produced by owners, compared to 40 percent in 1971, as a result of an increase in parcel ownership, organization of cooperatives, the increase of land donations, and sale of farms as a reaction to the agrarian reform process. Therefore, farmers' behavior influenced by land tenure is reflected in the agriculture of El Salvador.<sup>3</sup>

Stability in land ownership is very important and linked to agriculture production. Title transfer policies in El Salvador involve several institutions and steps making the process slow and complicated. A simple way of transferring land titles would improve the buying/selling procedures in the country.

### 2.2.1 Policy Framework

Several transnational, regional, economic, sectoral, and specific policies have influenced land tenure during the last decade in El Salvador. Exhibit 2.10 lists the major policies affecting land tenure.

At the transnational level, policies including the financial policies of international organizations such as AID have contributed to development of the agrarian land reform process. This has been through the influence on conditionalities, policy dialogue, and financial assistance.

The major macroeconomic policies affecting land tenure include credit and export taxes. The present Government of El Salvador presented these policies

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<sup>1</sup>Michael L. Wise, "Agrarian Reform in El Salvador Process and Progress". USAID\El Salvador RDO. September, 1986. Pg.5.

<sup>2</sup>Ibid., p. 2.

<sup>3</sup>Proyecto Planificación y Evaluación de la Reforma Agraria (PERA), "Estudio Nacional del Sector Agropecuario; Encuesta sobre uso y tenencia de la Tierra, "Ministerio de Agricultura y Ganadería, San Salvador, Enero 1989, p.4

**EL SALVADOR - NATURAL RESOURCE POLICY INVENTORY**

**Exhibit 2.9 Number of Farms and Area By Form of Land Tenure, 1988.**

| <b>Form of Land Tenure</b> | <b>No. of Farms</b> |                | <b>Area (Has.)</b> |                |
|----------------------------|---------------------|----------------|--------------------|----------------|
|                            | <b>Units</b>        | <b>Percent</b> | <b>Percent</b>     |                |
| <b>Owner/Operator</b>      |                     |                |                    |                |
| 207 Farmers                | 46,991              | 14.80%         | 69,240             | 4.60%          |
| Reform Coops               | 322                 | 0.10%          | 207,752            | 13.79%         |
| Non-Reform                 | 233,847             | 73.65%         | 1,157,875          | 76.87%         |
| <b>Sub-Total</b>           | <b>281,160</b>      | <b>88.55%</b>  | <b>1,434,867</b>   | <b>95.26%</b>  |
| <b>Renter</b>              |                     |                |                    |                |
| Rent                       | 25133               | 7.92%          | 58,539             | 3.89%          |
| Colonia                    | 1                   | 0.00%          | 2                  | 0.00%          |
| Other Form                 | 11235               | 3.54%          | 12,790             | 0.85%          |
| <b>Sub-Total</b>           | <b>36,369</b>       | <b>11.45%</b>  | <b>71,331</b>      | <b>4.74%</b>   |
| <b>TOTAL</b>               | <b>317,529</b>      | <b>100.00%</b> | <b>1,506,198</b>   | <b>100.00%</b> |

Source: Samuel A. McReynolds, Thomas M. Johnston, Peter H. Gore, Joe D. Francis, "The 1989 El Salvador Agricultural Land Use and Land Tenure Study." Washington, D.C.: National Cooperative Business Center, 1989. p. 21.

**EL SALVADOR - NATURAL RESOURCE POLICY INVENTORY**

**Exhibit 2.10 Policies Related to Land Tenure by Type, 1990.**

| <b>Type of Policy</b>     |                                |                                  |  |
|---------------------------|--------------------------------|----------------------------------|--|
| <b>Transnational</b>      | <b>Macroeconomic</b>           | <b>Sectoral</b>                  | <b>Specific</b>  |
| <b>Regional</b>           |                                |                                  |  |
| - <b>Financing Policy</b> | - <b>Monetary-Credit</b>       | - <b>Basic Grains Price Band</b> | - <b>Decree No. 153/Agraria Reform Law</b>   |
|                           | - <b>Fiscal-Budget Deficit</b> |                                  | - <b>Decree No. 154/Expropriation of farms larger than 500 Has. (Phase I)</b>                        |
|                           | - <b>Fiscal-Export Taxes</b>   |                                  | - <b>Decree No. 842/Incorporation of State land</b>  |
|                           | - <b>Trade</b>                 |                                  | - <b>Decree No. 207/Assignment of 7 Has. parcels (Phase III)</b>                                     |
|                           |                                |                                  | - <b>Decree No. 839/Voluntary transfer of land (Phase II)</b>  |
|                           |                                |                                  | - <b>Decree No. 895/Expropriation of farms larger than 100 Has. (Phase II)</b>                       |
|                           |                                |                                  | - <b>Decree No. 896/Transfer of State property (Phase II)</b>  |
|                           |                                |                                  | - <b>Art. 105 of the Constitution of 1983 Expropriation of farms larger than 245 Has. (Phase II)</b> |

in the Social and Economic Development Plan 1989-1994.<sup>1</sup> Their characteristics were discussed in this report in the section on land use and soil fertility.

Implementation of agrarian reform to redistribute land ownership began in 1980. Mechanisms to implement the reform included elimination of large farms (over 500 has.), distribution of state-owned land, and elimination of land rental on farms under 7 has. In addition, farms with areas between 100 and 500 has. were to be redistributed.

Decree 153 is the basic agrarian reform law. In addition, several decrees regulate land redistribution according to size and condition. Decree 842 authorizes the distribution of government-owned property. Decree 154 deals with the expropriation of farms larger than 500 has., which has been designated for Phase I of the agrarian reform. Decree 207 assigns parcels of 7 has. or less to previous renters during Phase III. Decree 840 authorizes the creation of the Farm Organization Committee (COC). This Decree was declared unconstitutional on September 13, 1989.

In addition to these decrees, a series of laws regulate what is to be done in Phase II. Decree 896 authorizes the transfer of government-owned property. Decree 895 regulates the expropriation of farms larger than 100 has. Article 105 of the Constitution of 1983 establishes the expropriation of farms larger than 245 has. Decree 839 establishes the voluntary transfer of private lands. These Decrees have not been implemented because the COC was instrumental for their implementation, and it was declared unconstitutional.

### 2.2.2 Institutional Framework

The government, private, and international institutions that have played an important role in the land tenure issue of El Salvador are listed in Exhibit 2.11. The most relevant organizations are described in this section.

The U.S. Agency for International Development (A.I.D.) has contributed to the implementation of several projects for proper management of agrarian reform. A.I.D. has provided financing for proper follow-up, technical assistance, agriculture development, evaluation, and other aspects of agrarian reform.

The Salvadoran Institute of Agrarian Transformation (ISTA) is the main agency implementing the land reform policies established under Phase I, which includes Decrees 153, 154, 842, 895, and 896 since 1987.

The National Financial Institute for Agricultural Lands (FINATA) is an autonomous institution in charge of implementing Phase III of the land reform under Decrees 207 and 839.

The Agrarian Reform Evaluation Program (PERA) is an assistance office

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<sup>1</sup>Ministerio de Planificación y Coordinación del Desarrollo Económico y Social, "Plan de Desarrollo Económico y Social 1989-1994," San Salvador, El Salvador, 1989. p.4

**EL SALVADOR - NATURAL RESOURCE POLICY INVENTORY**

**Exhibit 2.11. Institutions Involved in Land Tenure Policies, by Type of Policy, 1990.**

| <b>Type of Policy</b>                                    |   |   |  |
|--|---|---|--|
| <b>Transnational/Rigonal</b>                             | <b>Macroeconomic</b>  | <b>Sectoral</b>   | <b>Specific</b>  |
| - U.S. Agency for International Development (U.S.A.I.D.) | - Ministry of Finance<br>- Ministry of Economy<br>- The Central Bank of Reserve | - Ministry of Agriculture<br>- Ministry of Public Works<br>- Ministry of Justice<br>- The Agricultural Fomentation Bank | - Salvadoran Institute of Agrarian Transformation (ISTA)<br>- National Financial Institute for Agricultural Lands (FINATA)<br>- Agraria Reform Evaluation Program (PERA)<br>- Municipalities |

within the Ministry of Agriculture and Livestock in El Salvador. Its main responsibility has been the yearly report evaluating the agrarian reform process since its establishment. The Organization Farms Committee (COC) was created in 1988 under Decree 840 to coordinate implementation of the new Phase II.

### 2.2.3 Analysis

Land tenure, an important issue closely related to agricultural development, has changed with the implementation of several policies. The provision of land to many landless families in El Salvador started with implementation of agrarian reform in March 1980 (Decree 153). Such reform was divided into Phases I, II, and III. This classification was based on size of holdings and type of tenure.

Phase I (Decree 153 and 154) specified the expropriation of farms of 500 has. or more and the organization of cooperatives. A total of 477 holdings grouped into 358 cooperatives were affected in this phase. At present, 328 are active and 30 inactive. The inactivity is due to the conflicting situation in the areas of their location. Besides these land holdings, all existing agricultural properties belonging to the Government before the agrarian reform implementation were added to Phase I (Decree 842). A total of 17,886 has. of the 207,752 has. included in Phase I have been designated as national reserve. ISTA is the institution in charge of implementing Phase I.<sup>1</sup>

Phase II, originally planned to expropriate land of 100 has. or higher, has not been implemented. Consequently, under Article 105 of the 1983 Salvadoran Constitution, the amount of land to be expropriated for Phase II has been increased from 100 ha. to 245 ha.

Phase III (Decree 207) affected land parcels according to type of tenure instead of size. The beneficiaries were landless farmers without access to ownership. The size of plot to be assigned was 7 ha. or less. The assignment of a parcel under this phase is launched by a petition from the interested person. At present, this phase, under the direction of FINATA, has had about 47,000 beneficiaries.<sup>2</sup>

To continue with the agrarian reform process, Decrees 839, 840, 895, and 896 were enacted at the end of 1987 as new Phase II. The purpose of Decree 839, "law of voluntary transfer of land with agriculture characteristics," is to provide an opportunity for landowners to sell their farms to the Government for future settlements.

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<sup>1</sup> Proyecto Planificación y Evaluación de la Reforma Agraria (PERA), "VIII Evaluación del Proceso de Reforma Agraria". Ministerio de Agricultura y Ganadería, San Salvador, Septiembre 1989.

<sup>2</sup> Roger D. Norton and Mercedes Llorca, "Una Estrategia para la Reactivación del Sector Agropecuario en El Salvador." Fundación Salvadoreña para el Desarrollo Económico y Social, (FUSADES). San Salvador, El Salvador 1989.

ISTA will implement Decree 895, "special law to expropriate idle land exceeding 245 ha." and Decree 896, "law to transfer Government holdings to beneficiaries." Finally, Decree 840 established a Committee of Farmers Organizations (COC).<sup>1</sup>

The socio-economic objectives for implementing the agrarian reform included the following: to increase the income of farm families and improve their income distribution, allowing capital and savings formation; to increase employment in the agriculture sector; and to increase and diversify production.

A comparison of Phase I and Phase III indicates that the land area assigned to cooperatives (Phase I) is three times bigger than that provided to the beneficiaries in Phase III. However, the number of beneficiaries in Phase III is 50 percent higher. Beneficiaries of Phase I, 7.7 percent of the rural population, receive more than half the official resources for agricultural programs. However, the success of this phase has been less than expected due to various problems. The type of cooperative established (Modelo Comunitario Cultivista) lacks clearly defined legislation. It also lacks a direct relation between the cooperative members and their revenue. These voids and the weak managerial and financial structure of the cooperatives are the worst problems affecting Phase I.<sup>2</sup>

In the cooperatives of Phase I, 21 percent of the available agricultural land has not been used. Lack of sufficient credit under the reform sector has been the main reason. According to PERA, the area not cultivated in the cooperatives has increased 50 percent since 1985.<sup>3</sup> Between 1984/85 and 1987/88, the areas worked collectively within the cooperatives have decreased 12 percent. Therefore, due to lack of credit to cultivate all agricultural lands within the cooperatives, individual farmer activities have increased 15 percent during this period. Of these, 78 percent are members and 21 percent are non-members. Another major reason for individual activities is the farmers' reaction to the type of model used in the cooperatives (Modelo Comunitario Cultivista). Even though members have access to socio-economic benefits such as schools, clinics, and credit, they feel like landless labor rather than owners of the land or of the crop. During the 1988-89 period, according to PERA, 3,001 members abandoned the cooperatives due to resignation, death, indefinite absence, and dismissal.

Since Decree 840 was established in 1988, members of the farm organizations have requested ownership of 1,748 parcels. In addition, voluntary

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<sup>1</sup> Proyecto Planificación y Evaluación de la Reforma Agraria (PERA), "VIII Evaluación del Proceso de Reforma Agraria." Ministerio de Agricultura y Ganadería, San Salvador, Septiembre 1989, p.2.

<sup>2</sup> Roger D. Norton and Mercedes Llorca, "Una estrategia para la Reactivación del Sector Agropecuario en El Salvador." Fundación Salvadoreña Para el Desarrollo Económico y Social, (FUSADES). San Salvador, El Salvador, 1989.

<sup>3</sup> Proyecto Planificación y Evaluación de la Reforma Agraria (PERA), "VIII Evaluación del Proceso de Reforma Agraria." Ministerio de Agricultura y Ganadería, San Salvador, Septiembre 1989, Pg. 15.

sales of 769 properties have been recorded. Results have been satisfactory due to the opportunity to buy land and the chance to benefit other groups of landless families. All this contributed to the policy of incorporating more people into the agrarian reform process.<sup>1</sup>

Development policies have failed to create enough jobs for the growing labor force. The failure of other sectors of the economy to grow forces the growing population to stay in their rural setting, increasing the need for people to own a piece of land for their livelihood.

The past foreign exchange policy and the coffee export tax have contributed to the drastic reduction in coffee production. Coffee is highly labor-intensive. Rural landless labor's major need is to have an income of some sort. As the demand for labor decreases with declining production, landless farmers' demand for a piece of land increases, putting pressure on the land tenure system.

This same logic applies to policies on regulating prices of export crops and basic grains, which have affected producers outside the reform sector as well as beneficiaries of agrarian reform. There has been a transfer of resources from farmers to the rest of the society, contributing to a reduction in rural income and demand for labor. This increases pressure on the limited land.

Credit access has varied in relation to form of tenure. According to the "1989 El Salvador Agricultural Land Use and Land Tenure Study," 12.3 percent of the non-reform producers (233,847) requested credit. These had a higher rate of denial than the reform sector requests. The beneficiaries of Phase III and farmers who rent parcels have a high rate of credit approval, along with a low percentage of credit solicitation. Inadequate instruction on credit procedures and lack of tenure security are two main reasons for the low application rates. Cooperatives of Phase I have received many credit requests, but their productivity has been lower than expected. Financial and managerial inefficiency and the reduction of agricultural prices are two of the main reasons.<sup>2</sup>

The debt of the agrarian cooperatives (Phase I) is significant. The outstanding balance exceeded 1,200 million colones, with arrears above 500 million colones as of 1989.<sup>3</sup> The debt in Phase I is due to the initial value of the assigned farms, still undefined in some cases. Part of the debt was also used to pay farmer's salaries during the first year of operation.

Insecurity about land ownership is one of the major land tenure problems of Phase I beneficiaries, who are organized into cooperatives and have

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<sup>1</sup>Ibid., p. 147.

<sup>2</sup>Roger D. Norton and Mercedes Lloret, "Una Estrategia para la Reactivación del Sector Agropecuario en El Salvador." San Salvador, El Salvador: Fundación para el Desarrollo Económico y Social (FUSADES), 1989. p. 12.

<sup>3</sup>Ministerio de Agricultura y Ganadería, "La Estrategia Sectorial Agrícola", Resumen. San Salvador, El Salvador: MAG, 1989.

no government-assigned land titles. Because the land is not theirs, farmers perceive little risk in borrowing. For the same reason, they have little incentive to invest in improvements, which contributes to soil degradation.

Even though Phase II has never been implemented as stipulated, owners of the farms potentially affected under this phase have reacted in different ways since 1980. Lack of investment, minimal use of agricultural land, and land fragmentation (resulting in parcels smaller than the 245 ha. minimum required by law) have been typical reactions, contributing to land degradation and deterioration.

It is difficult to develop an efficient land market in El Salvador because land title transfer is a slow procedure, involving many steps and institutions including municipalities, the Ministry of Justice, and the Ministry of Finance. Owners' land titles generally lack the required topographic survey. Registration of property, tax payments, and litigios (lawsuit) procedures are cumbersome.

Owners in the non-reform sector (233,847) control over two-thirds of cultivated land (395,925 has.). However, only 34.2 percent of it is planted in crops. They also possess nearly 84 percent of pastureland, using only 36 percent of their land for livestock. Thus, the largest share of unused land in the country belongs to this group. It is estimated that 90 percent of the inactive land in El Salvador is owned by 16 percent of the landowners. Landowners with 100 to 200 has. have the most idle land, with 20 percent not utilized.<sup>1</sup>

This phenomenon has persisted for several reasons. The results of a survey conducted by PERA among 35,798 farmers in 1987-88 indicated that 28.5 percent of the farmers did not cultivate their land due to conflicts within their farms. A total of 24.5 percent left their land inactive for a period in accordance with traditional agricultural practice. Lack of time to cultivate was the response of 18.1 percent. Another 16.1 percent did not cultivate due to lack of credit. Other reasons cited included inclement weather conditions, labor shortages, lack of soil conservation procedures on their farms, and leasing of parcels. Despite the high rate of unemployment, several agriculture regions of the country have labor shortages due to the rural to urban migration.

Land tenure has played an important role in the development of El Salvador's economy. Non-reform as well as reform farms contribute to this development. Several measures need to be adopted to improve the present land tenure situation. Economic, social, and political policies need to be revised and the conservation of natural resources through sustainable agriculture need to be considered.

#### **2.2.4 Potential Policy Alternatives**

- o Approve a law defining the farms that would not be affected by the agrarian reform process. This would eliminate farmers'

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<sup>1</sup>McReynolds, Samuel A., Thomas M. Johnston, Peter H. Gore, Joe D. Francis. "The 1989 El Salvador Agricultural Land Use and Land Tenure Study." Washington, D.C.: National Cooperative Business Center, 1989.

uncertainty about losing their farms. Some categories could include farms in forestland, farms with certain soil classes, farms of a certain size, and farms with a combination of factors that would contribute to good soil management and soil fertility.

- o Assign definite land titles to agrarian reform participants. These titles should be saleable in order to be of value to banks and owners.
- o Change the thrust of agrarian reform on land transfer from loans to grants. Alternatively, provide a very long repayment schedule at zero interest rate.
- o Review the legislation governing cooperatives to clarify the conditions and participation of membership and definition of ownership.
- o Strengthen technical assistance to all beneficiaries, especially in managerial and financial skills.

#### **2.2.5 Recommendations for Future Research and Analysis**

- o Study the agrarian reform structure. Its economic and social objectives should be reviewed to determine alternatives;
- o Study alternatives for recommendations related to the agrarian debt;
- o Study financing alternatives to expand Phase III. Provide opportunities for cooperative members to sell their abandoned or underutilized lands to displaced people and other farmers; and
- o Study alternative mechanisms involved in land title transfer to reduce complicated and slow procedures.

#### **2.3 Pesticide Management**

Pesticide management is very important for sustainable agriculture. Misuse of pesticides kills the natural predators of common pests. Pests also develop resistance to certain pesticides after continuous use. Both factors increase future pest control costs, and create secondary pest problems. Pesticides also pollute streams and kill microorganisms needed for soil fertility. Worse yet, pesticides are detrimental to humans. Appropriate pesticide management decreases production costs over the long run and improves product quality for an increasingly educated consumer.

A.I.D. financed "An Environmental Assessment of Pest Management

Practices and Pesticide Use in El Salvador," a study that revealed serious misuse, overuse, and unsafe handling of pesticides in El Salvador. An average of more than 1,100 hospital visits due to poisoning have been recorded each year since 1980. Of these, pesticide poisonings are among the top 10 causes of mortality.<sup>1</sup>

Pesticides are readily available, even to the poorest farmers, and Salvadoran peasants are accustomed to their use. Observe overuse of pesticides, application at inappropriate times, disregard of proper safety precautions, and a lack of awareness of alternative methods of pest control are common.

Because of the high illiteracy rate of Salvadoran farmers, alternate labeling methods are needed. The deterioration of the Government's agricultural extension system has further inhibited the transfer of alternative pest control technologies. Color labels are already in use. Pictographs have been studied, but at the present time no system has been adopted due to deficiencies in interpretation.

The pesticide load per total surface area was higher in El Salvador than in any other Central American country. This was due mainly to the importance of cotton, which accounts for 60-80 percent of the country's pesticide use.<sup>2</sup> Cotton has declined from its high of 150,000 manzanas in 1978 to 18,000 in 1988/89.<sup>3</sup> Nonetheless, pesticide use-levels continue to be high. Fortunately, pesticide imports have been declining. In 1983/84 pesticide imports were \$26 million, dropping to \$12.8 million in 1987/88.<sup>4</sup> Currently, all pesticides are imported as finished products or components that are turned into a finished product in the country.

Integrated pest management is practiced on a very limited basis, and meteorological information is not taken into consideration. Scientific evidence indicates that plant and pest growth can be predicted with meteorological models, information that can then be used to program the control measures.

### 2.3.1 Policy Framework

Exhibit 2.12 presents a list of major policies affecting pesticide use in El Salvador classified according to whether they are transnational or regional, and macroeconomic, sectoral or specific.

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<sup>1</sup>Heriberto Arreaga, Filmore Bender, Mary Louise Higgins, David Kauck and Bruce Mann, "An Environmental Assessment of Pest Management Practices and Pesticide Use in El Salvador." College Park, Maryland: Consortium for International Crop Protection, January 5, 1989. p. viii.

<sup>2</sup>Ibid., p.58.

<sup>3</sup>Dirección General de Economía Agropecuaria, "Anuario de Estadísticas Agropecuarias, 1988-1989." Edición 28. San Salvador, El Salvador: MAG, Febrero 1990. p. 14.

<sup>4</sup>Heriberto Arreaga, Filmore Bender, Mary Louise Higgins, David Kauck and Bruce Mann, "An Environmental Assessment of Pest Management Practices and Pesticide Use in El Salvador." College Park, Maryland: Consortium for International Crop Protection, January 5, 1989. p. 73.

**EL SALVADOR - NATURAL RESOURCE POLICY INVENTORY**

**Exhibit 2.12 Policies Related to Pesticide Management by Type, 1990.**

| <b>Type of Policy</b>                                  |                             |                    |                                 |
|--|-----------------------------|--------------------|---------------------------------|
| <b>Transnational<br/>Regional</b>                      | <b>Macroeconomic</b>        | <b>Sectoral</b>    | <b>Specific</b>                 |
| - Import regulations in Other Countries                | - Monetary/Money Supply     | - Education Policy | - Decree 315 of April 25, 1973  |
|  | - Monetary/Credit           | - Research         |                                 |
| - Production policies of pesticide exporting countries | - Monetary/Foreign Exchange | - Extension        | - Regulation 28 of May 21, 1980 |
|  | - Fiscal/Budget Deficit     |                    | - Decree No. 89                 |
|  |                             |                    | - Decree No. 31                 |
|  |                             |                    | - Decree No. 229                |
|  |                             |                    | - Decree No. 145                |

At the transnational level the major policy affecting pesticide use in El Salvador is the established standards for imported agricultural products in industrialized countries, especially the U.S. USEPA, USDA, and USFDA establish parameters for the protection of U.S. consumers. These laws apply to domestic as well as imported products. The USEPA is responsible for the registration of agro-chemicals for the US as well as for establishing the residual "tolerance levels" that are acceptable. The registrations are accepted per individual product on specific crops only. The submitted label is a legal instrument and describes the use, crop, dose, toxicity levels and possible danger to the environment (humans, animals, aquatic life, bees, etc.). The FDA is the implementing agency. They sample and analyze in the US and at US ports of entry. The FDA policy guidelines specify the levels of bacterial presence, and the percent of foreign matter. The USDA is concerned with the presence of live pests and diseases in agricultural products.

The major macroeconomic policies affecting pesticide availability and use in El Salvador are the following: foreign exchange, credit, import tariffs, and the budget deficit. The major sector policies are education, agricultural research and extension, and agricultural credit.

The specific policies are Decree 315 of April 25, 1973; Decree 28 of May 21, 1980, the Regulation to apply Decree 315; Decree 89; Decree 229 of the July 27, 1961 Law of Agricultural Health; Decree 31; Decree 145; and Decree 95 of December 21, 1976 that regulates the cotton crop.

### 2.3.2 Institutional Framework

Exhibit 2.13 lists institutions involved in pesticide use management, according to the four major policy groupings. In the Central American Region the most important institution is the International Regional Organization for Agricultural Health (OIRSA), a regional organization headquartered in San Salvador that advises local government agencies on regulations needed to avoid contamination of insects and diseases from one country to its neighbors.

The Central American Presidential Commission for the Environment and Development (CCAD) in coordination with FAO has a regional project on the International Code of Conduct for the Distribution and Use of Pesticides. FAO also has a regional project on the control of a fungus that attacks cocoa. This is done in collaboration with EPA and AID.

USAID, UNDP, the Interamerican Development Bank (IDB) and the Central American Bank for Economic Integration (CABEI) are involved in financing agricultural projects. Policies are influenced insofar as projects funded by these entities make recommendations and set requirements and restrictions for pesticide use. Especially important is the project financed by USAID to diversify agricultural exports (DIVAGRO) through FUSADES, which has research plots on integrated pest management practices. It recommends the use of less toxic pesticides, and conducts courses on IPM and safe use of pesticides. DIVAGRO is establishing a laboratory to monitor pesticide residues through its quality assurance program that supervises the use of pesticides for export crops. It uses only pesticides approved by the U.S. Environmental Protection Agency

**EL SALVADOR - NATURAL RESOURCE POLICY INVENTORY**

**Exhibit 2.13 Institutions Involved in Pesticide Management, by Type of Policy, 1990.**

| <b>Type of Policy</b>  |                               |  |  |
|--|-------------------------------|--|--|
| <b>Transnational/Regional</b>  | <b>Macroeconomic</b>          | <b>Sectoral</b>  | <b>Specific</b>  |
| - Central American Presidential Commission for The Environment and Development | - The Central Bank of Reserve | - Ministry of Agriculture  | - MAG-General Directorate of Agricultural Defense            |
| - International Regional Organization of Agricultural Health (OIRSA)           | - The Banking System          | - Ministry of Education  | - MAG-General Directorate of Renewable Natural Resources     |
| - U.S.A.I.D.   | - Foreign Exchange Offices    | - Ministry of Health and Social Assistance - Directorate of Normative Services | - MAG-CENTA  |
| - GTZ  | - Ministry of Finance         | - CENTREX  | - Association of Agricultural Inputs                         |
| - Central American Bank for Economic Development (CABEI)                       | - Ministry of Economy         |  | - FUSADES-DIVAGRO  |
| - U.N. Development Program (UNDP)  |                               |  | - Salvadoran Ecological Foundation                           |
| - U.N. Environmental Program   |                               |  | - Association of Earth Friends                               |
| - FAO  |                               |  | - Society of Agronomic Engineers of El Salvador              |
| - IDB  |                               |  | - Salvadoran Ecological Movement                             |
| - CATIE  |                               |  | - Salvadoran Association for Conservation of the Environment |
|  |                               |  | - Teclena Foundation for the Environment                     |

(EPA).

CATIE, a research and education institution, has been involved in integrated pest management research in Central America through programs that contribute to a better understanding of the effects of pesticides and the use of alternative methods. CATIE's IPM project conducts on-farm research. Farmer participants are limited to small and medium-sized parcels where family members fill most labor needs.

GTZ, a German organization, has worked extensively in Central America on pesticide use, training technicians and supporting research efforts in IPM and proper use of pesticides. GTZ is providing support to develop integrated pest management technologies in El Salvador, a project started in September 1988. The overall goal of the project is to improve integrated pest management in cotton, corn, and beans. Existing technologies are identified, the technology is disseminated, and research is conducted where necessary. Thirty percent of resources are spent on research and 70 percent on extension.

The Central Bank of Reserve is responsible for monetary policy, which is implemented by the banking system and the foreign exchange offices. The Ministry of Finance is in charge of the fiscal policy.

The Directorate of Agricultural Defense (DDA) is responsible for implementing the laws regulating the importation, exportation, registration, use, handling, storage, and disposal of pesticides. It sets policy regarding the types of chemical that can be imported into El Salvador and determines the registration status of chemicals, quality standards, use standards, environmental protection, and human health and safety. Four major departments are responsible for implementation: Legal, Registration and Certification, Animal Health, and Plant Health.

DDA depends on the Agricultural Technology Center (CENTA) to conduct the necessary analysis and monitoring of agricultural chemicals which include pesticides and fertilizers. The analytical laboratory at CENTA is divided into two sections: pesticide analysis for registration, and quality control and pesticide residue analysis. Most IPM-related research is conducted at CENTA. This is the only laboratory in the country with the mandate to monitor residues in foods, water, humans and the environment, but the labs are seriously constrained by inadequate operating resources and insufficient staff.

The Center for Exports and Imports Procedures (CENTREX) was created in 1987 by Decree 8 to streamline the import and export processes in the Ministry of Economy. CENTREX's major objective is to streamline by centralizing the export/import functions of different government institutions and to help importers and exporters effectively support commercial activities. To meet the regulatory requirements and goals of CENTREX, thus reducing costs for importers and exporters, CENTREX incorporates the delegates of the DDA, General Directorate of Agricultural Economics (DGEA) and the Fisheries Development Center (CENDEPESCA). CENTREX plays a key role in authorizing pesticide imports as determined by DDA and DGEA.

The Agricultural Fomentation Bank (BFA), a government agricultural

development bank, provides limited technical assistance in addition to its lending activities. It also distributes agro-chemical inputs through its Commercial Division. Its clients receive preferential prices for those inputs. It is frequently the only formal source of credit available to poorer farmers from both the traditional and the agrarian reform sectors. The BFA imports an estimated 45 percent of the nation's fertilizers, roughly one-third of all herbicides consumed, as well as smaller quantities of insecticides and fungicides. It pays no custom duties on these inputs and offers them to clients as part of the production loan package. These in-kind loans are not optional. That is, if the farmer wants a BFA production loan, he must accept the entire loan package, including inputs. The farmer is not free to select the inputs that he prefers. Loan officers develop a farm plan that specifies the type of chemical inputs to be disbursed. Also, the loan officer would not consider a loan request and farm plan which substitutes cultural and mechanical controls for the use of chemicals to be a good risk. Such a request is likely to be declined, tying a farmer to the use of pesticides.

The Association of Agricultural Suppliers (APA) is a 22-member trade organization of manufacturers and importers of agricultural chemicals (fertilizers and pesticides). Its main objective is to sell chemicals. They claim as their objective to protect the environment and human health by promoting the correct use of agricultural chemicals and fostering the introduction of new products. It maintains a communication channel with the Government. One of its major programs, the Safe Use of Pesticides, consists of training and demonstrations for extension agents, farmers, and farm labor.

### 2.3.3 Analysis

The most important macroeconomic policy affecting the quantity of pesticides used in El Salvador was the rate of exchange between the colone and the U.S. dollar, which contributed to the sale of pesticides at less than their "real price." Under this scenario, farmers had the opportunity to use more pesticides than economically optimal or technically appropriate in a free market with educated farmers. Fortunately, this measure has been revised, and the present government has allowed the colon to float.

The credit policy has been low interest rates, even below the inflation rate. The Agricultural Fomentation Bank is the single largest provider of formal agricultural production credit in El Salvador with offices throughout the country and agents who work directly with farmers to monitor loans. In addition to its credit department, BFA has a commercial department which sells agricultural inputs including pesticides and fertilizers. BFA has a policy to extend credit in-kind to ensure that agricultural loans are used according to the plans developed during the initial loan request. Consequently, the farmer's loan plan, extension of credit in-kind, and subsequent monitoring of the farmer's activities by the BFA agent all combine to encourage a predetermined level of pesticide use regardless of level of infestation.

The present policy of budget deficit reduction, while effective for reducing inflation and stabilizing the foreign exchange rate, is limiting government employees' salaries. This contributes to the reduction of trained

personnel in institutions that regulate the use and trade of pesticide in El Salvador.

Salvadoran education policy has been very deficient as indicated by the high illiteracy level, making it difficult to train farmers. Ignorance of technical personnel about integrated pest management practices contributes to heavy pesticide misuse and complicates the labeling of pesticides.

Lack of funding in government institutions limits the research into integrated pest management practices for different crops in El Salvador. The extension service is also very limited. MAG has too few technicians to cover the training needs of Salvadoran farmers, and the existing staff lacks adequate logistical support.

The major law regulating pesticides is Decree 315 of April 25, 1973, Law on the Control of Pesticides, Fertilizers, and Products for Agricultural Use. Regulation 28 of May 21, 1980, establishes the mechanisms to enforce the law.

Regulation 28 guarantees the quality and composition of agricultural chemicals, outlining requirements and actions to prevent damage to human health and the environment. It provides detailed guidelines for product registration, product formulation and manufacture, quality control, commercialization, application and use procedures. It also establishes sanctions for violations of the pesticide law. Pesticides must be reregistered every three years.

The registration requirements for the import and use of Class I (most toxic) and Class IV (least toxic) chemicals apparently do not differ. Import fees and taxes are the same, and distribution and use are not restricted.

New agricultural chemicals must be registered for use in El Salvador with the Directorate of Agricultural Defense when the product first comes in and must be renewed every three years. The formulator and/or importer solicits DDA for the permit to register a new compound in El Salvador. The private firm must submit an analytical standard, samples of product, analytical techniques, efficacy data and technical literature to DDA. The sample goes to CENTA for analysis. A protocol for investigation is developed and submitted if the product is new. The importer must provide evidence to certify that the compound is registered for the same or a similar use in the originating country (e.g. according to the guidelines of the Environmental Protection Agency for U.S. products) and is sold freely for the stated use. The company pays for the analysis conducted by CENTA.

Finally, as outlined in Article 43, the company must develop an approved label in Spanish for the product that appears to follow the basic protocol used by EPA and FAO. The label must be complete and color labeled (i.e. red, yellow, blue, and green in order of decreasing toxicity). It must include the following information: category of toxicity, conditions of use (date, dosage, interval before entering the field, interval before harvest), tolerances, crops and pests for which it is used, specific environmental hazards, specific safety measures and hazards, the commercial and the common name, and the percentages of active ingredients.

Technicians at the Directorate of Agricultural Defense indicated the lack of a defined set of standards. Hopefully, this will be resolved by the project on the International Code of Conduct for the Distribution and Use of Pesticides. They also said information and research are inadequate, due to their limited budget.

Research efforts on IPM in corn, cotton, beans, and coffee have reduced pesticide application in cotton from 35 to 20 applications per crop cycle.

People do not use protective equipment during applications due to the cost of the equipment, and the inadequacy of safety equipment for this climate. To solve this problem, those costs could be included in the loan applications. However, workers do not use protection during cotton applications because of the high temperatures during application hours. They are probably unaware of the risks involved and need education on the harmful effects of pesticides.

Even with regulatory laws, non-approved pesticides find their way into the marketplace. The Government confiscates these products when they are discovered. However, the Directorate of Agricultural Defense lacks sufficient personnel or resources for adequate supervision. Stronger enforcement mechanisms need to be implemented to avoid the sale of these illegal chemicals.

Due to the high cost and lack of adequately trained personnel, trials on pesticide effectiveness are not conducted, even though they are required by law. However, the importer or manufacturer could pay for them.

Decree 229 of July 26, 1961 is the Law on Agricultural Health, which aims to protect the country's agricultural resources through prevention, control, and eradication of pests, diseases, and other pathogens that reduce yields and destroy plants and animals. It provides the legal framework for quarantines at ports of entry and regulates the spread of contagious diseases. Decree 145 regulates the importation of animals and vegetables and their products and sub-products.

The existing laws are relatively complete and if the resources and institutional structures were available to assure implementation and enforcement of the law, many problems could be reduced. As it is, the decrees have insufficient muscle behind them for effective enforcement.

#### **2.3.4 Potential Policy Alternatives**

The alternative policies should have the following objectives:

- o Prevent illegal as well as legal import and use of pesticides prohibited for use in industrialized nations.
- o Reduce overall use of pesticides by developing alternative IPM technologies.
- o Improve on the proper use of pesticides including protection of the person handling the pesticides, as well as more

appropriate levels of application to crops, timing, and product handling to avoid run-off contamination and heavy pesticide residues on all foods.

The following recommendations are a possible means of achieving these objectives:

- o Make credit available for IPM practices along with pesticides purchases.
- o When pesticide use is required, make available resources for the purchase of adequate handling equipment in the loan program.
- o Eliminate duty-free privileges in the importation of pesticides from all agencies that have such privileges.
- o Due to insufficient government funding, use the import taxes on pesticides to improve research in IPM, hire better staff and equip the regulating institutions.
- o Include in every agricultural project a training module on safe pesticide use and alternative pest management techniques;
- o Revise the education policies in El Salvador to reduce illiteracy in the rural population.
- o Improve pesticide labeling requirements so requirements for safe application can be understood by an illiterate person.

#### **2.3.5 Recommendations For Future Research and Analysis**

- o Study ways to modify the research policy to conduct more IPM research. Focus on extension where technologies exist and on research where it is needed. Research should be adaptive in nature and designed, developed, and implemented with the participation of extension agents and growers.
- o Study ways to charge higher fees in the registration procedure and use the funds to improve the facilities of the Directorate of Agricultural Defense. Study the possibility of imposing higher fines when companies are found to be marketing a product below the standard of that which was registered.

### 3. FORESTRY

Wood has many uses in El Salvador, which is typical of all developing nations that once were largely covered by forest. In even a superficial evaluation of climatic data (temperature and especially precipitation), soil profiles and relict vegetation distribution show very clearly that forest once covered at least 90 percent of the territory in El Salvador. Mostly deciduous except for the mangroves, coastal plain, scattered pine, and high-altitude cloud forests, this essentially continuous green mantle may have contained as many as 1,000 different species of trees. Some 80 to 90 percent of these species persist today. However, the outlook is poor for survival of more than half of them in the long run, considering current distribution patterns and environmental deterioration.

A brief encounter with rural Salvadorans reveals an array of needs for wood. While the most important today are clearly firewood and house construction, wood is used for a myriad of other purposes, including instruments, vehicles, boats and rafts, tools, kitchen utensils, furniture, fences, weapons and clothes. In areas where small but highly diverse remnants of forest remain, the diversity of uses of bark and resin, as well as the uses of trees by local wildlife for food and refuge, can be striking. The urban planners know little about these uses nor do they know that very few (if any) alternatives to wood exist in rural areas once these resources are exhausted.

To many Salvadoran urban dwellers, wood is an essential commodity. The need for materials for construction, furniture, panels, and roofing places heavy demands on this resource. Of course, wood is still heavily used as a fuel even in San Salvador.

While the importance of wood in the lives of many Salvadorans is underestimated, the use, management, and supply of this resource is a crucial political parameter. Due to the great variety of properties of the numerous species of Salvadoran trees and the marked absence of fossil and mineral fuels in the country, it will be difficult to find alternative materials.

Thus, the issues of deforestation, reforestation, forest management and wood uses are closely related and must be addressed very seriously by decision-makers in El Salvador. Since wood and trees are renewable resources adapted to local soil and climate, one solution to the problem of scarcity is research and development of native species rather than substitution with exotic species.

Numerous dissertations, articles, and publications have pointed out the precarious condition of forests in El Salvador. While forest removal is still proceeding much more quickly than forest replacement, some research and measures have been taken to confront the problem. The quantity, effectiveness, resources, timing, and remaining reforestation work are all fundamental issues to a forestry policy or policies.

With less than 12 percent of its territory still covered by natural forest, El Salvador has depleted its forest resources more than any other nation of continental tropical America. By 1979 aerial photography analysis revealed

that the country's forest cover of about 268,000 has. was divided as follows:<sup>1</sup>

|                                    | Hectares       | Percent    |
|------------------------------------|----------------|------------|
| Conifer (pine) forest.....         | 48,477         | 18         |
| Broad leaf (mainly deciduous)..... | 90,759         | 34         |
| Mangroves.....                     | 45,263         | 17         |
| Shrub & Bushlands.....             | 77,789         | 29         |
| Forest Plantations.....            | 5,792          | 2          |
|                                    | <u>268,100</u> | <u>100</u> |

However, ground observation of much of the forest inventoried under the first two categories suggests that 50 percent or more of the pine forests have been degraded to a level (60 trees or less per hectare) that makes it difficult to classify them as forests. Likewise, the broad-leaf forest, the most heavily damaged and least known of El Salvador's forests, has been reduced to about 50 percent of the total indicated. If one goes further, and questions the inclusion of shrub and bushland as true forest, it is possible to give the following more indicative figures for 1990:<sup>2</sup>

|                              | Hectares       | Percent    |
|------------------------------|----------------|------------|
| Conifer (Pine) forest.....   | 25,000         | 19         |
| Broad leaf (deciduous).....  | 40,000         | 31         |
| Broad leaf (evergreen*)..... | 12,000         | 9          |
| Mangrove.....                | 45,263         | 35         |
| Forest plantations.....      | 7,000          | 6          |
|                              | <u>129,263</u> | <u>100</u> |

This extrapolated figure of roughly 129,000 has., representing 6.1 percent of the total national territory, is probably a better indication of the status of forests in El Salvador. Of this total, the National Parks and Wildlife Service (1976, 1989) estimates that at most one-third (about 40,000 has.) can be considered worthy of conservation efforts as parks or reserves. The rest is either too small, too isolated, or too patchy to merit currently expensive protective measures, or is highly disturbed secondary forest currently under strong exploitation.

While El Salvador's forests are in critical condition quantitatively, this does not mean that its forest resources are poor. With over 900 species, El Salvador's tree biodiversity is at least 20 percent greater than that of the entire United States.<sup>3</sup> A more accurate statement is that El Salvador's rich tree diversity is in a critical state quantitatively. The crisis is due to the very small areas to which the trees are confined, as well as to the limited knowledge of planners and scientists about these areas. Thus, they are usually

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<sup>1</sup> USAID/El Salvador. "El Salvador, Perfil Ambiental, Estudio de Campo." San Salvador, El Salvador: USAID Contract No. 519-0167-6-00-2039-00, April 1985.

<sup>2</sup> By Extrapolation

<sup>3</sup> The United States has 620 species and its size is 450 times larger than El Salvador.

considered unimportant economically.

Citing several studies, Ponce points out that in 1980, 64 percent of total energy consumption in El Salvador was derived from firewood (mainly for cooking), down from 69 percent in 1970.<sup>1</sup> It is likely that the percentage of energy from firewood has decreased even further since then though the actual amount of firewood consumed has probably increased.

Deforestation is a process easily documented by aerial photography analysis or simply by walking out of a city and looking in any direction. While much forest removal clearly results from cutting for firewood, much deforestation per se is the result of indiscriminate removal of all trees in the process of converting forest to agricultural land.

Considerable amount of wood cutting occurs through the gradual thinning of forest and shrubland, which in many areas is the most serious form of deforestation. Of course, some tree cutting is for purposes other than providing fuel; cutters and distributors readily agree that fine quality hardwoods are becoming more scarce. Many regular users of wood, such as carpenters, admit that to obtain fine wood they need to bribe, smuggle, and even poach from reserves.

Reforestation, on the other hand, usually involves rapid-growth species that are not native. Eucalyptus, casuarine, and teak have been very popular, with some local species of pine coming in a close second. Since 1975 more than 20,000 hectares of trees have been planted by the Forestry Service alone. Of these, less than one-half have survived. The remaining--some 7,000 hectares--represents a little less than one-half of what has apparently been cut each year since 1975.

Objective research in forestry is noticeably lacking. Research and development of local trees has been concentrated on about 35 species, mainly in seedling production, and carried out mostly by the Forestry Service. Except for a short burst of interesting studies during the early 1970s (mainly on nurseries and forest pests), very little applied research has been done in this field in El Salvador. Tree growth, synonymous to production, and growth behavior related to different soil types, slopes, and depths, are basic parameters that local forestry researchers have virtually ignored. In fact, the absence of growth data as a basis for predicting production and yield per area may be a major reason that credits for forestry projects are so difficult to obtain. Nonetheless, research in general has such a low priority that the Department of Forestry Research has essentially not functioned for over 10 years.

### **3.1 Policy Framework**

Unlike several other Central American nations, El Salvador has few significant external pressures that enhance or diminish local forests and wood supplies. Due to its small size and the scarcity of its forests, foreign

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<sup>1</sup>USAID/El Salvador, "El Salvador, Perfil Ambiental, Estudio de Campo." San Salvador, El Salvador: USAID Contract No. 519-0167-6-00-2039-00, April 1985.

interest in El Salvador as a market for forest products is minimal.

Several national policies work against forest survival, including the general notion, implicit in many agrarian laws, that forests are "idle" lands that should even be heavily taxed to induce the owners to "get them to work." The Spanish term "monte" (essentially meaning "weedland") is often used to describe forests. This attitude is strongly apparent throughout legislation including the agrarian reform laws. Because it was considered idle, forestland was expropriated, distributed to farmers, and placed in agricultural production.

Even major local and international banks have trouble taking reforestation projects seriously. Financing the cultivation of trees that are usually removed to make land accessible to agriculture seems to contradict common economic sense. Unfortunately, several conservationist movements may actually foster this notion by creating an excessively romantic aura around reforestation activities. Thus, lofty statements such as, "reforesting hills to save the soil and keep the rain coming," still find their way into the speeches of high government officials. It should therefore not be surprising when concrete actions do not follow these words.

Another major problem is the isolation in which planning is done for irrigation, soil conservation, and the servicing of potable water. Even though irrigated crops give the highest yields, the contradiction implicit in the idea that irrigation should be carried out as forests are depleted does not reach the planning table. Likewise, no incentives are given to landowners with forested lands from which clear potable water flows. These landowners are more likely to have a utility company install a pump station on their land and then charge them for their own water. This abstract policy of administering natural resources as unrelated, independent components clearly reflects a general unawareness that the environment is the sum total of natural resources that interact in very concrete, dynamic ways.

The most important relevant law is Decree 268 of February 8, 1973, the Forestry Law, which aims to regulate the conservation, improvement, restoration, and expansion of forestry resources in El Salvador. The law defines the term forest, as well as the types of land that should be classified as land appropriate for forestation or reforestation. It prohibits the parceling of land suited for forests, except for the purpose of forestry or reforestation. The law has eight chapters with 84 articles. Chapter I covers general dispositions; Chapter II, organization of the Forestry Service; Chapter III, articles on the conservation and use of forest resources; Chapter IV, the legal framework for regulating forestry and reforestation; Chapter V, the protected zones, forest reserves, national parks, and equivalent reserves; Chapter VI, forest fires and pests; Chapter VII, violations and sanctions; and Chapter VIII, the necessary terms for applying the law. The law does not have a regulation.

Decree 458, passed on October 23, 1973, modified the Forestry Law to exclude the cutting or pruning of coffee trees and their shade trees from the regulations established under the law.

Other decrees also affect the forest resources. Decree 418 of July 24, 1986 establishes a stumpage fee of 2.50 colones per tree of mangroves. Decree

14 of April 1, 1986 regulates the establishment of salt factories on coastal lands and the use of mangroves in aquaculture. Decree 47 of May 23, 1974 establishes the Soil Protection Zone of Chalatenago; Decree 53 of November 17, 1987, the National Park Montecristo; Decree 59 of August 22, 1985, a forestry ban on the Impossible Forest; Decree 20 of June 6, 1989, the national park, El Imposible; and Decree 124 of June 1, 1984 the regional park, Bosque de Los Péricos.

### 3.2 Institutional Framework

The only institution dealing directly with forests and deforestation in El Salvador is the Natural Resource Center (CENREN) of the Ministry of Agriculture and Livestock (MAG). Two sections in particular deal with this issue: the Forestry Service (Servicio Forestal y de Fauna) and the National Parks and Wildlife Service (Servicio de Parques Nacionales y Vida Silvestre).

The Government forestry program formally started in 1945 with the establishment of the Forestry Section within the Soil Conservation and Reforestation Department, then under CENTA. In 1968, when the program became the Forestry Department of the Watershed Conservation and Reforestation Service, the Natural Resource Program broke away from CENTA and converted to a General Directorate. By 1973 it had become an independent service.

The Forestry Service was created in 1973 by the Forestry Law that it is now supposed to administer. This period coincided with the initiation of probably the largest and most successful forestry project in the country's history, Distrito Forestal de Metapán, which is among the most complete reforestation projects in Central America. Actually conceived as a broad watershed protection project, it was implemented by a joint FAO/GOES team. The project provided a basis for much training and experience and established much effective infrastructure. By 1978, with the return of several scholarship trainees, the work capacity of the Forestry Service reached its peak with about 16 professionals who had college degrees and many more with technical training in forest management.

An unfortunate sequence of events led to a virtual collapse of the program by 1990, however. The 16 college-level staff members and annual budget of over 3 million colones fell to a staff of three college-level professionals and a budget of just above 1.3 million colones. Research has suffered the most, with no professional staff currently undertaking activities of this nature.

Early activities and research were oriented mainly toward exotic species, including eucalyptus, casuarine, and teak; but some work was also done with local pine species and a few native hardwoods. The Forestry Service has divided its work into three areas: planning and project formulation; forestry promotion and forestry research. After regionalization in 1984, a fourth area, forest administration, was transferred to the regions and essentially halted. A semi-autonomous forestry institute, which some have suggested creating, might have more administrative power, but technical effectiveness in forestry might actually decrease due to the loss of interaction with other environmental components of the Government.

The Forestry Service has paid little attention to the issue of firewood. In fact, this aspect of wood use has received more attention from the Commission Ejecutiva del Rio Lempa (CEL), through its department of biomass energy. Essentially a planning department, a complementary Section for Conservation and Development of Natural Resources was established in 1989 which enables CEL to actively undertake projects in reforestation and other watershed protection and energy production areas. A coordination committee ensures a complementary rather than duplicative role with the Center of Natural Resources (CENREN) of MAG. Most of CEL's activities are focused on the Lempa River watershed.

An independent project within CENREN, Proyecto MADELEÑA, has complemented Forestry Service action but with more success. Sponsored by CATIE, the concrete objective of this project (which has a staff twice the size of the professional staff of the Service itself) is to encourage rural communities to produce seedlings and plantations to satisfy their own needs for fuel. Technical assistance is provided to choose, plant, and manage appropriate tree species. In particular, as demonstration plots and catalyzers for larger-scale reforestation, this project has had many successes throughout the country. It is part of a larger project being carried out quite successfully throughout the Central American region.

The National Parks and Wildlife Service, through its Wildlife Department, initially gave a primary role to tree classification and evaluation which was to be the basis for classifying natural areas in El Salvador. The first and only formal publication was that of the trees of Deininger Park (Witsberger et al, 1979). Work on the trees of the Montecristo Cloud Forest produced a thesis that has not yet been presented as a formal publication. Another comprehensive work on the trees of the El Imposible forest, with almost 200 species not described in the former two works, is still on the drawing board. However, this inventory and several other wildlife projects have been suspended for several years and it is not clear whether they will be completed. These activities, plus the protection of all trees within areas protected as parks or reserves, completes the NPWS work in forestry.

### 3.3 Analysis

While there are few pressures on Salvadoran forests from outside the country, a major exception is the extensive purchasing and/or smuggling of mangrove wood to Guatemala, usually large, straight trunks or bark for the extraction of tannin, motivated by El Salvador's low stumpage fee. A 20 to 25-meter long red mangrove trunk can be purchased for as little as \$0.40 U.S. Much stricter regulations in neighboring Guatemala apparently motivate frequent though often discreet incursions across the border for Salvadoran logs and bark. Still occurring in 1990, these extractions have created massive and serious damage on the southwestern coast of El Salvador from bordering Bola del Monte (which has essentially been cut down completely) to Barra de Santiago, a major mangrove-estuarine region of western El Salvador. The latter area, the first choice of many experts for conservation efforts in the country, was the major site the National Parks and Wildlife Service selected in 1976. Fifteen miles from the border, it is the easternmost point where mangrove wood smuggling occurs.

Export crop cultivation, which in the recent past was a major cause of forest destruction, has been temporarily halted due to several factors that have detained crop expansion.

Neighboring countries, especially Honduras and Nicaragua, have become far more reluctant to export wood to El Salvador, which has strongly affected local wood prices, especially fine hardwoods. However, emphasis on planting and growing of native species has been minimal, so this has not fostered even small reforestation projects or protection of local stocks.

Several local policies and policy voids strongly encourage deforestation. The most serious policy void is that major government development plans do not regard natural resources as a basis for economic development. Thus, it is assumed that trees, water, soil, and wildlife are "no-cost" items. That many of these resources are suffering severe depletion or deterioration is apparently regarded as an inevitable consequence of "progress." That most macro-economic planning is strongly biased towards industrial, commercial, and other urban development strategies is significant in this vacuum. That agriculture and animal husbandry programs (and other rural industries) view these resources as completely devoid of environmental considerations is also significant. Thus, yield predictions are usually based on amount of land planted, fertilizer imported, and seed varieties. Climate, soil depth, pests, and other environmental factors are apparently considered insignificant.

National firewood requirements have not reached the attention of government central planning authorities, although there is already a clear deficit in supply, and the population is expected to double in the next two decades. Strangely, firewood production or firewood quality and use are not central national issues. This is also true for reforestation of the northern highlands, where both precipitation and erosion are rapidly reducing the effective life of all three of the country's dams.

Interviews with several low income farmers throughout the country in 1983/84 (F. Serrano, unpublished) revealed that a) in most cases, especially in the eastern lowlands, favorite firewood species have been depleted and woods currently used are second, third, and even fourth preferences at best; b) a "good" firewood species was one that gave little or no smoke, burned slowly, and left little ash; c) firewood is purchased in rural areas less than 10 percent of the time, usually to save the time of obtaining it; and d) the time required to obtain the necessary firewood has increased on average by just over 200 percent in 10 years.

For urban firewood consumers, the problem is more than just price. During the last 10 years the price of firewood in San Salvador and Santa Ana has risen by more than 400 percent. The escalating prices are probably creating a competitive demand on wood in rural areas. While interviews reveal that landowners are making it more difficult for outsiders to cut wood on their properties, no objective evidence of the effects of high urban prices on wood in rural areas exists.

In rural El Salvador, there is little economic alternative for fuel other than wood. Local mineral or organic non-renewable fuel resources (coal,

petroleum, gas, etc.) have yet to be found. Propane gas obtained locally by refining imported petroleum is too expensive for at least 75 percent of the rural population. Low rural income is matched by the general misconception that firewood is a free and pervasive resource, which allows for the cutting of wood on private property, the looting of forests (perhaps especially national forests), the cutting of trees without replanting, and other questionable and/or unwise practices.

Most reforestation programs are oriented to industrial woods rather than firewood, except for the MADELEÑA project. Most species being contemplated as sources of firewood do not match the preferences stated by farmers.

While the problem of firewood does not directly affect the budget of most rural people, evidence indicates that related problems are on the rise. These include an increasing use of dung for fuel, almost non-existent two decades ago; interference with basic education, as young children are clearly bearing the brunt of the increased time and effort required to obtain fuel; and most noticeably, an alarming rise in erosion and wildlife depletion as forests and steep hillsides are increasingly subjected to more removal than regrowth of vegetation.

Most other important uses of wood are not objectively documented, much less taken into account in reforestation programs or planning, except for the use of wood for urban construction.

As mentioned previously, very little is known about the properties and value of the country's more than 800 species of trees. Information about such properties as wood density, grain, stress resistance, and even growth is virtually unknown. In fact, natural forests are in general viewed as "wastelands" whose heterogeneity and low value defies economic management. As recently as 1974, the last magnificent remnant of the eastern coastal forest (Jucuarán) was replaced by cashew plantations, which flopped and were abandoned less than five years later. Formal and technical proposals have been made to remove oak from pine-oak forests to "improve" the economic value and management feasibility of the remaining pine forest.

While cedar (*Cedrella mexicana*) and mahogany (*Swietenia humilis*) are locally prized as fine quality cabinet woods, several native trees have even greater potential for untreated-wood uses such as doors, beams, ox-carts, canoes, fences, posts, floors, and furniture. The list of these species (which includes Balsam, El Salvador's national tree) is surprisingly long and deserves close, objective, and technical investigation.

No signs of objectives of the Salvadoran reforestation program can be observed in the distribution and structure of established plantations. Except for the Metapan Forestry Project, erosion control has not been a major objective on a national scale. Until recently, the production of firewood has not been a major objective either. A large part of the approximately 7,000 hectares of established plantations clearly suggests usage for industrial purposes. Teak, pine, and eucalyptus account for more than 75 percent of the trees planted. The remaining 25 percent is formed by about 20 different species of local hardwoods and three exotic species. The National Parks and Wildlife Service has taken a

different approach in which some 75 native tree species have been used. However, these efforts have not been significant. Only 200 hectares have been reforested, mainly to restore a "natural environment." Neither service has gathered much data on plantation behavior and maintenance.

Witsberger, Current and Archer (1982) in a study of a strongly deteriorated lowland deciduous forest, reported 144 species of trees. Over 45 had readily identifiable valuable wood properties for local and international markets. The fact that industrial properties of the remaining species were not identified probably reflects the lack of appropriate information rather than a low commercial value. Tablas (unpublished) has identified a much larger number of commercially valuable trees for the El Imposible National Park. These numbers do not reflect a careful, updated analysis, but rather a cursory survey to obtain indicative data. These studies, undertaken by the National Parks and Wildlife Service in the late 1970s, were part of a national tree inventory for the classification of natural areas but has been discontinued.

No objective incentives such as tariffs or appropriate long-term credit or tax exemptions have been provided in El Salvador that would lead landowners to view trees as a crop. Thus, "land for conservation" (i.e. strict protection)" is substituting for "idle lands" with the same negative connotation for the landowner: land expropriation. Areas covered with natural forests are acquiring a new negative connotation for the private landowner, leading to a new surge in deforestation or property fragmentation by people who perhaps justifiably fear expropriation. Even though from "worthless" to "valuable" is a positive step, no plans have been contemplated to involve the private sector in natural forest protection and development. This omission creates tension between the private sector and the Government.

The same situation applies to tree plantations. A technology more oriented toward introduced species (such as eucalyptus and teak) with little economic information on yields and market value is exacerbating an already damaging situation for trees.

Little protection is provided to those planting trees. The armed conflict has led to much forest cutting and burning, in particular by the army which understandably, if not justifiably, fears these areas as potential ambush sites, particularly those located near major roads and urban areas. Open looting also occurs, with little or no effort to stop it. Both private and army trucks are frequently seen carrying away considerable loads of wood from mangroves and pine forests alike. Even protected areas such as the San Diego Forest (in Santa Ana) and the Deininger Park (in La Libertad) are being cut down openly during the day.

The recent reorganization of the Ministry of Agriculture has inflicted perhaps considerable indirect damage. MAG was "completely regionalized" in 1984 for the second time in a decade. A major negative impact on forests has been the split suffered by the Forestry Service, which no longer has any real enforcement powers. Four regional offices have found themselves paying and (just barely) supporting a splinter group of forest wardens that has no legal power to enforce the Forestry Law.

The need for a National Forestry Plan has been mentioned frequently. To date, however, no document has outlined a national strategy with priorities identified for: a) reforestation requirements in species and geographical areas; b) quantitative needs for wood as a raw material for different uses; c) priority areas for watershed protection; d) strategies for substituting wood imports from neighboring Central American countries; e) research; and f) other macro-activities.

Several results, including the collapse of the Forestry Service, can be clearly traced to this national policy vacuum. The relatively large annual production of trees in State-managed nurseries has had an erratic and increasingly improvised fate year after year. At first (early 1970s), these trees were utilized for State projects and promotional sales to individuals in the private sector in an effort to encourage reforestation. Next (late 1970s), the promotional sales became central. From 1981 to 1985 reforestation on land affected by agrarian reform (usually state gifts to cooperatives) absorbed even more than the usual 1 million-a-year production of seedlings. Lately, production has fallen to about 500,000 to 600,000 (in eight nurseries distributed throughout the country). Most nursery saplings are given away to schools and NGO's for consciousness raising activities, mainly in urban areas and along roads and railway tracks. In 1990 all the trees were given away for these activities. People who wanted saplings for reforestation programs were informed that they were unavailable. Because of the dramatic drop in the Forestry Service vehicle fleet (i.e. from 37 vehicles to two, and from 68 motorcycles to five), it is doubtful that these trees could have been moved anyway. Thus, the fate of each year's production by MAG is usually decided on the spur of the wet season. Furthermore, during the last three years, production has been based on numbers (from 1 million to 10 million) rather than on species, wood requirements, or regional demand. At best, 700,000 have been produced and rushed to the site of planting, often with only a few weeks or even days of the wet season left. Losses of planted saplings have run as high as 80 percent during their first year.

Forest management can be divided into two areas according to forest type. The first involves management of natural forests, which has been discussed throughout Latin America, in particular during the last 10 years. In El Salvador, however, "management" of natural forests has almost universally meant extraction of "choice" species (such as mahogany and cedar) followed by the cutting down and burning (or abandonment) of the remaining forest.

The second type refers to the management of forest plantations (i.e. stands that have been planted and are usually characterized by low diversity and uniform spacing from the beginning). These are often plantations of exotic species, in particular eucalyptus or teak. Initial plantation density is usually from 1,500 to 3,000 trees per hectare.

Basic management includes weeding and sometimes fertilization during the first two years followed by selective extraction until only well-spaced large trees remain. High-intensity plantations, with over 10,000 trees per hectare, are still little-discussed curiosities, even though these have produced excellent results elsewhere, especially for firewood. Again, rapid-growth species are clearly preferred, and local hardwoods seldom used.

A promising variant is a program being implemented by a UNDP/GOES project called "agroforestry support for low income rural communities." Communal nurseries and plantations are established, using not only the usual array of exotic species but also, when possible, incorporating a few of the locally preferred trees. Undoubtedly, eucalyptus has had a major impact on many communities. Its rapid, straight, vertical growth and little horizontal branching usually makes a strong favorable impression on these communities and has motivated several of them to seek more ambitious reforestation plans. However, the use of some local favorites has facilitated acceptance and motivation. These communal nurseries and plantations are two more success stories in an already successful project.

A GOES/FAO forestry project carried out in Metapán, Santa Ana, between 1972 and 1976 provided a wealth of practical and theoretical experience. It also left infrastructure for the management of tree plantations. Emphasis was placed on seed selection and seeds banks, nurseries, planting, plantation maintenance, harvesting and extraction, as well as fire and pest control. Professional training was provided for a significant proportion of the few Salvadoran experts in this field, who mostly have Bachelor of Science degrees. Further infrastructure and experience was developed in the forestry station at San Andrés, which is also located in the Department of Santa Ana, including facilities for post-cutting treatment of wood, a herbarium, and a xylothecum.

Often, there is little correlation between actual demand and plantation establishment during the planning stage. This omission frequently contributes to making management and sales an intuitive rather than a planned process.

Forestry-trained agronomists outside the public sector agree on a major complaint: Simply no incentives worth naming are available to carry out reforestation programs in El Salvador. Credits, in particular, are too short-term and interest rates too high. Likewise, fiscal incentives such as tax deductions are lacking. Because little national importance is attached to forests, and since firewood is still essentially viewed as a free commodity, an additional complaint is that plantations are viewed as invitations for "looters to serve themselves."

However, some local professionals in this field hold a different view. They believe that careful market analysis, selection of species, and appropriate care and management can make forestry a profitable enterprise with little need for what they call "charitable credits."

So far the "success stories" in reforestation projects are too few to motivate would-be entrepreneurs to follow suit. It is perhaps ironic that the three or four local successes have all been accomplished by people with no formal training in forestry science. Their projects range from growth of small woody bushes for firewood to growth of fine woods for the manufacture of furniture (usually done by the same person). Were it not for the current violence, these pioneers in Salvadoran reforestation would be ideal subjects for motivation through publicity.

Indirect benefits of forests and reforestation, often considered negligible, can in fact be quite high. Leasing of forested land for hunting,

camping, and other forms of recreation and outdoor sports can provide considerable income, especially when careful management is involved. This aspect of forests has received virtually no attention in El Salvador. It is usually assumed that outdoor recreation, except for a few coastal hotels, is an entirely governmental affair.

### **3.4 Potential Policy Alternatives**

- o A national environmental policy, in which the inter-relationship of all natural resources is clearly delineated, is imperative. The current statements defined as an ecological policy in the Government's Plan for Economic and Social Action (1989-1994) are mainly statements of condition and abstract intent. Virtually no concrete actions or State obligations are presented and thus, it becomes difficult to consider it as a policy.**
- o Define a National Forestry Plan with an objective and practical approach, including a description of research that must be conducted to improve the quantity and quality of this resource.**
- o The highest government authorities must designate reforestation for wood production, watershed management, recreation, and other uses as a national priority. The current silence at these levels on environmental matters is apparently having a highly negative effect at all other levels.**
- o Establish appropriate long-term, low-interest credits to stimulate reforestation projects throughout the country based on regional needs or other criteria that assure the producer of a satisfactory market. Even though reforestation is financially feasible, adequate stimulation and promotion are needed to catalyze sufficient reforestation to meet short-term national needs.**
- o Complement the credit program with additional incentives, such as fiscal deductions and technical assistance, to ensure initial success. Early triumphs are among the best catalysts for a self-propelling and growing activity in this area.**
- o Give practical, objective research the highest priority in the Forestry Service as a logical and exclusive basis for obtaining optimum production of both native and introduced species in El Salvador. This research should respond to fundamental concerns such as wood properties, growth according to site, harvesting capacity of natural forests and plantations, management, and pests.**
- o Revise the budget of the Forestry Service. The current low**

wages have resulted in the loss of most trained professionals. A budget increase can be combined with merging of existing funds to create a service that emphasizes quality and capacity rather than quantity and mere subsistence.

- o Administration of national forests (such as mangroves) should be carried out at the highest level of responsibility and management. National resources must be viewed as property of all future generations including the present one. Current negligence in forest administration must be halted immediately.
- o A marked reorganization of the Natural Resources Center is necessary. A country with as critical an environmental problem as El Salvador should consider a step already taken by several other Latin American nations: raising these concerns to the level of a vice-ministry or ministry.
- o Reorganization of the Forestry Service into a national centralized organization, with the needed authority to enforce conservation efforts.

### **3.5 Recommendations for Future Research and Analysis**

- o Carry out a detailed economic study that quantifies the direct and indirect benefits of forests and forest products. It is doubtful that significant political decisions will be made regarding forestry until the economic importance and potential of its resources have been clarified objectively. This study should include an evaluation of national needs for wood based on all major uses, including fuel.
- o A national inventory of all native trees and exotic species of high commercial and environmental potential, including wood properties, growth characteristics, and environmental requirements would be a natural starting point for national forestry development. This inventory could probably be coordinated with other institutions such as NPWS, the botanical gardens, the University of El Salvador, and FAO.
- o Species growth and behavior in different, representative sites should be carefully studied and monitored as a basis for production and economic projections for planning, granting credit, and other uses. Complementary research, involving management and pests, for example, will have to be conducted for selected species. It should emphasize local resources and technology as well as environmentally sound practices (e.g. biological pest control).
- o Both national and international demand for wood and wood products should be carefully determined for production (i.e.

reforestation projects). Quantitative and qualitative aspects should be considered, and needs and market price behavior determined.

- o The role of forests in water production per unit area, particularly in the Salvadoran highlands, must be monitored and measured. These data must be converted to economic figures according to water use as a real basis for tax deduction or other form of tariff support to forests and reforestation. Wherever and however possible, other derived benefits of forests should be measured and converted to economic and social figures.
- o Financial models that have proved successful in promoting reforestation in other regions of the world should be carefully studied and an appropriate model devised for El Salvador. This must be done at the national governmental level, as well as locally involving the private sector.
- o Study ways to subsidize reforestation.

#### 4. WILDLANDS AND BIODIVERSITY

Wildlands are natural land and water areas where native species predominate, relatively untouched by modern society. Wildland management is the direct maintenance, protection, or enhancement of relatively unmodified natural ecosystems and their characteristic plant and animal species.

Biodiversity, as used in this section, refers to diversity of native and introduced species that live and reproduce independent of man. It is synonymous to "wildlife" as a term encompassing all organisms from bacteria to mammals. For convenience, the term biodiversity will not be used to imply intra-specific diversity or diversity within different ecosystems.

The major issues identified in this section are protection of endangered species and biological diversity, and park and reserve management and ecotourism.

##### 4.1 Protection of Endangered Species and Biodiversity

CITES (the International Convention for the Protection of Endangered Species of Flora and Fauna) (IUCN, 1973) implicitly describes three categories of endangered species:

- o Plants and animals (no monerans, protists or fungi yet) whose world populations are clearly in danger of disappearing in the short run (CITES Appendix 1);
- o Plants and animals whose populations are excessively threatened (usually by commercial activities), even though they are in no immediate danger of extinction (CITES Appendix 2); and
- o Plants and animals whose local populations (of a given country) are threatened, usually because of reduced habitat or excessive human pressure (Defined by country; CITES, Appendix 3).

Many of the neotropical terrestrial animals listed in Appendix 1, mainly vertebrates such as the jaguar and harpy eagle, are already extinct in El Salvador. Serrano (1978) summarizes reasons for the small populations of many local species. These include over-harvesting, pesticide use, uncontrolled commercialization, and habitat destruction, which is singled out as the major cause of extinction in the country.<sup>1</sup>

The high degree of environmental specialization and interdependency with other organisms within their natural ecosystems makes long-term survival

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<sup>1</sup>Francisco Serrano, Supervivencia o Extinción, el Dilema de Nuestra Fauna. San Salvador, El Salvador: Impresos Litográficos de Centro América, 1978.

outside their habitats virtually impossible for over 80 percent of native plants and animals. Size of natural habitat is also important, as has been well illustrated in the brilliant work on island biogeography by Wilson and McArthur.<sup>1</sup> Naturally, original habitat is equally important to most native plants that require local fauna for pollination, seed dispersal, and pest control, among many other reasons.

Hunting and fishing are to a large degree non-regulated activities in El Salvador. A wildlife management law proposal has sat in Congress for more than 10 years without being discussed even once. Political fear of regulating activities of low-income rural inhabitants is probably a major reason for this apathy, reflected in statements by politicians, such as, "How will those poor people live if we do not allow them to ....." These are common responses to requests and demands for State intervention in numerous cases of wanton destruction. Thus, many rural inhabitants are being allowed to cut, hunt, and fish themselves out of resources due to lack of supervision and management. Management is not viewed as an activity to maintain and increase a local resource but rather as a "State intervention" that interferes with human rights of survival.

It would be unfair to pinpoint a particular sector as the sole cause of local extinction. The causes range from industrial pollution and large-scale or extensive farming to slash-and-burn practices involving the entire Salvadoran society. Unfortunately, local claims that a certain social sector is the cause of extinction or deforestation have made many politicians wary of touching these issues.

Extinction of species in Latin America is at its peak in El Salvador. Most threatening is the heavy pressure on the small natural areas of the country. The five most important such areas are El Imposible (5,000 has.), Montecristo (8,000 has.), Nancuchiname (1,200 has.), Barra de Santiago (2,000 has.) and Los Volcanes (7,000 has.). Combined in area, they are smaller than the 31,000 has. park of Corcovado in Costa Rica. Thus, many animal and possibly plant species such as the jaguar, tapir, and harpy eagle could not be reintroduced even if given absolute protection.

Species biodiversity, wildlife, and natural (biological) patrimony are three terms used loosely as synonyms at times and as entirely different terms at other times. On a national basis these three terms essentially refer to the variety of living native and free-living introduced organisms of all kingdoms: bacteria, fungi, protists, plants, and animals. Use of any of these terms in a more restricted context is conventional (e.g. wildlife limited to game birds and mammals). However, it underscores the true dimension of these terms. Thus, in this policy framework, the three terms will be used as synonyms.

As pointed out by Dr. Edward O. Wilson in the introduction of the book Biodiversity (1988), "The immense richness of tropical biodiversity is a largely untapped reservoir of new foods, pharmaceuticals, fibers, petroleum substitutes

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<sup>1</sup>R. H. MacArthur, E. O. Wilson, The Theory of Island Biogeography. Princeton, N. J.: Princeton University Press, 1967. p. 203.

and other products." He further indicates that most tropical nations are unaware of what resources they have, much less their value. In fact, these resources are generally regarded as wildlands or weeds that must be removed and replaced with valuable crops and cattle.<sup>1</sup>

El Salvador is no exception in this regard. Except for birds and orchids, no major group of plants or animals have been described in publications that satisfactorily convey an idea of their diversity and general characteristics. Potential for breeding, ecological roles, and other characteristics requiring more detailed studies are even further from being understood (or even known for that matter) by the public and most of the scientific community. Research in these areas is limited or non-existent in public and private institutions alike.

National and private universities have devoted little if any attention to this area during the last decade. No effort is being made to take a basic inventory of Salvadoran plants and animals.

Formal studies have provided valuable insights into the resources under discussion. For example, preliminary collection and identification suggest that El Salvador probably has at least 750 species of trees, 500 species of birds, 900 or more of butterflies and 800 or more of marine fish alone. These figures suggest that the biodiversity of these areas, even though quantitatively poor in natural areas, is very high and still reflects neotropical characteristics. However, the very small and in general unprotected status of most of these natural areas foreshadows the potential loss at stake.<sup>2</sup>

Several proposals have been made through education programs to arrest this loss as well as that of environmental deterioration. In fact, the Ministry of Education introduced a very good program in 1976 as compulsory at the high school level. Unfortunately, very little time, effort, and money has been invested in producing the texts and other materials required to make such programs successful.

#### 4.1.1. Policy Framework

Policy frameworks are one area where international legislation has been of assistance. CITES has been the most effective tool throughout many nations of Latin America.

There is little local legislation that directly allows for the regulation of activities involving endangered wildlife. A few municipalities have attempted to establish local controls over activities such as wildlife commerce (e.g. La Libertad 1987; San Salvador, 1989) with some success. Resolution 265 of 1990 signed by CENDEPESCA bans the fishing of dolphins, marine

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<sup>1</sup>F.O. Wilson, *Biodiversity*. Washington, D.C.: National Academy Press, 1988.

<sup>2</sup>USAID/El Salvador, "El Salvador, Perfil Ambiental, Estudio de Campo." San Salvador, El Salvador: USAID Contrato No. 519-0167-C-00-2039-00, April 1985.

turtles, and lobster with eggs and those under 20 cms. long. However, no effort worth mentioning has been made on a national scale.

The highest level officials of the current government have not yet made any statement touching this issue. A brief ecological policy described at the end of the current Government's Plan for Economic and Social Development (1989-1994) addresses environmental issues mainly with a diagnostic and descriptive approach, but does not indicate what measures may eventually be taken.

The great potential of El Salvador's biodiversity is essentially unknown, and thus is not given any major weight in higher level political strategies or protective measures. It was not until the Constitution of 1982 that natural resources were contemplated at all at a primary level. Even today, there is no comprehensive secondary legislation, such as a law for the protection and management of wildlife, much less specific and formal regulations for hunting, sport fishing, commercialization of wildlife, and others.

#### 4.1.2 Institutional Framework

The institution designated to play the central role in protecting endangered species is the National Parks and Wildlife Service. However, it lacks appropriate legislation and infrastructure to do the job. In its early years (the 1970s) its Department of Wildlife carried out ambitious programs of production and inventory, together with the Museum of Natural History (MNH), but it has gradually fallen into an almost total eclipse, especially in basic research.

The MNH has played a vital role in providing a basic inventory and quantitative evaluation of native flora and fauna mostly in its initial years (1976-79). MNH and the National Zoo, are part of the Directorate of Natural Patrimony of the Ministry of Education. Other institutions that protect endangered species are private zoos, reserves, and botanical gardens. A private botanical garden, Jardín Botánico Plan de La Laguna and a Biology Department in the University of El Salvador have provided considerable technical input in the past, but have no national regulatory functions.

The General Directorate of Agricultural Defense, along with Customs authorities, has played an important role in controlling the international commerce of endangered species at points of entry/exit to or from El Salvador.

The most important institution in the regulation of biodiversity in El Salvador is the Ministry of Agriculture and Animal Husbandry (MAG). Its Center for Fisheries Development (CENDEPESCA) oversees both freshwater and ocean fishing. In fact, it is the only office that currently has any major influence in the management of marine resources. The Natural Resource Center (CENREN) gives the broadest coverage, with a Forestry Service that oversees the management of all natural forests (except those declared national parks or equivalent reserves), tree plantations, and even trees. The National Parks and Wildlife Service (NPWS) oversees the protection and management of both natural areas and wildlife, although it lacks major legal instruments with which to enforce its criteria.

The National Parks and Wildlife Service has two departments. The Department of National Parks and Equivalent Reserves is in charge of natural ecosystem management. The Department of Wildlife Management has the broadest national responsibility for biodiversity management, including the study, protection and management of all native and introduced free-living organisms in El Salvador. However, in practice it has concentrated on developing protection and management strategies for a few large reptiles, birds, and mammals.

#### 4.1.3 Analysis

The protection of endangered species in El Salvador is in an incipient stage. The most important measure currently required is the protection and restoration of the natural ecosystems in which these organisms live. Although plans have been initiated, work is proceeding so slowly and timidly that it may fail to save many native plants and animals.

External factors have affected the biodiversity of El Salvador both positively and negatively. Demand for wildlife and wildlife products, especially when coupled with highly tempting prices, has had devastating effects on local populations of plants and animals. At times preventing smuggling of expensive wildlife involves life-threatening efforts, which are often avoided.

The crocodile, the caiman, the scarlet macaw, and the yellow-napped parrot are a few of the many species that have been reduced to dangerously low populations or even pushed to extinction in the country.<sup>1</sup> El Salvador's joining the CITES convention in 1987, however, provided a useful tool to offset this pressure. Illegal wildlife traffic has dropped dramatically. The fact that scarlet macaws and wild cats, both on Appendix 1 of the CITES convention, are still frequently sold on the streets of San Salvador indicates that this valuable tool has yet to be fully exploited, however. In El Salvador, the scientific authority for the CITES convention is the National Parks and Wildlife Service. However, key institutions in the implementation of the CITES convention in recent months have been the General Directorate of Agricultural Defense, and more recently, customs authorities at points of entry/exit to or from El Salvador.

El Salvador marked two achievements with the signing of the CITES convention. First, its role in the international smuggling of wildlife was significantly reduced. The previous shipments of wildlife through the country to gain Salvadoran status and evade CITES regulations have been terminated. Equally important, Salvadoran authorities finally obtained a tool to reduce pressure from external demand with its tempting prices and to control all shipments of wildlife entering or leaving the country.

The confiscation of illegal or unauthorized shipments is having a local impact. An increasing number of people prefer to process legal permits or avoid questionable shipments. A common complaint of those who try to fully follow the regulations is that they are treated with suspicion and subjected to frustrating

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<sup>1</sup>Francisco Serrano, "Supervivencia o Extinción, El Dilema de Nuestra Fauna." San Salvador, El Salvador: Impresos Litográficos de Centro América, 1978.

delays or both. Very often authorities' actions are based more on personal preferences than on regulations. When written instructions are requested, authorities make clear that they do not yet exist. Government authorities should make procedures clear, easy, and efficient to further encourage a respect for and willingness to follow legal channels. It would also help to avoid loopholes that open the way for corruption or misunderstandings.

That protected species are still sold in San Salvador and elsewhere in the country indicates that further enforcement is required. Likewise, that the CITES convention has demonstrated its effectiveness should be no excuse for withholding or delaying the passage of national legislation to regulate wildlife use.

Effective implementation of the CITES convention is further hindered by El Salvador's failure to define its APPENDIX 3 (i.e. the list of species that are locally endangered or threatened, even if common or abundant elsewhere, such as the yellow-napped parrot). Enough information exists to provide a preliminary list of locally endangered vertebrates and orchids.

Overly protective attitudes can be harmful. The view that "wildlife should be seen but not touched" does not respond to local needs or the potential of all biological resources (i.e. their capacity to produce many offspring, especially when bred in captivity under appropriate conditions). Several international organizations and institutions dealing with conservation, including CITES, have expressed this overly protective attitude, which is likely to discourage many developing nations that want to consider their resources as a basis for economic development.

Internal commercial pressure presents an entirely different perspective. With virtually no legal backing and little appropriate technical information for curfews and other restrictions, local authorities are hesitant to intervene effectively in commercial activity. The government impression that regulatory measures would be highly unpopular is incorrect as well as unjustifiable as a basis for non-intervention. Fishermen, hunters, wood-cutters and other individuals who depend on natural resources for their subsistence usually express a willingness if not an open desire for regulations, as long as they are implemented reasonably and objectively. On the other hand, the affected parties absolutely and sometimes violently reject closed prohibitive measures.

In evaluating pressures on national biodiversity, national policies again play a major role. In general, the population at large, the private sector, and the Government have little awareness of the local biodiversity and its economic value and potential. This general ignorance facilitates the rapid elimination of the areas where most of the biodiversity is located: the natural areas of El Salvador.

Building awareness is a major function of education. The Ministry of Education ecology program for high school students introduced in 1976 unfortunately has had little impact, although it is well designed and well-conceived. No curriculum materials were written or made available to the teachers who had to present this subject in their classes. In general, the lack of written material is a major obstacle to dissemination of basic knowledge and

awareness on Salvadoran biodiversity. There are no plans to fill this vacuum as yet.

Another factor undermining local biodiversity is a generalized attitude that research is an inconvenience for developing nations, and perhaps even an unnecessary luxury. This attitude is often expressed in the practice of concentrating efforts on existing knowledge, or simply incorporating technology from developed nations. The instructions to make "adaptations to local conditions" rarely, if ever, are followed. Thus, sectoral and specific institutions find themselves administering resources whose nature they frequently do not understand. Local and foreign individuals who have experience with these resources rapidly sense the inexperience and take full advantage of it. Open hunting, looting, and smuggling of natural resources is easy for people who know far more about these resources than the individuals or institutions supposedly in charge of managing them.

El Salvador's governmental institutions and policies reveal a self-defeating attitude toward research. The paucity of resources is a paramount cause of excessive reliance on technology transfer, which frequently means the introduction of foreign materials or adaptations of local resources that usually perform better under entirely different circumstances. These circumstances can be determined by observing the natural conditions under which a species thrives. Careful, well-designed research can reveal the properties and potential uses of many Salvadoran plants and animals. This type of research may be a major highway out of the world of "underdevelopment."

One major loophole in the implementation of effective legislation and technical measures to protect endangered species is a marked lack of basic information for determining endangered species and the measures required to recover or protect existing populations. In fact, no basic inventory of native plants and animals in El Salvador has been conducted, except for higher vertebrates and orchids. Such inventories are essentially basic taxonomic-systematic studies. Their unpopularity may be due to lack of support funds, coupled with the fact that most biologists find themselves more attracted to modern areas of their subject area, such as marine biology, genetics, or ecology, than to traditional studies, such as the inventories.

On a national scale it would be appropriate for the government to encourage these basic inventories of the nation's natural heritage. The first step in protecting or using a resource is knowing of its existence. Publication policies implemented by the Ministry of Education's General Directorate of Publications, in which works are published cheaply to be "made available to all," may be a major deterrent to publication. One reason these publications are provided so cheaply is that no author's rights are paid.

However, much literature is available, though not locally, identifying native plants and animals with valuable properties. A careful compilation of these properties, combined with an evaluation of local use of these resources, could provide the incentive to initiate or broaden local applied research.

The Museum of Natural History (MNH) clearly has the major responsibility in carrying out a reliable inventory of native plants and

animals. However, after the first three years of its existence (1976-78) MNH stopped fulfilling this responsibility. The basic work of collection and identification has not been a major goal of its own work programs for a long time. This institution has even lacked a motor vehicle to do fieldwork during the last eight years. While other institutions, such as university biology departments and botanical gardens, can and should play major roles in the inventory, MNH must have central responsibility if this major goal is to be achieved.

While the museum's work in natural history dates back to at least 1926, all traces of these efforts were lost in the late 1960s and early 1970s when the archaeological and historical sections were put into a separate museum (Museo David J. Guzmán) and the valuable natural history collections disappeared.

In 1975, taking advantage of a donation by Japanese philanthropist Saburo Hirao to establish a park in the Finca Modelo near the National Zoo, the Ministry of Education and the Saburo Hirao Foundation made provisions to establish a natural history museum. Inaugurated in February 1976, this museum has been trying to establish a master reference collection of Salvadoran plants, animals, minerals, and fossils, even though plants have been emphasized less, due to the impressive work of the Plan de la Laguna Botanical Garden. It is also developing exhibits, mainly oriented to school audiences, to enhance an appreciation for the diversity, beauty, and value of Salvadoran species. An initial joint program with NPWS (which at the time was greatly concerned with the inventory of species at the major sites identified for conservation), together with a group of Peace Corps volunteers selected with help from the Smithsonian Institution, was a very successful and a fruitful three-year period of collection and observation. It was abruptly halted at initial signs of the military conflict and the departure of the Peace Corps.

The museum then suffered a long period of neglect and decay. An evaluation made by former museum director Lic. Zulma de Mendoza in 1988 indicated that more than 95 percent of the materials in the museum were accumulated during the initial three-year period. The Natural History Museum today, low on a ministerial list of priorities, is just starting to approach a time when productive fieldwork may once more be feasible.

Without knowledge of the biological resources, determining which species are endangered and what measures are required to recover or protect them will be a speculative endeavor. Much basic information required for effective technical and legal measures is urgently needed. Basing survival on guesswork is risky enough when one knows what one is supposed to be guessing about.

While MNH has good overall collections of vertebrates, insects, shells and a few other groups of animals, most collections are still fairly incomplete. Several phyla, such as those including corals, annelids (true worms), starfish, rotifers, and others are almost completely devoid of specimens. Marine organisms, lower invertebrates, and plants in particular have been poorly documented. Another major gap in its work is the paucity of publications. MNH has produced no major publication on Salvadoran plants or animals, which is unfortunate, considering that the General Directory of Publications is part of the same ministry as the museum. This directory is well-equipped to produce fairly good

quality publications relatively inexpensively.

Without publications, the public cannot be informed or motivated to protect or develop national resources. The lack of sufficient information and the absence of national laws are the major obstacles to protecting endangered wildlife further, even though limited resources also play an important role. Too little information is available in appropriate form to hope that broad education programs could facilitate local cooperation and participation. Therefore, an external catalyst is strongly needed to integrate relevant information from different sources.

In summary, El Salvador's biodiversity is unknown, little appreciated, and clearly suffering rapid and marked depletion and/or deterioration. Many of these resources are being lost without ever having been known. Many animals and plants previously recorded or currently present on both sides of Pacific Central America suggest that extinction is not only occurring but probably accelerating in pace. No major local initiatives are evident that suggest this issue is truly considered important.

Catalyzing national interest in El Salvador's biological resources is an imperative short-term goal, which could be achieved by an international team (including two or three local experts) that could: a) make a master list of native species of plants, animals, and other organisms so far identified in El Salvador; b) determine through literature review and consulting what potential and real value (economic, medicinal, industrial, pet industry, and others), has been identified locally as well as elsewhere for these resources; and c) publish the results of the study in an attractive publication designed for public consumption. Both the Ministry of Education and the Ministry of Agriculture have excellent mechanisms for disseminating this information nationwide to all sectors of the population. A political awareness of this document is especially important, assuming that it is done in an objective style and non-technical language.

The national zoo, private zoos and reserves, and botanical gardens can and should play a role in preserving and restoring native plants and animals. So far, only the national zoo and the botanical garden Plan de La Laguna, have started formal, very small-scale projects in this area. These kinds of projects provide highly valuable information on basic biological characteristics of the organisms involved and should be promoted for wildlife recovery and wildlife use. While at times they can be fairly expensive (e.g. large cat breeding programs), returns are almost always much higher than the investment. This concept will be hard to convey to a population that is not even aware of existing resources.

The national zoo has also played an important role in promoting Salvadoran biodiversity. Even though its collection is both exotic and local, and includes mainly higher vertebrates, several of its species are endangered, even extinct, in El Salvador. The extinction of these species has prompted many newspaper articles and enlivened tours at the zoo.

The issue of endangered species, like that of natural ecosystems, is an urgent topic in environmental conservation. Unlike reforestation, soil conservation, decontamination and other important environmental issues, the

disappearance of a species or a natural ecosystem is usually irreversible. Even if the same species is found in other nations or regions, the genetic make-up, developed through natural selection over very long periods, reflected in different degrees of resistance or adaptation to climate and disease, often make reintroduction of a species difficult or impossible.

Thus, any policy addressing this issue in El Salvador must have an objective urgency. The present slow pace of action must be accelerated and more effort invested in solving at least the worst cases with temporary actions that can gain time for longer term solutions.

A national effort, undertaken with international assistance, in taking an inventory of Salvadoran plants and animals, their distribution and basic aspects of their annual cycles is imperative. Such efforts have been successful in the past (e.g. the assistance of the Tropical Institute of Scientific Research (ITIC) in the 1950s and the vital U.S. Peace Corps participation in the early stages of the Museum of Natural History).

High priority must be placed on publication of the results of these inventories, not only to enable more Salvadorans to become aware of what is available but to avoid repeating the same work, as has often occurred in the past. Since fundamental elements of El Salvador's natural and national patrimony are being addressed, quality control should be an important consideration in these activities.

Well-illustrated publications, such as field guides and natural history style narrations, can be produced to satisfy demands of a knowledge-hungry population. The speed with which even highly technical publications have been removed from book-store shelves indicate that this is an urgent need.

The current ministry organization, especially in the Ministry of Education, places operational institutions such as the National Parks and Wildlife Service and the National Museum of Natural History so low in the existing hierarchy that budget assignments and access to decision making levels are usually both very low.

The National Parks and Wildlife Service, the Museum of Natural History, and the National Zoo share the problem of having no control over their own budgets. General formulas are prescribed at higher levels, in which the same budget as last year minus 5 percent and any positions vacant at the time result in dangerously low budget levels. In fact, during 1989 zoo officials were forced to call on the international community for help when they found that they could no longer even feed the animals. Assistance as well as sharp criticism were quick to arrive.

Low salaries are a common problem that has reached critical proportions. This is especially true in the Ministry of Education, where professionals with B.S. degrees in biology may find themselves paid at the same level as janitors. It may be feasible for institutions with responsibilities for protecting the national heritage to reduce the number of employees so that trained professionals can be hired for long-term projects. In addition, the current one-year plans should be adapted to allow for projects that take longer

to complete.

It is essential that Salvadorans view their biological resources as resources that can and must be used for social and economic benefit. This view, however, conflicts with the opinion of many that wildlife should be "looked at but not touched (i.e. exploited)."

Adversaries of wildlife development and commerce may be unaware that what they really dispute are activities that push native wildlife stocks toward depletion or genetic deterioration. Annual harvesting of natural populations, such as that conducted by fishing industries, is often feasible. However, production in captivity or on plantations is often more productive, sustainable, and profitable. It does, however, require research.

The importance of objective research cannot be over-emphasized. The significant potential of local resources must be vividly portrayed if government and private sector are going to care enough to make efforts to increase investment of time and money. Conservationists may wish to emphasize the role of these resources in future economic and social development, rather than the tragedy of their loss.

A complete inventory of local biodiversity, as ambitious as it may sound, is a high priority for a nation trying to determine its basic wealth and potential for growth. Rather than cultivating crops that are produced in large quantities worldwide (thus having virtually no control of world prices), producing local neo-tropical commodities may provide an interesting alternative. Such an alternative would provide other benefits such as reducing the needs for pesticides, improving environmental quality and developing national pride, among others.

Such an inventory is a major task. A joint effort by the Museum of Natural History, local universities, the botanical gardens, the National Parks and Wildlife Service, and other appropriate national and international institutions is needed. Adequate funding, salaries and coordination are basic requirements that can be satisfied without exorbitant financial resources.

National heritage must receive national priority. The loss of Salvadoran biodiversity is irreversible and irreplaceable. Wise measures should be implemented to protect, research, restore and use biodiversity for national benefit. Conservation has had little expression in concrete action, despite many declarations of intent. As long as high-level government decisions are not forthcoming, brave efforts of low-level bureaucrats will have minimal effect and, in fact, may even conflict with government policies.

The NPWS, initially interested in the inventory of El Salvador's flora and fauna, shifted all attention to another program begun during the same period, for production and management of commercially valuable wildlife species in captivity, as a basis for future commercial use as well as for propagation and recovery of endangered wildlife. This program reached a peak of field activity in 1983-84, when U.S.A.I.D. funds allowed for extensive fieldwork with marine turtles, tree-ducks, iguanas, and other wildlife species. This program also came to an almost complete end in 1985.

In the process of carrying out wildlife management, many factors affecting native populations were identified by the NPWS, thus providing a basis for corrective action. The virtual discontinuation of this program is probably related to budget limitations and the current violence. Other factors, such as institutional priorities and policies, may also play a decisive role. This issue merits close observation and discussion.

The University of El Salvador has made several valuable contributions to knowledge of the country's biodiversity. From 1952 to 1959 (a golden age of research, perhaps unmatched in this discipline in any other period of Salvadoran history), the Instituto Tropical de Investigaciones Cientificas (ITIC) carried out a series of inventories of ecosystems, geological formations and phenomena, and biota. Conducted mainly by foreign investigators, several of them world renowned specialists in their areas of expertise, this work fortunately produced many useful and well-written publications, clearly oriented to establishing a basic foundation of knowledge in the natural sciences. Most of these were published in the Institute's journal, COMUNICACIONES, but several books and monographs were published independently. Unfortunately most are now out of print and unavailable, a common and fundamental problem.

A large vacuum was felt with the disappearance of the ITIC in 1960. It was not until 1967 that a Biology Section previously in the Faculty of Medicine was transferred to the facilities previously occupied by the ITIC, that a formal Biology Department was established, and that biology became a career in itself. During its early years (up to the mid-1970s), the Biology Department placed a fair emphasis on research. The late 1970s and 1980s, however, have been characterized by a concentration on teaching to the virtual exclusion of other academic activities.

Monerans (bacteria and blue green algae) and protists (protozoans and protophyta) are not currently under the jurisdiction of any government institution. The role of blue-green algae in freshwater and their potential as food and decontaminators of water and the vital role of algae in marine productivity are general knowledge worldwide. In fact, other than indirect criteria (such as the importance of legumes for soil enrichment) even soil management programs in El Salvador do not consider soil bacteria, or soil biota of any type for that matter, except in connection to certain crop diseases. This generally negative attitude explains high-level politicians (and high level policy failure to regard these as "valuable resources."

Fungi, with the possible exception of a few introduced edible species, are likewise assigned little value and are more often regarded as pests. The fate of native plants and animals is slightly better.

National parks need infrastructure to enable them to serve as schools of environmental education and appreciation for all sectors of the population but especially for students. Environmental education should be a motivating experience. Obsolete and dry approaches requiring memorization of useless facts should be discarded and replaced with dynamic approaches using "hands-on" experience. Of course, it is assumed that none of these activities should harm the natural resources.

#### **4.1.4 Potential Policy Alternatives**

- o Approve a law to protect and manage wildlife that includes regulations for wildlife commerce, hunting, importation and exportation, and protection and recovery of endangered species.**
- o Define the CITES Appendix 3.**
- o Establish a mixed private enterprise/government administration for the National Museum of Natural History to allow the hiring of adequate, long-term personnel and develop research programs.**
- o Develop economically viable wildlife production programs, at both artisan and commercial scale.**
- o Revise the publications policy to make adequate information more accessible to the entire population.**
- o Establish a conservation policy as a national priority. The obsolete idea that conservation is a protectionist concept meaning "look but do not touch or use in any way" must be discarded. Conservation is synonymous to best use (by appropriate management) so the resource under consideration does not decrease in quantity or quality.**
- o Seek international assistance to help this nation realize that apparently high initial costs have very high dividends and need to be carried out essentially only once. An established national park will serve as a permanent wildlife refuge for generations and probably centuries.**
- o Define clear institutional objectives. Major institutions responsible for the inventory, evaluation, and management of wildlife should define objective and productive projects in these areas that reflect a willingness and effectiveness in carrying out these responsibilities.**
- o Redefine the education policy. All Salvadorans must be aware of an important responsibility in the preservation and improvement of the nation's biodiversity.**
- o Seek NGO participation in promoting a national awareness of the importance of conservation.**
- o Design educational programs that will enable local people to know and enjoy wildlife in their natural environment.**

#### **4.1.5 Recommendations for Future Research and Analysis**

- o Study alternatives for research efforts on life cycles and environmental requirements of native plants and animals with identified commercial potential and/or in danger of extinction.
- o Study alternative ways of collecting funds to finance activities necessary to protect endangered species.

#### 4.2. Park and Reserve Management, and Ecotourism

As pointed out in the previous section, the destruction of natural habitat is the major cause of extinction or reduction in biodiversity in El Salvador. As much as 80 percent of local species of plants and animals may depend for their survival on less than 50,000 hectares in El Salvador. This represents 2 percent of the national territory.<sup>1</sup> Thus, the protection and management of these natural areas as national parks and reserves is essential.

Another important factor is Salvadorans' need for recreation in a natural and healthy environment. Parks and reserves provide future generations with options for alternative economic and social development. Often these natural areas are also crucial for the protection of resources that have other uses. An example is the Montecristo Cloud Forest's relationship with high quality water for irrigation, hydroelectricity, and direct human consumption.

The protection of natural areas as such is still regarded as competitive rather than complementary to rural and urban development in El Salvador. Unfortunately water, firewood, and clean air have not been quantified in economic terms that would be relevant to politicians and the population at large. This may be a vital priority in the short run.

Of the more than 60 natural areas worthy of some protection in the country (Benitez, 1989; Serrano, 1981) only four have park wardens: Montecristo, El Imposible, Barra de Santiago, and Lake El Jocotal. One other area, the Volcano of Santa Ana (part of the Los Volcanos Project) also has four wardens. However, their activities are limited to the 160 hectares of government property. The Deininger Park in La Libertad (740 has.) and Cerro Verde (40 has., part of the Los Volcanos Project), are also protected by wardens of the Salvadoran Institute of Tourism. More than 40 of the remaining natural areas have no personnel. These are areas seriously affected by the agrarian reform process of 1980. They are already being transferred to the Ministry of Agriculture for management as parks or reserves.

None of the natural areas of El Salvador have infrastructure (interpretation center, rest rooms, etc.) that provides for formal and open recreational services, much less addresses international tourist requirements. Nonetheless, visitors are allowed to visit the Montecristo cloud forest during

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<sup>1</sup>USAID/El Salvador, "El Salvador, Perfil Ambiental, Estudio de Campo." San Salvador, El Salvador: USAID Contrato No. 519-0167-C-00-2039-00, Abril 1985.

non-breeding season (October through April) and an area just below the cloud forest with a camping site and other recreational facilities year-round. This general lack of facilities, plus relatively difficult access by road, has hindered the development of a broader sense of value for national wildlife, as well as an economically feasible plan for the development of national parks.

Neighbors of potential major national park sites have sensed a drop in protective measures, and pressures for hunting, fishing with pesticides, wood cutting and other illegal practices have risen sharply. So far, high level government officials have made no declaration suggesting that the protection of natural areas is a priority in El Salvador. In fact the Trifinio project, originally conceived as a World Biosphere and trinational park project, has been modified and reissued as a project of rural development. This may seriously threaten the park's existence by inducing immigration and a sharp increase in land value and human pressure in the area.

If the major natural landscapes of El Salvador are to be salvaged for future and current generations, appropriate establishment, protection and development of national parks and equivalent reserves must be considered and implemented during this decade. This is one environmental resource that will not be available to future generations if not protected by this one.

Tourism can be described as an industry that integrates all actions and infrastructure oriented toward visitors (i.e. non-residents of an area) to make their stay as productive, safe, and comfortable as possible, according to the goals or purposes established by the tourist who may be a foreigner or a native of the country. However, the term tourist is most often used in the context of a non-native.

Tourists travel for multiple reasons, and a particular tourist may have several objectives in mind, including recreation, education, health, and professional growth. Tourist expectations for good attention, comfort, and novelty form the basis for a broad range of services that can capture both foreign exchange and local currency. While local residents can be major beneficiaries of tourism, the nation as a whole usually benefits directly from the injection of foreign currency and a decentralization of economic benefits. The main income of a number of nations is tourism. Because this income can be considerable, most nations are paying increasing attention to activities that encourage it.

El Salvador's governments have often expressed high expectations for capturing foreign revenues through the expansion of tourism. This is evident in virtually all recent government development plans. However, a concrete strategy on how to encourage tourism has not yet materialized, except through fairly vague and intuitive statements. Construction of roads and hotels, encouragement of cultural festivals, and frequent invitations to outsiders to hold conventions in the country are the most elaborate steps taken.

Europe, with a well-documented historical, political, and artistic past has capitalized heavily on culture, tradition, monuments, and museums to attract millions of visitors a year. Other countries with a short and/or poorly documented history, such as Costa Rica and Canada, have capitalized more on

natural aspects such as wildlife, fishing, camping, hunting, hiking, national parks, and natural monuments. Still other countries, such as Guatemala and India, are promoting both their natural and cultural heritages.

So far, there is little evidence that El Salvador is contemplating either alternative to attract foreign tourism. The major consequences of this omission, besides obvious economic losses, are that El Salvador may be rapidly falling behind other countries that are using their national heritage to entice and sustain tourism. Even worse is that local natural and cultural resources, unappreciated and unprotected, are rapidly being depleted beyond recovery.

#### **4.2.1 Policy Framework**

In 1984, when Prince Philip, president of the World Wildlife Fund, visited El Salvador, he requested a presentation of the local government's intentions and plans for conserving natural areas. Two years later, the President of Costa Rica was decorated in Washington D.C. for his exemplary role in promoting the conservation of national parks. These two events, though rarely mentioned today, had a major impact. Opinions from developed nations can be very influential in developing nations. In this case an important message was clearly conveyed.

One of the immediate benefits of the two events was to open communications between the National Parks and Wildlife Services and higher MAG decision making levels. Another benefit was a clear message that park management was a program separate from forest management. This concept facilitated the administrative step to a service of its own in 1981.

However, no laws regulate the management of national parks and reserves. A law proposed for the management of national parks and equivalent reserves was drafted in 1980 but apparently did not pass beyond the Ministry of Agriculture. No recent efforts have been made to pass such a law. An unwritten policy emphasizes governmental versus private sector management of parks and reserves.

Several decrees create national parks or reserves. Decree 53 of November 17, 1987, the National Park Montecristo; Decree 20 of June 6, 1989, the National Park, El Imposible; Decree 124 of June 1, 1984, the Regional Park Bosque de Los Péricos.

Enticement of foreign tourism has so far been mainly a promotional activity. No clearly defined policy can be identified either in the public or the private sector. A possible exception has been the promotion of El Salvador through seminars, workshops, and other international meetings held in the country.

Domestic tourism has fared considerably better, mainly due to the efforts of the Salvadoran Institute of Tourism (ISTU), which administers or sponsors a series of tourist centers, excursions, and festivals; their popularity and accessibility have been widely documented and praised both at home and abroad. Serious financial limitations had until very recently resulted in marked

deterioration in all of ISTU's tourist centers. However, recent support is leading to substantial recovery of several of the 14 centers under its management. The policy has been to emphasize aquatic facilities.

#### 4.2.2 Institutional Framework

The conservation of natural areas and wildlife started abruptly in El Salvador in the early 1970s. In 1972, a Salvadoran philanthropist, Walter Deininger, donated 740 hectares of hilly terrain partially covered with heavily disturbed secondary forest to the Salvadoran Institute of Tourism (ISTU). While the overall purpose of the donation was clearly recreational, a crucial statement was included in the deed providing that "the area suffer no development that would alter the basic natural conditions." This statement eventually saved the area from becoming a race track and converted ISTU into a park manager. Ten years later, becoming aware of the implications of managing natural forests at the Deininger Park in La Libertad and another smaller area on mountainous Cerro Verde, ISTU was to transform its Department of Tourist Centers into one of National Parks and Tourist Centers.

In 1974, catalyzed by a section of the Forestry Law, the Ministry of Agriculture and Livestock (MAG) created within the Forestry Service a National Parks and Wildlife Department (NPWD). This birth within a forestry program was common for parks and wildlife departments in Latin America. From the very beginning, NPWD set out to "identify, inventory, obtain, protect and develop the major representatives of Salvadoran ecosystems and to protect and manage Salvadoran wildlife." Two sections were set up accordingly: the National Park and Equivalent Reserves Section and the Wildlife Section. In 1981 the NPWD was formally converted to a service. NPWS with its own budget and the two sections were likewise raised to the status of departments. Catalyzed by FAO's initial support, four World Wildlife Fund grants in the late 1970s, and A.I.D. employment generation funds in the early 1980s, the NPWS hit an operational peak around 1984/85. Several factors, mainly but not exclusively the regionalization of CENREN in 1984, have led to the NPWS' current low effectiveness and low national impact. The decline occurred along with a drastic reduction of its operational budget.

Important sources of external support have been A.I.D., World Wildlife Fund, IUCN, and CATIE. Support of the first two has been mainly, though not exclusively, financial, while support of the latter two has been mainly technical.

A budget analysis for NPWS is difficult to undertake, because for the last five years budget write-up and administration has been done at a higher level (CENREN) and a large portion of the funds originally allocated to the Parks Service was transferred to the regions in 1984.

#### 4.2.3. Analysis

The establishment of national parks and other types of natural reserves in El Salvador, formally initiated in the early 1970s, is proceeding much too

slowly to offset the rate of destruction of native ecosystems. This is the most urgent of many important environmental issues which must be addressed, and the delay may prove devastating if not corrected immediately. Natural ecosystems have many unknown organisms, behavior, and interrelationships with other ecosystems whose loss is largely an irreversible process for twentieth century science and technology. It is likely to be so for a century or two more.

NPWS has identified over 60 natural sights considered worth protecting as parks or reserves. The most important include Montecristo, El Imposible, Barra de Santiago, Lake Jocotal, Los Volcanes (Izalco VC, Santa Ana-Cerro Verde), Nancuchiname, Los C6banos, Vc. San Miguel, Isla San Sebasti6n and the San Diego Forest, next to Lake Guija. Only the first five have formal protection with park wardens.

In 1975 the Montecristo Cloud Forest was closed for the first time to all visitors during the breeding season. Three years later a noticeable increase in the population and tameness of the wildlife had generated public sympathy and enthusiasm for further protective measures.

NPWS was administering five natural areas by the end of the 1970s. However, a major handicap was already evident at that time: the inability to buy additional land to protect and restore ecologically viable units. The agrarian reform of 1980, probably the most influential policy affecting the Parks and Reserves Program in El Salvador so far, changed this situation abruptly.

More than 19,000 hectares of El Salvador's 34,000 hectares of better natural forests was affected by Phase I. This included almost 50 percent of El Imposible, 80 percent of the San Diego dry forest, and 100 percent of Nancuchiname. In addition, about 5,000 additional hectares of natural areas have been identified since 1984, mostly as small, isolated patches of forest. Many have high conservation value as reserves. All these areas are being formally transferred to MAG for management as conservation areas. No budget has yet been formally assigned, discussed or presented for their management. This is a delicate situation that could, if ignored too much longer, upset gains achieved with the transfer of land.

On the other hand, the relatively high cost of land in El Salvador currently makes the Government balk at the completion of land purchases. This is an indispensable step for appropriate park establishment and management, even more so today given current economic and political limitations. It is doubtful that El Salvador can do so without external help.

Another important issue is the lack of private sector participation in current conservation plans. The idea that areas with potential for conservation must be nationalized is motivating many landowners to "discreetly" alter and even eliminate remnants of natural forest on their land. With so many of these small areas, government supervision, to say nothing of government management, is quite unfeasible. Clearly, an alternative plan is needed. A National Plan for the Management of National Parks and Equivalent Reserves being designed by NPWS with technical assistance from CATIE and IUCN, while quite extensive, does not contemplate private sector participation. It might be wise to reconsider this issue.

The highest priority in this area would be to identify, purchase, protect, and restore natural areas, which can usually be achieved simply by allowing them to regenerate. Because a major fraction of the scarce valuable natural areas of El Salvador has been identified already, the purchase and protection should be done without further delay. Undoubtedly many small, valuable though not excessively unique natural areas in this country, have already been identified. Given obvious government technical and financial limitations, incentives should be created and provided to private landowners where these areas are located so they will continue to protect them for national benefit. Tax exemptions, technical assistance, and other true incentives must be provided as alternatives to government management. Natural areas within agricultural areas provide many benefits. These benefits should be identified and made clear to the landowners. Temporary subsidies for initial investments may be desirable.

Another factor that limits national park growth is the inadequate infrastructure available for human access and recreation in the few sites currently under government protection. Public awareness of the beauty and importance of these areas can be developed even under highly controlled circumstances. This does not require expensive strategies.

Given the magnitude of work involved in the appropriate design and establishment of a park and reserve network, inter-institutional cooperation and action is imperative, especially in a nation with limited resources. Classification of natural areas in El Salvador is still unsatisfactorily vague, especially in the broad-leaf deciduous/semi-deciduous forests found from the coastal foothills to the oak-pine belt. A well-defined classification system is fundamental to identifying key park/reserve sites and guiding investments in major conservation efforts.

ISTU has fortunately not conflicted with NPWS, as their protective efforts have been oriented to different geographical areas. A joint venture might, in fact, be quite desirable, especially if complementary activities can be identified. Joint efforts between government organizations can only be beneficial, especially during the highly critical period of park and reserve establishment.

For administrative and technical reasons, however, it is convenient to concentrate administration and authority in one office technically, legally and financially equipped to manage these valuable and currently fragile areas adequately. A large majority of native plants and animals, the nation's natural biological heritage, depend for their survival on the natural ecosystems to which they are adapted. Responsibility is too great and time too short for ineffective, much less conflicting, endeavors.

The outcome of the regionalization of MAG in 1984 was a virtually zero operational budget support for the wardens located in the natural areas, and conflict between NPWS and the regional offices. Handwringing and bickering is draining patience and morale. The losers have been the natural areas. Poaching, illegal cutting and fishing, and even massive river poisonings and forest fires are causing rapid deterioration in the value and capacity for survival of the few remaining natural areas in El Salvador. Worse, previous achievements are rapidly

being reversed. NPWS has a clear idea of what must be done. However, it seems unlikely that the Government will be able to administer effectively the widely dispersed, relatively numerous small areas that qualify for the status of natural reserve.

Very little integrated, inter-institutional effort is devoted to confronting the extremely serious threat of natural area destruction. Given the limited resources of most institutions, this individualized approach may not be the best. One interesting exception is a multi-institutional study CATIE and NPWS are coordinating for establishing a network of national parks and equivalent reserves. This study is being conducted by a team of members from different institutions and ministries, which offers an opportunity to determine how complementary these institutions really are and how convenient joint actions beyond planning may actually be.

Conservation efforts in El Salvador can be effective and well-received at both the local and the national levels. Public opinion in general indicates that the Government is going too slowly in this area. Again, results have been highly positive, with both plant and animal life recovering remarkably well even in relatively short periods in the Montecristo by simply providing appropriate protection.

While the protection of natural ecosystems by simply allowing them to regenerate or repairing them may be a simple procedure, the management of natural ecosystems is probably the most complex and multi-disciplinary field of environmental science. Thus, while many aspects of the ecology of natural ecosystems may be intuitively simple, an objective, predictive management plan is likely to require extensive and highly professional planning.

Therefore, it would be convenient to use the "purchase and self-repair stage" to take full advantage of competent national and international expertise to establish ecologically viable boundaries for national parks and equivalent reserves, although this may not always be possible for small natural reserves. Meanwhile, competent and interested professionals in the relevant disciplines should be sought and motivated (by scholarships and grants) to pursue post-graduate studies in which they conduct the basic research for establishing management plans to protect and develop national parks over the long term.

The inventory and evaluation of natural areas in El Salvador, being carried out by the National Park and Wildlife Service and other institutions, should receive the highest priority to ensure completion as soon as possible. Together with the inventory of El Salvador's biodiversity, it is clearly a priority action that fortunately does not require very sophisticated knowledge, even though detailed, specialized, and painstaking work is involved.

Certainly the inventory of natural areas could benefit greatly from more sophisticated technology, professional interpretation of satellite images, for example. When such technology is locally available, it should be sought through appropriate channels. The Ministry of Planning, so far omitted from this inventory, may well find a role in this and similar activities.

El Salvador's interest in tourism for revenue needs little

justification. However, more concrete actions are needed to establish an infrastructure that will attract tourism. Right now there is little support for the development of the country's natural and cultural heritage.

Ignoring the rapid growth in demand for ecotourism is the same as overlooking a large and readily available market. While there are other reasons to promote and develop natural areas and wildlife, ecotourism is clearly worth analyzing and considering.

ISTU's role in international tourism is mainly one of promotion. It also seeks to involve the tourist industry more broadly in different components of the private sector. ISTU has played a minor but interesting role in promoting local folklore and cultural events.

Local tourism has a broader range of needs, including recreation, education, and health. Improved performance in industry, school, and peace are some of the indirect fringe benefits observed elsewhere.

For national or local tourism, ISTU has played an admirable role in establishing a small but attractive network of recreational sites, usually in a natural or semi-natural setting. A heavy emphasis has been placed on aquatic facilities, such as large pools and gardens. Fourteen of these sites have been developed, called "turicentros," ranging from 3 to 100 acres (most are between 50 and 70 acres). Located in eight of El Salvador's 14 departments, their popularity is evident from the many visitors they have each year. Around 3 million people have visited the parks during each of the last three years.

The low prices of entry (about \$0.14 U.S. per person entrance fee; \$0.30 car daily parking fee) make them highly accessible and popular with visitors of virtually all economic levels. Developed for low-income people, the parks have been a major success for over 30 years. ISTU also promotes excursions by bus and by foot (buses alegres and caminatas alegres) that go to virtually all corners of the country. However, these programs have appealed to a noticeably smaller group of people, due both to higher cost and/or effort required.

Slightly more baffling to ISTU has been the management of the Cerro Verde Hotel and, in particular, the Deininger Park. After initial efforts to convert the latter into a race track in 1973-74, the area has essentially been abandoned for development. The Deininger Park, itself part of a larger property that was split at the time of donation, is not an ecologically viable unit in the long run. With very little flat coastal plain forest (or coastal plain land for that matter), an evergreen vegetation that can provide food and protection to the park's wildlife during the dry season simply does not exist. Thus, the park's capacity to sustain wildlife is currently quite limited. Likewise the upper limits of the park (about 290 meters above sea level) does not represent the upper edges of a watershed or any other natural topographic feature for that matter. Thus, the entire park is vulnerable to land misuse, such as fire, and pesticide wash-out. In fact, the park has been the scene of several very damaging forest fires during the last five years. A more multi-disciplinary, multi-institutional team will have to be temporarily brought together to establish more appropriate ecological boundaries and development plans for this park.

Cerro Verde, located virtually in the geologic center of a planned national park of a much greater size, will require similar treatment.

There is no national strategy for tourism that clearly defines the roles of nature and natural resources. Technical assistance from countries such as Costa Rica and Kenya could help in the conception and design of such a strategy. Local wildlife, forests, and landscapes can attract ecotourism, but it should be only under carefully administrated plans and technology.

Fortunately, local tourism needs for recreation have been well-addressed. However, ISTU's 14 centers are insufficient to meet existing demand and are frequently ecologically unstable (e.g. are lower parts of small watersheds that are being deforested and degraded in other ways along the upper slopes). Their relatively small size and usually heavy exotic, attractive vegetation also reduce their value for conservation education and tourism considerably. Major demands of ecotourism and local conservation in a country so heavily deprived of its natural resources can be met only by a well-established, well-administrated network of national parks. Areas identified as "natural reserves" are usually too small and too unstable to withstand much human use.

An evaluation of the potential of ecotourism by a well-made study might pay high dividends. Also, an aggressive program to protect and develop national parks and establish adequate supportive infrastructure in the immediate surroundings should be conceived and implemented rapidly. Visits to other nations should indicate the steps required and what to avoid. The attraction of sites that combine nature and culture (such as Copan in Honduras or Tikal in Guatemala) deserves close attention.

There is much opportunity here for private sector participation. A few hotels along the coast and others on lakes, forest edges, and other scenic areas could greatly enhance the attraction by maintaining or regenerating a natural environment.

#### **4.2.4 Potential Policy Alternatives**

- o Transfer the management of national parks and reserves to private foundations.**
- o Alternatively, return administrative authority to the National Parks and Wildlife Service, together with the necessary funds to provide basic required support. While basic extension and administrative services may be conveniently regionalized, technical administrative procedures probably require the direct supervision of a highly qualified, and centralized, technical office.**
- o Purchase the land necessary to complete the major national park projects.**
- o Design a system of incentives for private owners to create**

**parks and reserves.**

- o Approve a law for the management of national parks and reserves.**
- o Design a scholarship program to train professionals at higher levels of education in different aspects of parks management.**
- o Motivate and involve NGOs in conserving El Salvador's natural patrimony.**
- o Use national parks as effective instruments of environmental education.**
- o Establish an educational policy of training programs for guides from the public and private sector. Programs would be designed and implemented by native and foreign scientists and nature guides. Well-designed environmental education programs must be developed by highly competent scientists and education experts so Salvadorans can learn to appreciate and enjoy their own biodiversity and other natural resources. Such programs must be described in layman's language and enriched with quality audio-visual aids and as much hands-on activities as possible.**

#### **4.2.5 Recommendations for Future Research and Analysis**

- o Finish the inventory of natural areas suitable for conservation and define a functional strategy for their effective administration.**
- o Complete a satisfactory system for classifying natural areas in El Salvador as a basis for their conservation.**
- o Study the economic and social returns of ecotourism in El Salvador. Evaluate the characteristics, needs, costs and benefits of ecotourism. Conceive a strategy based on basic comfort (rather than luxury) infrastructure with local architecture and carefully designed trips based on the requirements and behavioral patterns of most attractive biological groups (e.g. birds, mammals, orchids, butterflies).**
- o The previous recommendation implies that careful studies of distribution, behavior, reproduction, feeding habits and other basic environmental requirements of most sought-after wildlife (or equivalent traits of natural ecosystems) be done, as an indispensable basis for planning trips and promoting ecotourism.**

## 5. WATERSHED MANAGEMENT

The previous three chapters have addressed the themes of sustainable agriculture, forestry, and wildlands and biodiversity. This chapter addresses the watershed in its totality. A watershed is the geographic area where all the water naturally drains toward one common outlet, the lowest elevation in the system. Each watershed is a natural biophysical unit. Thus, the balance of its interactions depends on the degree of equilibrium in its natural resources. Sustainable agriculture, forestry, wildlands and biodiversity form integral parts of a watershed. Watershed misuse leads to land and water degradation as well as other costs which threaten agriculture, potable water supplies, hydroelectric generation, irrigation, flood control, fisheries, navigation, and tourism.

This chapter addresses the issues of watershed management, as well as issues of water resources not discussed in previous chapters. These include water use, water management, water quality, coastal zone management, and fisheries.

### 5.1 Watershed Management, Water Use, and Water Management

The hydrographic system of El Salvador is made up of 590 rivers and streams grouped in an array of natural watersheds. The territory has been divided into 10 hydrographic regions according to their extension and magnitude of their water flows (Exhibit 5.1). Depending on their superficial dimensions, geo-morphological characteristics, biophysical resources availability and geographic position, each encompasses one or more of the 17 watersheds that form the Salvadoran territory.<sup>1</sup> Three of these regions cover only one portion of the important watersheds shared with neighboring countries (Honduras and Guatemala).

One of these watersheds, the Lempa River, traversing 49 percent of the country's territory, has received the most attention in conservation, development, and resource utilization policies. Passing through most of the major cities, it is the heart of the energy system and exemplifies the number and diversity of environmental problems in El Salvador's watersheds.

Before 1969, the watershed as a concept for the management of natural resources had not been considered in El Salvador's governmental policies, even though use of the Lempa River watershed for energy purposes started in 1954.<sup>2</sup>

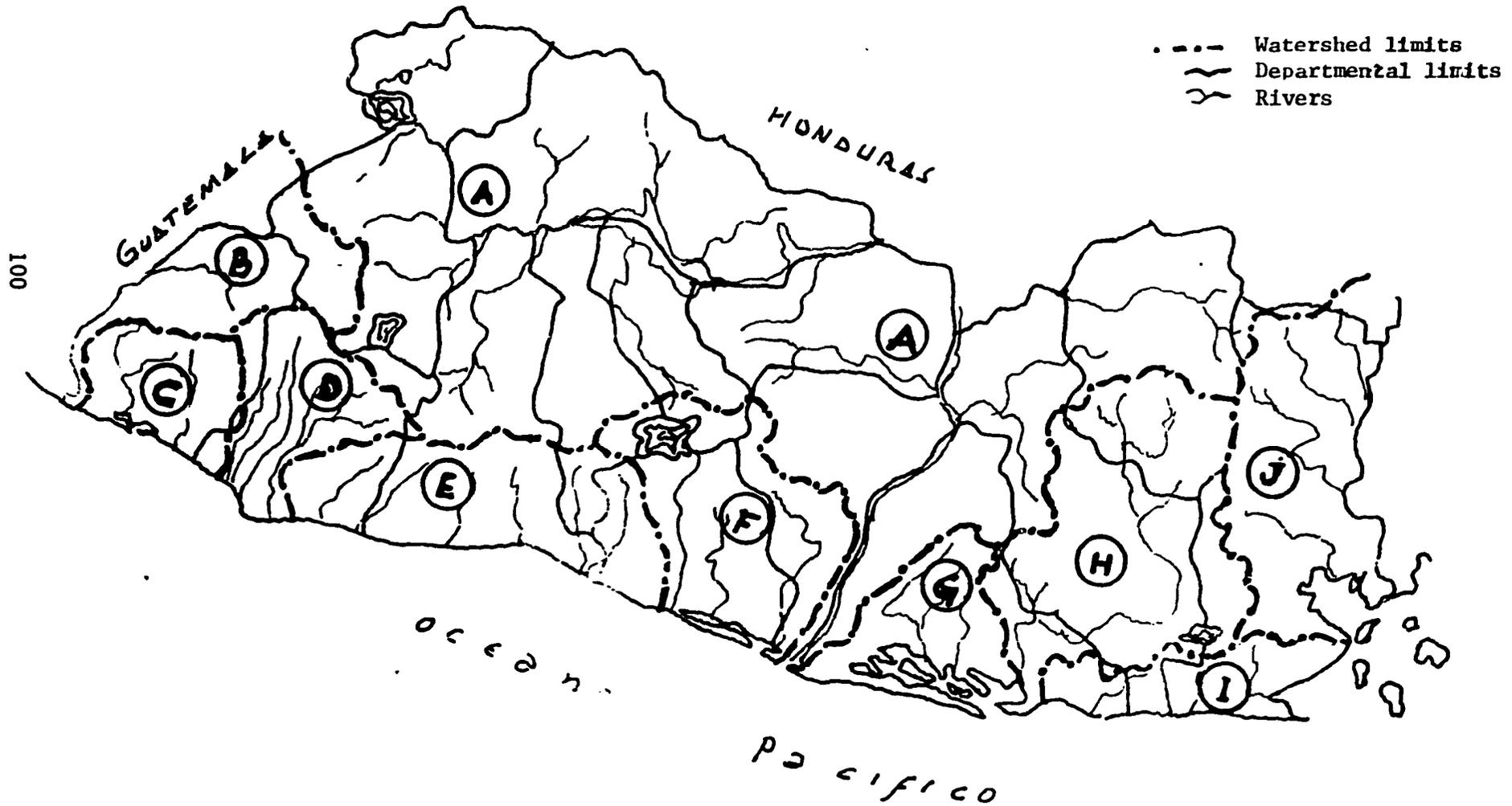
Implementation of the Agro-Forestry Project of the Northern Zone also started in 1954. The project's primary objective was to stabilize the Torrencial del Río San José watershed in the northeastern region, particularly to correct

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<sup>1</sup>F. Lemus Serrano, "Planificación de los Recursos Naturales Para el Aprovechamiento Racional Múltiple de los Recursos Hidráulicos de El Salvador." San Salvador, El Salvador: Dirección General de Recursos Naturales, MAG, 1973.

<sup>2</sup>Memorias de la Comisión Ejecutiva Hidroeléctrica del Río Lempa, CEL.

Exhibit 5.1 Map of Hydrographic Regions,  
El Salvador, 1990



Note: Exhibit 5.3 describes the regions.

flooding problems in Metapán. This experience initiated the focus on integrated management of natural resources and watershed management in El Salvador.

With this conceptual focus legitimizing environmental protection in El Salvador, the General Directorate of Renewable Natural Resources was created in 1973. This directorate became the present Center for Natural Resources of the MAG, which was where the first service for watershed organization was structured and also where the first policies oriented to studying, managing, and developing natural resources at the watershed level were formulated. Special attention was given to evaluating natural interactions in the conservation of environmental resources and water resources in particular.

The El Salvador Hydrological Balance, estimated in 1980, indicated that from a total precipitation of  $56,683 \times 10^6 \text{ m}^3$  discounting runoff, underground percolation and evapotranspiration, a total yield of  $17,971 \times 10^6 \text{ m}^3$ , could be expected.<sup>1</sup> Water use has been classified into three major areas: human and industrial consumption, irrigation, and electricity generation. With population growth demand for all uses growing, it becomes extremely important to maintain a balance among users so as to preserve the availability of good water.

The proportion of population living in urban areas has been steadily increasing from 36 percent in 1950 to 40 percent by 1971. It is estimated at about 50 percent today, and by the year 2000 is projected to be 60 percent.<sup>2</sup>

It is difficult to project population growth in a society with so many changes and social tensions, yet population growth is the basis for planning water demand. Under these circumstances, El Salvador has adopted the policy of overestimating future water demands. However, growth in certain urban areas like San Salvador has been much greater than anticipated and water supply does not meet the needs of the population.

Generation of electricity does not directly consume large quantities of water. However, evaporation from the large lakes formed by the dams results in a sizable loss estimated at an average rate of  $1,312 \text{ lts/m}^2$  per day.<sup>3</sup> This is a significant figure when estimated over the total area during the dry season.

The installed hydroelectric capacity is about 23.8 percent of the total potential available in the country. Present production is almost totally from the Lempa River watershed. The gross hydroelectric potential for the entire country is estimated at 1,763 megawatts. National electricity demand for the year 2000 is projected at 1,311 megawatts.<sup>4</sup>

Until 1963, construction of irrigation infrastructure developed very

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<sup>1</sup> Plan Maestro Recursos Hídricos en El Salvador, PNUD/GOES San Salvador, Mayo 82.

<sup>2</sup> Population projections of the Ministry of Economic and Social Development Planning and Coordination.

<sup>3</sup> Dirección General de Riego y Drenaje, "Plan Operativo 1990."

<sup>4</sup> PNUD, "Plan Maestro Recursos Hídricos." San Salvador, El Salvador: PNUD/GOES, Mayo 1982.

slowly and exclusively by the private sector, which by 1970 had irrigated an area of 17,500 has. After approval of the Irrigation and Drainage Law in that year, the private sector constructed infrastructure to irrigate an additional 3,852 has. over the next five years.<sup>1</sup>

Participation by the public sector started in 1963 with the Agricultural Land Improvement Program (META), which offered technical and financial assistance to build small irrigation facilities, covering a total of 3,200 has. In 1966 the Directorate of Large Irrigation Infrastructure was created, becoming the General Directorate of Irrigation and Drainage in 1970. This institution has constructed infrastructure to irrigate 9,819 has.<sup>2</sup>

The areas under irrigation are concentrated mainly in regions A and D (Exhibit 5.1). The sources of water are the Sucio and Suquiapa rivers, within the Lempa River watershed. According to an evaluation of the Development Assistance Corporation, "the area with existing infrastructure for irrigation is estimated to be approximately 38,500 has., of which only 45 percent or a total of 17,325 has. is actually irrigated, mainly due to poor maintenance of existing systems."<sup>3</sup> Other sources report that irrigated areas cover about 28,000 has. with a potential to irrigate 188,900 has.<sup>4</sup> Of this total 136,011 has. can be irrigated with superficial water, and 52,893 has. with underground sources. Even though there are discrepancies about the actual irrigated area, a consensus exists that the irrigation infrastructure uses water very inefficiently, allowing significant water loss at the point of capture and in conducting water.<sup>5</sup>

The National Plan calls for irrigating an additional 20,816 has. of land in the next 10 years, with a potential area of 48,816 has. under irrigation by the year 2000.

Water management for irrigation purposes is organized in water districts but arrangements vary according to the size of user, the type of management (individual farmers or an association), and the type of system (private or public). Seventy-four percent of the irrigation units are microsystems, with an average of 1.32 manzanas irrigated by farmer or 5 percent of the total irrigated area. Small systems irrigate an average of 14.9 manzanas each, represent 12 percent of the total farmers, and irrigate 9 percent of the total area. Medium systems irrigate an average of 51.4 manzanas, represent 8

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<sup>1</sup>Dirección General de Riego y Drenaje, OSPA, "Política Nacional de Riego." Soyapango, El Salvador: MAG, Mayo, 1990. p.2.

• <sup>2</sup>Ibid.

<sup>3</sup>Donald R. Fiester and George Hargraves, "Second Evaluation of the USAID/Government of El Salvador Water Management Project (519-0303)." Washington, D.C.: Development Assistance Corp., March 31, 1990. p. 2.

<sup>4</sup>Dirección General de Riego y Drenaje, "Plan Operativo 1990."

<sup>5</sup>MAG, "Seminario Para la Revisión de La Situación Jurídica del Riego en El Salvador". San Salvador, El Salvador: MAG, 3 al 4 de Abril, 1990.

percent of the farmers, and irrigate 20 percent of the total area. Large systems irrigate an average of 194 manzanas, represent 6 percent of the farmers and irrigate 66 percent of the total area.<sup>1</sup>

Individual irrigation units account for 62 percent of the farmers. Of these, 29 percent are organized in associations, and 2 percent in cooperatives. Of the 19 crops using irrigation, pasture represents 62.5 percent of irrigated area. Sugar cane and coffee represent 23.7 percent. Irrigation of pasture is very inefficient, done mainly by uncontrolled flooding and occasionally by canals.<sup>2</sup>

Micro and small irrigation systems are characterized by limited land and capital in the form of infrastructure and equipment. Labor is provided by the family. Production is mainly for the local market and family consumption.

Medium and large systems have plenty of land, large infrastructures, and irrigation equipment, but they experience labor limitations during the harvest season of export crops. Production decisions are made according to the expected prices. There is less flexibility for diversification due to the type of crops grown, which include pasture, sugar cane, and coffee.

The large reform sector units are organized in cooperatives that are managed by executive committees. Agriculture diversification is limited, with the major crops being pasture, sugar cane, and corn. Irrigation use is limited due to deterioration of the systems.

The present Government has presented a National Irrigation Policy that identifies nine major constraints to irrigation development:<sup>3</sup>

- o Lack of training,
- o Inadequate legal framework,
- o Lack of good basic information,
- o Lack of appropriate technology,
- o Centralized marketing systems,
- o Weak institutional structure,
- o Lack of projects ready for implementation,

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<sup>1</sup>Ibid.

<sup>2</sup>Dirección General de Riego y Drenaje, OSPA, "Política Nacional de Riego." Soyapango, El Salvador: MAG, Mayo, 1990. p.4.

<sup>3</sup>Dirección General de Riego y Drenaje, OSPA, "Política Nacional de Riego." Soyapango, El Salvador: MAG, Mayo, 1990. p.6.

- o Lack of financing for projects and producers, and
- o Lack of political support for irrigated agriculture.

### 5.1.1 Policy Framework

Only three international treaties related to watershed management, water use, and water management have been signed with neighboring countries: the Water Limits with Guatemala of August 23 and 27, 1935; the Treaty Between El Salvador and Guatemala for Using Lake Guija; and the Peace Treaty with Honduras of October 30, 1980. These treaties establish boundaries with Guatemala and Honduras, many of which are waterways that serve as dividing lines.

The treaty with Honduras is the most critical one because the Lempa, El Salvador's most important river, originates in Honduras. However, the treaty does not contain a single reference to the shared water use.

There is also an agreement signed with CATIE on watershed protection. A Regional Committee on Watershed Protection, formed by the Central American countries and CATIE, operates through bilateral agreements between CATIE and each country.

At the national level, numerous laws affect the use of water, as well as watershed and water management. Romero Pineda & Asociados conducted an exhaustive study of the legal structure of water resources in El Salvador, which contains a detailed analysis of the legislation.<sup>1</sup> Exhibit 5.2 lists all the policies related to watershed management, water use, and water management.

The Law on the Integrated Use of the Water Resources, Decree 886 of December 2, 1981, along with its Regulation, Decree 144 of March 23, 1982, provides a normative framework for the integrated management of water resources. This has been the basis for the generation of a series of actions resulting in a territorial organization of water management into hydrographic regions (Exhibit 5.3).

Government policy has focused on watersheds with the largest environmental risks for the hydroelectric generating system. The main emphasis has been on soil conservation and reforestation.<sup>2</sup>

The present Government's environmental conservation policy in its action plan addresses lack of control, lack of adequate measures for natural resource conservation, soil erosion, and deforestation, as well as contamination of rivers, lakes, and the rest of the environment. The main objective is to

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<sup>1</sup>Romero Pineda & Asociados, "Diagnóstico de la Situación Jurídica Sobre el Riego en El Salvador." San Salvador, El Salvador: MAG, Proyecto GOES/AID "Manejo de Aguas." Marzo, 1989.

<sup>2</sup>OSPA, "Plan Quinquenal de Desarrollo Agrario y Pesquero." San Salvador, El Salvador: MAG, 1985.

EL SALVADOR - NATURAL RESOURCE POLICY INVENTORY

Exhibit 5.2 Policies Related to Watershed Management, Waster Use and Water Management, by Type, 1990.

| Type of Policy   |                 |                   |  |
|--|-----------------|-------------------|--|
| Transnational/Regional                                       | Macroeconomic   | Sectoral          | Specific   |
| - Treaty with Guatemala of August 12 and 27, 1985            | - Foreign debt  | - Health          | - Constitution of Dec. 20, 1983 (Arts. 103, 117, 131, N. 31 and 116)   |
| - Treaty with Guatemala to use Lake Guija, of April 15, 1957 | - Fiscal Budget | - Ag. Development | - Civil Code of Nov. 20, 1860  |
| - Peace Treaty with Honduras of October 30, 1980             |                 |                   | - Civil Code of Nov-20, 1960 (art. 568)  |
| - Agreement with CA. IE on watershed protection.             |                 |                   | - Penal Code of 1974   |
| - Agreement with CATIE on watershed protection.              |                 |                   | - Commerce Code  |
| - Investment   |                 |                   | - Mining code of 1922, with Reforms of 1953  |
|  |                 |                   | - Agrarian Law of 1907, with reforms by Legislative Decree No. 60 of Aug. 26, 1941                             |
|  |                 |                   | - Health Code of April 1988  |
|  |                 |                   | - Law on Electrical Services: Decree No. 117 of Dec. 31, 1935; with reforms of Decree No. 384 of Nov. 30, 1961 |
|  |                 |                   | - Expropriation Law, Decree No. 33 of July 25, 1939  |
|  |                 |                   | - Decree No. 137 of Nov. 18, 1948, Created the CEL   |
|  |                 |                   | - Decree No. 194 of July 13, 1949, Law on the Nationalization of Aquifers.                                     |
|  |                 |                   | - Decree No. 29 of Dec. 17, 1958, General Regulation of Irrigation   |
|  |                 |                   | - Executive Decree of Oct. 7, 1975, Created the National Coordinating Committee of Water Resources             |
|  |                 |                   | - Decree 153 of Nov. 9, 1970, Irrigation and Drainage Law  |
|  |                 |                   | - Decree No. 17 of Feb. 28, 1973, Regulation of Decree No. 153   |
|  |                 |                   | - Decree No. 214, Created the Irrigation and Drainage District No. 1, Zapotitan                                |

| Type of Policy         |               |          |  |
|------------------------|---------------|----------|--|
| Transnational/Regional | Macroeconomic | Sectoral | Specific   |
|                        |               |          | <ul style="list-style-type: none"> <li>- Decree No. 11 of Jan. 25, 1973, Initiated the operations of the Irrigation and Drainage District No. 1, Zapotitan</li> <li>- Decree No. 28 of March 22, 1977, Internal Regulation of the Irrigatio and Drainage District No. 1, Zapotitan</li> <li>- Decree No. 36 of July 11, 1973, Created the Irrigation and Drainage District No. 2, Atiocooyo</li> <li>- Decree No. 36 of July 1, 1978, Initiated the operations o the Irrigation and Drainage District No. 2, Atiocooyo</li> <li>- Decree No. 27 of March 21, 1977, Internal Regulation of the Irrigatio and Drainage District No. 2, Atiocooyo</li> <li>- Decree No. 16 of April 18, 1980, Provitonal service rates for irrigation and drainage of District No. 2, Atiocooyo</li> <li>- Decree No. 147 of March 8, 1979, It reduces the maximum land holding in the Irrigation District Atiocooyo</li> <li>- Decree No. 268 of Feb. 19, 1973, Forestry Law</li> <li>- Decree No. 315 of April 25, 1973, Law on the control of pesticides, fertilizers and products for agricultural use</li> <li>- Police Law of 1900</li> <li>- Decree No. 463 of Sep. 9, 1969, Law on Roads and Rural Roads</li> <li>- Decree No. 95 of Dec. 21, 1976, Regulation on the cotton crop.</li> <li>- Decree No. 47 of May 23, 1974, Created the second zone to protect the soil</li> <li>- Decree No. 886 of December 2, 1981, Law on Integrated Use of Water Resources</li> </ul> |

| Type of Policy         |               |          |  |
|------------------------|---------------|----------|--|
| Transnational/Regional | Macroeconomic | Sectoral | Specific   |
|                        |               |          | <ul style="list-style-type: none"> <li>- Decree No. 144 of March 23, 1982, Regulation of Decree No. 866.</li> <li>- Executive Decree No. 50 of October 16, 1987, Regulation on water quality, control of waste disposal, and protected zones against contamination</li> <li>- Law to create the Irrigation District No. 3, Lempa-Acahuapa</li> </ul> |

NATURAL RESOURCE POLICY INVENTORY - EL SALVADOR

Exhibit 5.3 Hydrografic Regions in El Salvador, 1990.

| Region  | Area in Kms2<br>Na- Inter-<br>tional National |      | Observations  |
|---|---|------|---|
| A Lempa River Watershed                         | 10,255  | 7985 |   |
| B Paz River Watershed                           | 929   | 1183 | By now its the only watershedwith underground water resources for agricultural production |
| C South Watershed from coastal zone, Ahuachapan | 659   |      |   |
| D South Watershed from Balsamo zone, Sonsonate  | 879   |      |   |
| E La Libertad Coastal Watershed                 | 1146  |      |   |
| F La Paz Coastal Watershed                      | 1717  |      |   |
| G Bahia Jiquilisco Watershed                    | 704   |      | It considers only continental areas   |
| H Grande River Watershed, San Miguel            | 2250  |      |   |
| I Jucuaran Valley Watershed Conchagua           | 804   |      |   |
| J Guascaran-Sirena Watershed                    | 3047  |      | The Honduras area was not estimated   |

Source: D.G.U.N.R., "Development Master Plan of Water Resources". 1983

rescue the environment from the ongoing degradation. A second objective is to create the conditions to foster conservation of resources for the present and future generations.

Decree 137 of September 1948 created the Executive Hydroelectric Commission of the Lempa River (CEL), which has the mandate to develop, preserve, manage, and use the country's energy resources.

The First Integrated National Energy Development Plan, developed by CEL, includes policies within the conceptual framework of watershed management. It focuses on the Lempa River watershed due to the degradation and deterioration of its resources.

The policies on the use of water for human and industrial consumption have been oriented to construction of infrastructure to increase the water supply, as well as to evaluation of potential sources. The policy on irrigation has been to expand the agricultural frontier by irrigating new areas.

The Government has redefined the national irrigation policy with an objective of promoting the optimum use of the resource, using appropriate irrigation technology. Also, the policy promotes the intensive and continuous use of irrigated area to increase agricultural output.

The first objective of this policy is to rehabilitate and/or build appropriate irrigation infrastructure. A second objective is to create the conditions that allow the optimum use of water for agricultural purposes. Other objectives include irrigating new areas and training professionals, technicians, and water users to create a culture of irrigated agriculture. The policy seeks to strengthen and promote the organization of water users to efficiently manage and operate the water infrastructure.

The policy indicates that the construction of large irrigation infrastructure will continue to be a function of the public sector, shared with the private sector. The public sector will select and determine priorities for future investments, absorbing the pre-investment cost. Part of the total cost will be transferred to users of the irrigation system by trespassing part of the debt. Construction will be contracted to the private sector.

The policy indicates a clear desire to privatize the management of water for irrigation and proposes a project to transfer to the private sector management of irrigation districts over a period of no more than three years. Likewise, it proposes to play a minor role in managing new irrigation projects for a limited amount of time. For large projects it will participate for three years; medium projects, two years; and small and micro projects, one year.

### **5.1.2 Institutional Framework**

Water use in El Salvador occurs amidst conflicting sectoral interests. Even though a law mandates the integrated use of water and makes one institution responsible for coordinating the actions of all institutions involved, it has been impossible to integrate a planning system for water use that will assure

rational use over time.

The institutions involved in watershed management, water use, and water management policies are listed by policy type in Exhibit 5.4. Following is a description of the main institutions.

The Central American Commission for the Environment and Development (CCAD) is studying the integrated management of watersheds that cover several countries. The main one is the Lempa River watershed.

The Regional Committee on Watershed Protection, formed by the Central American countries and the Tropical Agricultural Center for Research and Teaching (CATIE), operates through bilateral agreements signed between CATIE and each country.

The international financial institutions, including IDB and The World Bank, have played an important role by providing financial resources for construction of hydroelectric plants and large irrigation projects.

In the past these large projects did not consider the management of the watershed as a unit, which resulted in an acceleration of siltation that shortened the productive life of the dams.

The FAO is providing financial and technical assistance for a project of soil conservation and management on hillsides.

A.I.D. has played an important role in providing financial and technical assistance on water management. Besides this project, A.I.D. is funding other agricultural projects, emphasizing the consequences of agricultural practices on the entire watershed.

The Ministry of Economic and Social Development Planning and Coordination (MIPLAN) is responsible for coordination and design of overall development planning for the country, including project design and negotiations for major investment in infrastructure. However, other institutions have demonstrated more influence in their own independent planning.

The National Administration of Potable Water and Sewage (ANDA) is in charge of all aspects of water use for human and industrial consumption. ANDA houses the Specialized Water Office (OEDA) that is responsible for policies concerned with all kinds of use of the water resources. The Ministry of Public Health and Social Assistance also is involved in water consumption from the quality standpoint and has a Division of Environmental Sanitation, which coordinates with ANDA, the municipalities, and the Salvadoran Institute of Agrarian Transformation (ISTA), to provide potable water and sewage treatment systems in rural areas.

On the other hand, the Ministry of Agriculture and Livestock (MAG), through its General Directorate of Irrigation and Drainage (DGRD), controls and develops water irrigation policies. This is established in the Irrigation and Drainage Law. The Office for Agricultural Sector Planning (OSPA) of MAG is involved with coordinating the irrigation plan and its finance and budget

EL SALVADOR - NATURAL RESOURCE POLICY INVENTORY

Exhibit 5.4 Institutions Involved in Watershed Management, Water Use and Water Management, by Type of Policy, 1990.

| Type of Policy  |   |  |   |
|---|---|--|---|
| Transnational/Regional  | Macroeconomic   | Sectoral   | Specific  |
| - Central American Presidential Commission for The Environment and Development (CCAD)   | - The Central Bank of Reserve<br>- Ministry of Finance              | - Ministry of Agriculture and Livestock (MAG)<br><br>- MAG-Natural Resources Center  | - MAG-General Directorate of Irrigation and Drainage (DGRD)<br><br>- National Administration for Potable Water and Sewage (ANDA)  |
| - Regional Committee on Watershed Protection<br><br>- Ministry of External Relations<br><br>- Agronomic Center for Tropical Research and Teaching (CATIE)<br><br>- IDB<br><br>- The World Bank<br><br>- FAO<br><br>- U.S. Agency for International Development (U.S.A.I.D.) | - Ministry of Economic and Social Development and Planning (MIPLAN) | - Executive Hydroelectric Commission of the Lempa River (CEL)<br><br>- Ministry of Public Health and Social Assistance-<br>Division of Environmental Sanitation<br><br>- Municipalities<br><br>- Salvadoran Institute of Agrarian Transformation (ISTA)<br><br>- MAG-National Center for Agricultural Research<br><br>- Urban and Architecture Directorate | - ANDA/Specialized Water Office<br><br>- MAG-Office for Agricultural Planning (OSPA)<br><br>- MAG-National Center for Agricultural Technology (CENTA)<br><br>- Irrigation Associations<br><br>- FUSADES-DIVAGRO<br><br>- Salvadoran Ecological Foundation<br><br>- Salvadoran Ecological Movement<br><br>- Salvadoran Association for Conservation of the Environment<br><br>- National Agricultural School (ENA) |

preparation, as well as irrigation policy. The National Center for Agricultural Technology (CENTA) of MAG conducts research on irrigated agriculture. The National Center for Agricultural Training of MAG is in charge of training the technicians and farmers on irrigation technology for agriculture. The Natural Resources Center (CENREN) of MAG also intervenes in water use policies in coordination with the Directorate of Irrigation and Drainage.

The Meteorological and Hydrometric Service is part of the CENREN. In 1980 the National Meteorological Network totaled 257 stations. With data collected through the stations, it was determined that the country's average annual precipitation was 1850 mm. with a minimum of 1354 mm. and a maximum of 2379. At present only 116 stations are working.

The National Hydrometric Network had 80 stations operating in 1980, which reported an average runoff of 564 m<sup>3</sup>/seg. or 17,778 x 10<sup>6</sup> m<sup>3</sup>. In 1990, only 10 stations are operating. Three-hundred water table observation stations were operating in 1980, but in 1990 none is operating. In 1980, 10 phenological stations were operating but in 1990, only five are operating.

The Urban and Architecture Directorate, which manages the drainage of urban rainwater, intervenes in the norms, design and dimensionality of the aqueduct systems and sewage disposition in urban areas.

The Executive Hydroelectric Commission of the Lempa River (CEL), develops, preserves, manages, and uses energy resources.

Each institution is concerned with certain aspects of the watershed. However, watershed management goes beyond the mandate of each institution. Thus, the need to create effective mechanisms of inter-sectoral participation and coordination among the institutions participating in resource utilization at the watershed level is paramount.

In the private sector several organizations are involved. FUSADES through DIVAGRO is training farmers in irrigation practices for diversified export crops. The National Agricultural School (ENA) plays an important role in training technicians. Irrigation associations are private organizations allowed by the Irrigation and Drainage Law (Art. 47 and 48), with bylaws approved by Escritura Pública registered in MAG. The law requires a minimum of 10 members. The Regulation of the Law (Art. 118 and 127) specifies certain conditions that must be included in the bylaws. Art. 103 of the law exempts them from fiscal and municipal taxes. There are 19 associations.

### 5.1.3 Analysis

The degree of progressive degradation and destruction of the natural resources in El Salvador has been documented by several national and international institutions and researchers. One example of this deterioration is the growing destruction of water resources, a direct consequence of

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<sup>1</sup>Source: Dr. Gelio Guzman, of the Meteorological and Hydrometric Service personal information.

deforestation and destruction of protective vegetation in the watersheds. This destruction contributes to an accelerated and continuous erosion and degradation of productive soils, accentuating the disequilibrium in the natural water balance that is critical to ecosystem stability.

Last year, a photometric interpretation of the natural resources indicated the level of environmental degradation at the watershed level, which was confirmed with field trips. A process of desertification has already started in critical watersheds.<sup>1</sup> To return to equilibrium will require substantial investments, collective participation, and institutional coordination.

In fact, the interdependency of natural resources means that intervention in one resource always affects the others, which is why the traditional schemes of addressing environmental problems unilaterally, without considering the secondary effects must be reformed.

El Salvador has three watersheds that go beyond its frontier into Honduras or Guatemala. The most critical situation is the Lempa River watershed. However, the peace treaty signed with Honduras in 1980 does not address the use of water that flows between the two nations. As an alternative, the Government is using the agreement signed with CATIE to negotiate specific terms with Honduras.

At the national level, the competition among interested institutions for the use of water resources may constitute the key to addressing environmental problems at the watershed level. It is not the mandate of ANDA, CEL, or the Ministry of Health and Social Assistance to conduct watershed management and protection activities through soil conservation, reforestation and other conservation measures. However, their interest in having high quality water and maintaining the potential to generate hydroelectric power should be the catalyst for coordination with MAG and the Specialized Water Office in developing integrated action plans for watershed management.

A vivid example of the lack of adequate coordination at the watershed level is the imbalance between the projected water needs and the real availability in the Lempa River watershed. Operation of the present and projected hydroelectric infrastructure assumes that the water flows of secondary watersheds will stay at least at present levels. Meanwhile, the water requirements for human and industrial consumption and irrigation are growing. This presents a growing and critical gap between water supply and demand.

A project to use superficial water from the Lempa River offers one solution to the deficit, mainly for the metropolitan area of San Salvador. However, there is no regulation of the discharge water from Santa Ana through the secondary watershed of the Suqiapa River,<sup>2</sup> and from industrial discharges in the secondary watershed of the Sucio River.<sup>2</sup> Furthermore, the project has program

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<sup>1</sup>CEL, "Primer Plan Nacional de Desarrollo Energético Integrado 1988-2000."

<sup>2</sup>Both of these secondary watersheds are part of the Lempa River watershed, feeding the main stream prior to where water will be taken for human consumption of the metropolitan area of San Salvador.

to protect the watershed. The Ministry of Agriculture through the Directorate of Irrigation and Drainage (DGRD) is exploiting the same watershed for irrigation purposes but is taking no steps to protect the watershed. CEL is using the same Lempa River watershed to produce electricity without paying enough attention to reforestation and preservation of the watershed to minimize siltation on its dams. The three institutions do not coordinate efforts on watershed management.

An analysis of water demand and supply reveals a gap for San Salvador due to faster than anticipated population growth. This situation will gradually worsen as the growing population increases the amount of discharge that the natural system has to process, limiting the capacity of water bodies.

The lack of coordination among institutions using water for different purposes is a major potential problem. Serious conflicts may arise in the future, jeopardizing a legitimate effort of one of the institutions.

MAG has an irrigation master plan to the year 2000. ANDA has a plan for tap water, and CEL has one for energy production. Do these plans conflict? Are they compatible? Are they proposing an integrated use of the resource, including the management of critical watersheds? Are the uses proposed the best alternatives in a complete system? Or does each plan maximize its own objectives? These questions need to be addressed to assure the best alternative use of water.

The Water Management Project of GOES/AID has addressed the legal aspects of water management. On April 3 and 4, 1990, the project held a seminar to revise the water legislation of El Salvador. It also contracted experts who have made recommendations regarding these formal policies. They concluded with a draft of a new law on irrigation and drainage to be submitted to congress.

A review of the laws indicated that the legislation relevant for water management is fragmented. No single law incorporates the different aspects of water management, nor is there one to regulate and control its quality. At present it is the responsibility of MAG and the Ministry of Health and Social Assistance, even though they have no responsibility over the water supply and the disposition of liquid residues. There is no unified policy that facilitates interactions of the different entities that intervene in the use of water and its physical space. However, as a temporary solution to shared water management, there are inter-institutional agreements for specific purposes. One example is the agreement for CEL-MAG to use the dammed water for energy and irrigation purposes simultaneously. Another example is the agreement between ANDA and CEL to use water from the Lempa River for energy and human consumption.

#### **5.1.4 Potential Policy Alternatives**

- o Use the Central America Agreement for the Protection of the Environment to develop actions and programs to better manage the watersheds whose areas cover more than one country.**
- o Revise the treaties with Guatemala and Honduras to define common management of the watersheds and waterways common to**

more than one nation.

- o Design a policy on integrated watershed management.
- o Approve the proposed irrigation and drainage law.
- o Look at water use alternatives as a way to reach the optimum for the entire system and not specific sectors. This is not an easy task. It will require some political decisions, because it might mean increasing the cost of water for human consumption versus irrigation or vice versa. Economic wisdom would suggest charging the same price for all uses, but this is not always an easy task for politicians.
- o Design a policy to stimulate and regulate the use of hydroelectric dam lakes for multiple uses.
- o Design a policy on conservation and protection of secondary and underground water sources.
- o Develop a policy on protection and conservation of water sources for human consumption.
- o Develop a policy to reuse water for irrigation purposes.
- o Develop a policy on the control and use of rain water in critical watersheds.
- o Develop a policy on the management of rainwater in urban areas that is integrated into the watershed management. These uncontrolled drainages cause the greatest alterations of natural watersheds.

#### **5.1.5 Recommendations For Future Research and Analysis**

- o Study alternative organizational schemes to manage the major watersheds in the country.
- o Study alternative methods of organization to assure adequate coordination among institutions using water for different purposes.

#### **5.2 Water Quality**

Most of the country's superficial and underground water is contaminated. The main factors affecting this situation are as follows:

- o Lack of treatment of domestic and industrial liquid wastes,

- o Disposal of raw liquid wastes into streams and rivers,
- o Uncontrolled use of chemical products such as fertilizers and pesticides,
- o Lack of treatment of liquid and solid agro-industrial wastes,
- o Disposal of raw liquid wastes from coffee, sugar cane, sisal, and kenaf mills and from tanneries,
- o Urban solid waste disposal on inadequate sites washed away by runoff, contaminating streams and rivers, and
- o Percolation of superficial contaminated water from the sources mentioned above contaminating underground water.

One of the main sources of contamination is the disposal of raw municipal liquid wastes into creeks, streams, and rivers. The Natural Resources Center carried out studies from 1977 to 1981 estimating that it would be necessary to have a national rate of flow of 253 m<sup>3</sup>/sec. to purify those liquid wastes by natural dilution. This figure exceeds the maximum estimated 1982 irrigation demand of 249 m<sup>3</sup>/sec. and is also twice the Lempa River's summer yield of 127 m<sup>3</sup>/sec.<sup>1</sup>

Water supply networks have had little or no maintenance and some have seriously overextended their estimated period of useful life.<sup>2</sup> In some cases lead-joint pipes are still in service.

Raw liquid waste effluents from agro-industries are the main source of river contamination because of their high concentration of organic compounds. Coffee mill effluents are the worst contaminators because they are created during a short time coinciding with the minimum river flow (summer).<sup>3</sup>

Laws regulating pesticide use are very lightly enforced. Dangerous pesticides such as DDT contaminate land, rivers, water tables, and the food chain, killing birds, fish, and other fauna. Farmworkers sometimes must drink and bathe from pesticide-laden irrigation ditches. San Miguel Great River has shown very high concentrations of pesticides such as DDT 3.15 mg/H and Dieldrin 3.77 mg/lit. Both far exceed the upper limit of 0.12 mg/lit set by international standards (concentrations of 0.12 mg/lit DDT or Dieldrin are enough to kill all fish living in a river).<sup>4</sup> The same effect has been detected in estuaries where shrimp, sea fish, and other species are being killed.

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<sup>1</sup>Perfil Ambiental de El Salvador, USAID, 1985.

<sup>2</sup>Tech International Inc. Draft Final Report to AID (p.30) Nov. 15, 1989.

<sup>3</sup>Plan Maestro de Recursos Hídricos, 1980.

<sup>4</sup>Perfil Ambiental de El Salvador, USAID, 1985.

The most populated urban centers are located in the Lempa River watershed. All the rivers within this watershed have very high concentrations of fecal origin coliforms and very low concentrations of dissolved oxygen throughout the year as a direct consequence of the raw liquid waste discharges.

Suquiapa River (running between Santa Ana City and Lempa River) is among the most contaminated rivers in the country. During summer it receives the sewage effluent of Santa Ana City (estimated population, 300,000 inhabitants), and discharges from several coffee mills. Combined, the effluent and discharges produce an oxygen-dissolved concentration of 0 mg/l at some miles below the Suquiapa's junction with the Lempa.

Shallow wells in the rural areas showed pesticide contamination in 1981.<sup>1</sup> All wells without sanitary protection also show bacteriological contamination mainly because of the surface excreta washed away by runoff. A study of nine wells in cotton plantation areas in San Miguel, La Paz, Usulután, La Unión, and Sonsonate in 1976 showed the presence of pesticides in underground water with very high concentrations of Alpha-Gamma BHC, Heptachloron, Aldrin, Dieldrin and DDT.<sup>2</sup> All the wells were considered "toxic sources." Wells widely used to tap groundwater sources bring up water unfit for either human consumption or irrigation.

Because the U.S. Food and Drug Administration requires that fresh vegetable imports into the U.S. meet its standards, private agro-exporters have started controlling irrigation water quality. Otherwise, irrigation systems do not include water quality control.

High turbidity indexes in the coastal water show a very high contamination and large amounts of fertile soil (up to 500 tons/ha./year) carried by rivers into the sea.<sup>3</sup> Very high concentrations of coliforms (up to 1,000 coliforms/100 ml) have been reported at Salvadoran beaches mainly from raw municipal sewage effluents discharged into the sea. The classic "Red Tide" with myriad of algae that sweeps the Salvadoran coast from time to time also indicates organic contamination.

Different limnological studies carried out in El Salvador, show that all lakes and lagoons are in the accelerated eutrophication process. Eutrophication is a natural aging process in which lakes and lagoons show some siltation, increased amounts of organic matter and biological life. This natural and positive process takes thousands of years. However, deforestation, fertilizer and pesticide contamination, urban development, and raw municipal and industrial sewage discharges accelerate the process by hundreds of years.

Statistics from the Ministry of Public Health 1988 yearbook (the ministry covers only 25 percent of the population) show that 65 percent or

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<sup>1</sup> Plan Maestro de Recursos Hídricos.

<sup>2</sup> 1985, El Salvador Environmental Profile.

<sup>3</sup> Dirección General de Recursos Naturales Renovables, Anuario 1984.

370,138 cases of sickness originated because of poor environmental conditions as follows:<sup>1</sup>

| Sickness             | Cases   | Percent |
|----------------------|---------|---------|
| Intestinal Parasites | 162,504 | 28.4    |
| Diarrhea             | 159,883 | 27.9    |
| Amoeba Dysentery     | 16,278  | 2.9     |
| Scabies              | 14,734  | 2.7     |
| Malaria              | 10,691  | 1.9     |
| Chicken Pox          | 6,048   | 1.2     |

Gastrointestinal infection that could be prevented by cleaner water remains a leading cause of death throughout the country.

From UNICEF'S sources, children under 5 years of age have a mortality rate of 70 per 1,000 on average for the country: 55 for the urban sector and 81 for the rural sector. (In the U.S. the rate is 11 per 1,000.)

### 5.2.1 Policy Framework

A general policy framework regulates water use in El Salvador, the Law on Integrated Use of the Water Resources, Decree 886 of December 2, 1981, along with its Regulation, Decree 144 of March 23, 1982. Article 8 of the Law establishes a General Water Law; however, a draft is still in the Legislature awaiting discussion and approval.

On October 16, 1987, Executive Decree 50 on water quality control of wastewater disposal and protected zones was submitted to the Legislature. Its main purpose is to establish controls to avoid or reduce contamination of water resources.

No policy includes water quality control on irrigation projects in spite of contamination levels affecting the health of farmers and technicians, as well as destroying crops and contaminating/eroding soils.

### 5.2.2 Institutional Framework

Exhibit 5.5 lists the major institutions involved in water quality by policy type. The most important ones are discussed here.

Water quality control is determined by three institutions according to its use: the Ministry of Public Health and Social Assistance (MSPAS), the Ministry of Agriculture and Livestock (MAG), and the National Administration for Potable Water and Sewage (ANDA).

MAG has jurisdiction over control of water quality for agricultural

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<sup>1</sup>Ministry of Public Health and Social Assistance "1988 Yearbook." San Salvador, El Salvador: Ministry of Public Health and Social Assistance, 1989.

**EL SALVADOR - NATURAL RESOURCE POLICY INVENTORY**

**Exhibit 5.5 Institutions Involved in Water Quality, by Type of Policy, 1990.**

| <b>Type of Policy</b>             |                            |  |  |
|-----------------------------------|----------------------------|--|--|
| <b>Transnational<br/>Regional</b> | <b>Macro-<br/>Economic</b> | <b>Sectoral</b>  | <b>Specific</b>  |
|                                   |                            | - Ministry of<br>Agriculture                               | - MAG-General Directorate of<br>Natural Resource                       |
|                                   |                            | - Ministry of<br>Public Health<br>and Social<br>Assistance | - National Administration for<br>Drinking Water and Drainage<br>(ANDA) |
|                                   |                            |  | - ANDA/Specialized Water Office<br>(OEDA)                              |
|                                   |                            |  | - Salvadoran Ecological Foundation                                     |
|                                   |                            |  | - Salvadoran Ecological Movement                                       |
|                                   |                            |  | - Salvadoran Association for<br>Conservation of the Environment        |

use, mainly irrigation. It also conducts analysis on agro-industrial waste disposal. In some instances it has cooperated with the two other ministries in testing municipal waste disposal.

The Specialized Water Office (OEDA), created by the Law on Integrated Use of the Water Resources, now operates under ANDA. The law authorizes OEDA "to design norms on water quality and the control of sewage disposal, industrial, mining and other kinds of waste, as well as any other active or passive water use that could contaminate the resource."

ANDA controls the quality of the water it supplies. The tests are done in its own laboratories, applying its own standards. Analyses are limited usually to chlorine residues and bacteriological concentration in water for human consumption.

MSPAS controls the bacteriological quality and chlorine residue of municipal and ANDA's water network. It also makes determinations of chlorine residue on rural water systems. A noteworthy policy developed by MSPAS in the rural areas is to request "latrination implementation" before any rural water supply service.

### 5.2.3 Analysis

The lack of a uniform and coherent policy at the national level for water quality control yields poor water quality. The high rates of waterborne diseases show that water quality control is not efficient in any water supply systems.

El Salvador has policies and regulations to prevent pollution and contamination of superficial and underground water, as well as sufficient technology for design and construction of sewage treatment plants. OEDA has started implementing policies requesting private industries to treat their wastewater effluents properly before disposing them in sewage systems. This is a good start but the bulk of raw waste is dumped into rivers. Sewage systems are administrated by ANDA. OEDA is located in ANDA, but some of its policies do not affect the main body.

Water supply systems have had little or no maintenance, reporting leaks mainly on lead joint pipes and house connections. ANDA has recently started a program to detect water leaks in its network and to repair the damage.

Laws on the use of pesticides and fertilizers are not properly enforced, and field contamination tests are seldom carried out. As stated above, there is no policy to include water quality control and little permanent maintenance on irrigation projects. Most agro-industrial raw wastes are dumped without treatment. Recycling of those wastes has not been attempted yet in El Salvador. Some new technologies that could be applied are biomass or bacteriological conversions.

#### **5.2.4 Potential Policy Alternatives**

- o Increase safety monitoring to assure quality control of the water supply and networks. Establish controls on irrigation water quality.**
- o Establish uniform water quality standards for the entire country.**
- o Review the water quality testing policy and investment procedures to provide testing laboratories for the three regions: West, Central and East.**
- o Review the sanctions system to make it practical in application.**
- o Review ANDA's water fees to include financing of municipal waste water treatment plants.**
- o Review irrigation fees to include water quality and maintenance financing.**

#### **5.2.5 Recommendations For Future Research and Analysis**

- o Study alternatives to centralize water quality control in a single unit.**
- o Study policies on standards to systematically test the water quality of rivers, lakes, lagoons, underground water, and the coastal zones.**

### **5.3 Coastal Zone Management and Fisheries**

**The Coastal Zone of El Salvador, located in the Central American Pacific Ocean Basin, is 185 kms. long, from the Guatemalan border east to the El Faro cape, the beginning of the Gulf of Fonseca. From there it continues north and then northeast up to the Goascoran River's outfall, its boundary with the Honduras. Its total length is 321 kms.**

**As a geographic region, El Salvador's coast is a transition between the West Coast (Guatemala and Mexico) and the East Coast (Nicaragua, Costa Rica, and Panama). The West Coast is characterized by lagoons and prevailing compensation coast without partitions such as peninsulas or gulfs. The East Coast is irregular with many peninsulas, gulfs, and even cliffs derived from mountains cut by the ocean.**

**The Salvadoran coastal region includes both sides of the land and ocean boundaries. The inland varies from flatlands to elevations of approximately 100 meters above sea level where the volcanic chain suddenly appears. El Salvador's**

coast has six zones:

- o The great west flatlands with a narrow strip of lagoons (from Paz River outfall up to "Sierra del Bálsamo" southwest boundary),
- o The "Sierra del Bálsamo" cliffy coast, 50-100 meters above sea level,
- o The central coastal flatland with mangrove forest, and estuaries of Jaltepeque and Aiquilisco,
- o The Sierra de Jucuarán cliffy coast,
- o The eastern flatland coast with small lagoons, and
- o The Gulf of Fonseca including its islands and the Volcano of Conchagua Fall.

El Salvador's oceanic coast (in the sea) is divided into three zones:

- o The continental platform, from the sea level up to 150 ms. (around 40-80 kms. from the shore),
- o The continental boundary from 150 ms. up 500 ms. high, and
- o The continental slope of the Guatemalan pit from 500 ms. up to a maximum of 5,400 ms.

The main factors that have contributed to El Salvador's present coastal configuration include the following:

- o Earth upheavals and sinkings,
- o Erosion and sedimentation, and
- o Surf and maritime currents.

Earth upheavals and sinking mainly caused by tectonic evolutions from the continent toward the Pacific Ocean are clearly shown by the "Cordillera del Bálsamo" and the Jucuaran hills on the one hand, and the formation of lakes and lagoons on the coastal flatland on the other.

Impressive cliffs and bluffs north to the Cordillera del Bálsamo, and the Sierra de Apaneca combined with the absence of young volcanic matter clearly show the presence of upheaval formations. The peculiar and marked slope of the flat coastland confirms that theory.

Mangrove forests have played an additional role in increasing land levels and forming estuaries and sandbars in the country's main rivers, surfs, tectonic evolutions, and maritime currents.

The benthic communities in El Salvador's shore have not been classified yet, but apparently sand benthos are predominant compared with rocky benthos and the other types.

At the beginning of the 20th century, the coastal woods area was quite large and a perfect habitat for vectors of sicknesses such as malaria, typhus, and yellow fever. Except for a small area of Usulután city, and El Triunfo Port, the remaining flatland was covered by dense forest. It was not until 1922 when pioneer cotton farmers stimulated by the excellent soil quality at Usulután decided to destroy large wooded areas to develop intensive cotton farming in the province of La Paz.<sup>1</sup>

Dickey and Van Rosem reported magnificent forests behind Barra de Santiago and El Triunfo (Juiquilisco Bay).<sup>2</sup> They also issued a warning in an effort to prevent their quick destruction. Three almost simultaneous factors contributed to the destruction of those forests: 1) an aggressive agriculture stimulated by success against different pests and vectors of sickness due to the effectiveness of the first industrial pesticides, particularly DDT; 2) the high price of cotton in the international market combined with low costs of pesticides and labor; and 3) the construction of the littoral highway.

Although mangroves extend over 45,000 has., they represent barely 2 percent of the national continental territory. Undoubtedly the ecological, economic, and social impacts of these natural terrestrial maritime ecosystems in the country are more significant and important than the mere figures indicate. Mangroves are the natural habitat for mollusks, crustaceans, and cooking fish. They are also a kind of nest for several maritime bird and animal species.

Production of common salt in El Salvador is mainly concentrated on the eastern coast, particularly in the provinces of Usulután and La Unión. Solar energy is widely used for processing common salt in Usulután, taking advantage of the large plain and flat beaches needed to process large volumes of salt. In addition, firewood taken from the mangroves is widely used at La Unión to evaporate sea water during extraction of salt. Untreated geothermal waste water from CEL power stations in Ahuachapán is being dumped into the ocean.

Maritime ship activities are limited to fishing and freight purposes and concentrated on four ports: Acajutla, La Libertad, El Triunfo, and Cutuco. El Salvador's main port is Acajutla, located around 90 kms. southwest of San Salvador. The original pier, built by the Spaniards during colonial times, remained until 1956 when a modern pier replaced it. A major revamping of the port in 1970 enlarged its capacity so it can serve eight large ships simultaneously. It has two piers, each 300 meters long, with a bottom depth of around 13 meters.

La Libertad port, located about 30 kms. south of San Salvador, is used exclusively for fishing. The port has a 300 meter-long bridge pier and is only

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<sup>1</sup>Choussy, 1931. Cited on "El Salvador Environmental Profile, 1985.

<sup>2</sup>Dickey and Van Rosem, 1938. Cited in "El Salvador Environmental Profile, 1985."

5 meters deep. El Triunfo port, located 120 kms. southeast of San Salvador inside the Jiquilisco Bay, is also devoted to fishing.

Cutuco port is a natural port within the Gulf of Fonseca located 190 kms. southeast of San Salvador. It has a concrete pier 100 meters long with a maximum depth of 9 meters. It is used for fishing but has the capacity to receive freight ships as well.

El Salvador has a potential resource in the Pacific Ocean. The political constitution states that the marine territory expands from the lowest tide up to 200 marine miles. This covers an area of approximately 93,240 kms.<sup>2</sup> of coast and 160 kms.<sup>2</sup> of estuary, almost six times its continental territory. The country also has 150 rivers with an area of 200 kms.,<sup>2</sup> five lakes with 180 kms.,<sup>2</sup> three dam lakes with 165 kms.,<sup>2</sup> and 124 hectares of water space.

Marine fishery has become a very important sector of the economy, contributing 96 million colones to GNP in 1986, 95 million colones in 1987, and 122.2 million colones in 1988. Exports from fisheries occupy fourth place in the economy, mostly in shrimp exports, the most exploited marine resource.<sup>1</sup>

Marine fishing is done by both industrial and small-scale boats. Industrial or technological fishing is devoted to catching shrimp (Penacus sp) and crawfish (Pleurocondes planipes). About 27,000 people are employed in fishing as of 1990, a significant increase from 1,500 people in 1985, just five years ago.

Industrial fishing started operations with a small fleet of 18 ships in 1958. The number of ships has increased to 147 ships operating along the Salvadoran shore at present. An OLDEPSCA study indicates that the country should only have 50 ships to maintain sustainable fishing.

Besides over-fishing, other serious problems affecting the shrimp industry include unreported offshore sales (sale of shrimp to pirate boats), and pesticide contamination in mangrove estuaries, the natural habitat for shrimp.

Besides shrimp, other fished species include Chilean type crawfish (Pleurocondes planipes), lobster (Panulirus gracilis), crabs (Ucides occidentalis, Callinectes toxotes, C. arcuatus, Menippe frontalis), and oysters (Ostrea iridescens, and O. columbiense). A mollusk named casco de burro (Anadara grandis) is practically extinct mainly due to over fishing. Artisan marine fishing is for local consumption.

Although El Salvador has many rivers and lakes, continental fishing has been neither technically developed nor exploited because of the lack of appropriate policies and protective regulations. Twenty-five native and seven foreign species of fish live in rivers, lakes, and lagoons.

Since no fishing licenses are required, no regulations limit the fishing. Furthermore, use of dynamite or poisonous substances is common among

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<sup>1</sup>CENDEPESCA, "Anuario Pesquero 1989." San Salvador, El Salvador: MAG/CENDEPESCA, 1990.

fishermen. Other species such as river crabs are also threatened. Over-fishing and the high level of pollution and contamination of rivers and lakes are limiting continental fishing.

### 5.3.1 Policy Framework

Exhibit 5.6 lists the major policies affecting coastal zone management and fisheries in El Salvador classified according to policy type. The ones that have been described in the previous sections are briefly mentioned while the ones specifically for fisheries are described in more detail.

International donors have played an important role in developing the fishery resources of the country and providing information about its size and limitations. They have provided technical and financial assistance in fisheries education and institution building, as well as export promotion and business development.

At the macro level, the most influential policy has been the foreign exchange policy, along with the fiscal policy. The most important fiscal policy is the export tax on shrimp. The shrimp export tax used to be 1 colone per pound of exports. This tax was eliminated as of January 1, 1990.

Another critical monetary policy is the money supply, which also influences the credit policies. As explained before, the Government has a tight money supply policy to curtail inflation and stabilize the foreign exchange rate. This reduces credit availability, especially for high risk activities.

A \$3 million dollar loan from IDB over the 1980-86 period has been the only specific source of fisheries financing. At present no specific credit lines are available for fisheries. The financing needs of the fishing industry are covered by the financial institutions' own funds and the agro-industrial and micro-enterprise credit lines.

Education policies have been very important in developing the specialized trained personnel for this activity. The Ministry of Education has a special program of education through the Sailing and Fishing Institute.

The General Law of Fishery Activities, Decree 799 of September 14, 1981, is the policy that regulates all fisheries activities. This law promoting and regulating fishing and aquaculture has the objective of promoting a rational use of the resource.

The present Government stated its fisheries policy in the document, "Política Pesquera."<sup>1</sup> It indicates its main objective is "to foster the optimum use of the resources through research, transfer of technology, management and organization of the fisheries sector."

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<sup>1</sup>Centro de Desarrollo Pesquero, "Política Pesquera." San Salvador, El Salvador: Ministerio de Agricultura y Ganadería, Junio de 1990.

**EL SALVADOR - NATURAL RESOURCE POLICY INVENTORY**

**Exhibit 5.6 Policies Related to Fisheries and Coastal Zone Management, by Type, 1990.**

| <b>Type of Policy</b>                   |                             |                    |   |
|---|-----------------------------|--------------------|---|
| <b>Transnational<br/>Regional</b>       | <b>Macroeconomic</b>        | <b>Sectoral</b>    | <b>Specific</b>   |
| - Import regulations in Other Countries | - Monetary/Money Supply     | - Education Policy | - Ban for fishing dolphins, marine turtles, and lobster with eggs and smaller than 20 cms. Resolution No. 265 of 1990 of the Center for Fisheries Development |
| - International Assistance              | - Monetary/Credit           | - Health Policy    |   |
|   | - Monetary/Foreign Exchange | - Research         | - Decree 125 of December 27th of 1982 creates the Center for Fisheries Development (CENDEPESCA) in the MAG.   |
|   | - Fiscal/Budget Deficit     | - Extension        |   |
|   | - Fiscal/Export Tax         |                    |   |
|   | - Trade                     |                    | - Decree 799 of September, 1981, General Law of Fishery Activities.   |
|   |                             |                    | - Decree No. 82 of October 20th, 1983 - Regulation of Decree No. 799.   |

National research policy is oriented toward generation of appropriate technology that would increase production and productivity. In fish farming, it proposes to validate appropriate technology for growing commercial species through adaptation and innovation. Research will also include quantifying the maximum sustainable levels of fishing.

The Center for Fisheries Development recently approved Resolution 265 which bans the catching of dolphins, sea turtles, and lobsters with eggs or under 20 cms. long

El Salvador has not had a coherent policy to control and protect its coastal zone, except for the Forestry Law, which includes mangroves as one of the forests to protect. The law allows the cutting of timber from mangroves with a prior permit from the Forestry and Fauna Service. The stumpage fee is 0.25 colones a log. The Navy Department of the Ministry of Defense confiscates illegal (cut without a permit) mangrove timber.

There is no urban recreation and tourism development policy for beaches and estuaries and no national policy to control floods at river outflows. There is no regulation to preserve and protect natural coastal habitats of marine wildlife or marine bird shelters. There is no regulation to prevent coastal zone contamination from pesticides and fertilizers used for different crops such as cotton, watermelon, and cantaloupe. There are no policies to prevent and control oil spills or any other kind of marine pollution. There are no sanitation policies to prevent fecal contamination from thousands of recreational houses built along the Salvadoran beaches. Only two of four city-ports have operating municipal sewage treatment plants.

### 5.3.2 Institutional Framework

Exhibit 5.7 lists the main institutions involved in fisheries activities by type of policy. Following is a description of their involvement.

A.I.D. has played an important role in financing several fisheries projects. Of special importance is the export promotion project at DIVAGRO, which is developing an industry of freshwater shrimp in feasible areas.

The Canadian International Development Agency has contributed technical and financial assistance to the Sailing and Fishing Institute. FAO is providing technical and financial assistance through a project of support to the Cooperative of Small Fishermen of the port, La Libertad.

The Central Bank of Reserve is the institution in charge of monetary policy, which is implemented through the banking system and the foreign exchange offices. The Ministry of Finance designs and implements the fiscal policy. The Ministry of Economy is responsible for the trade policy. The Ministry of Economic and Social Development Planning and Coordination (MIPLAN) is responsible for the Government overall planning functions and policy design.

The Ministry of Health and Social Assistance is in charge of health policy. Considerable fecal contamination reaches beaches and mangroves, where

**EL SALVADOR - NATURAL RESOURCE POLICY INVENTORY**

**Exhibit 5.7 Institutions Involved in Fisheries and Coastal Zone Management, by Type of Policy, 1990.**

| <b>Type of Policy</b>   |  |  |  |
|---|--|--|--|
| <b>Transnational/Regional</b>   | <b>Macroeconomic</b>   | <b>Sectoral</b>                                      | <b>Specific</b>  |
| - Central American Presidential Commission for The Environment and Development (CCAD) | - The Central Bank of Reserve<br>- The Banking System                            | - Ministry of Agriculture<br>- Ministry of Education | - MAG-Fisheries Development Center (CENDEPESCA)        |
| - OLDEPESCA   | - Foreign Exchange Offices   | - Ministry of Health and Social Assistance           | -MAG-CENREM-Forest and Fauna Service                   |
| - Ministry of External Relations  | - Ministry of Finance  | - CENTREX  | - MAG-Regional Offices                                 |
| - U.S. Agency for International Development (U.S.A.I.D.)                              | - Ministry of Economic and Social Development Planning and Coordination (MIPLAN) | - Port Authority Executive Commission (CEPA)         | - Ministry of Education- Sailing and Fishing Institute |
| - Canadian International Development Agency   |  | - FUSADES-DIAGRO                                     | - Ministry of Defense-Navy Department                  |
| - U.N. Environmental Program  |  | - Salvadoran Foundation for Ecological Development   | - Salvadoran National University- Biology Department   |

mollusks feed. These mollusks are later sold for human consumption.

The Fisheries Development Center (CENDEPESCA) of the Ministry of Agriculture and Livestock (MAG) is the institution in charge of fisheries research, extension, and monitoring activities and implementation of the mandates of the General Law of Fishery Activities. It has the following functions:

- o Establish policies for fisheries activities,
- o Control and regulate fisheries activities,
- o Provide technical assistance to fishermen, and
- o Develop technical studies on fisheries resources.

The Navy Department is a military unit within the Ministry of Defense, with the following main duties:

- o Monitor shores and beaches to prevent smuggling and illegal transport of mangroves by boat,
- o Control sailing at Salvadoran ports,
- o Curtail illegal marine fishing activities, and
- o Exercise national sovereignty on territorial sea.

The Sailing and Fishing Institute of the Ministry of Education provides a valuable service in training sailors, fishermen, mechanics, and processors of fisheries products.

The Forest and Fauna Service of the Center for Natural Resources (CENREN) of MAG is responsible for administering the Forestry Law which covers mangroves. The Regional Offices of MAG provide direct assistance at the regional level.

The Port Authority Executive Commission (CEPA) is an autonomous governmental agency in charge of managing the ports of Acajutla and Cutuco.

FUSADES, through DIVAGRO, has a program of aquaculture based on the private sector. The program's objectives are to diversify production and promote exports.

The Salvadoran Foundation for Ecological Development has played an important role in protecting turtles and mangroves in recent years. It has also contributed a research program on aquaculture to establish shrimp farming in El Salvador. It already has some positive results on farming freshwater shrimp with the species Macrobrachum resembergii.

The Salvadoran National University through its Biology Department has conducted research and some courses on aquaculture, ecology of estuaries, limnology, and oceanography.

### 5.3.3 Analysis

The most important international issue in coastal zone management and fisheries is management of the Gulf of Fonseca, which is shared by El Salvador, Honduras and Nicaragua. The three countries have disputed for some time over the boundaries and ownership of some of the islands. It is part of the boundary negotiations between El Salvador and Honduras. These two countries have been negotiating in international courts over the boundaries, which makes management of this area very difficult. However, the situation offers an opportunity for a management agreement as part of the final settlement. A good management plan will benefit the three countries. Fishery resources move freely from one side to the other, and if not managed adequately, they are bound for extinction. No international treaties preserve and protect the Gulf of Fonseca, which Nicaragua and Honduras share.

The quality standards of importing countries have influenced development of the fishing industry in El Salvador, imposing standards on the fishing fleets and product marketing that translate into benefits for locally consumed products.

Salvadoran coastal fisheries have been negatively affected by the lack of policies to protect coastal mangrove forests. Mangrove forests have been reduced to 24 percent of their original size. Because of the military conflict, surveillance of mangroves has been reduced and degradation of mangroves has accelerated to its highest rate in recent history.

Most of the mangrove forests belong to the Ministry of Agriculture and are administered and supervised by CENREN through the National Park and Wildlife Service. Lack of economic resources is hindering effective supervision and control over the commercial exploitation of these woods. Mark Leon Rocher estimated that around 30,000 has. equivalent to 40 percent of the original woods have been destroyed.<sup>1</sup> However, these mangrove remnants are the best conserved woods in the country, although their quality has definitely declined.

Coastal forests are being cut down to obtain firewood and timber. Recreational housing projects along the beaches and estuaries without coastal regulations are invading natural shelters or habitats of marine birds and other marine species. Also they are destroying the remains of mangrove forests.

Due to the absence of conservation policies, watershed deforestation is affecting coastal river outflows, increasing river flooding areas. Freshwater shrimp are being caught through the use of poisonous substances and dynamite in some coastal areas. Crocodiles and alligators have been eliminated from some Salvadoran coastal zones due to overexploitation.

Although reduction of cotton plantation farming has alleviated some pressure on marine species, pesticides and fertilizers from new export crops of cantaloupe, watermelon, and cucumber are again contaminating some coastal areas.

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<sup>1</sup>El Salvador Environmental Profile, 1985.

Research policies have been very limited due to budgetary constraints. Scientific research is required to know the benthic species, plankton, and the actual potential of the Salvadoran submarine platform. Also research should be extended to natural coastal habitats of marine wildlife species and shelters of marine birds.

Minimal equipment and specially trained people should be available to prevent and control oil spills, at least in the Salvadoran ports of Acajutla and El Triunfo.

Sanitation policies have not been expanded to mandate proper treatment of all industrial, municipal sewage effluent and geothermal CEL raw waste before discharge into the ocean. Similarly, no policy prohibits oceanic disposal of domestically produced radioactive and industrial toxic wastes. No provisions prevent oceanic disposal of radioactive and/or industrial toxic wastes from industrialized countries.

Most fish species have dramatically declined in number because of over fishing, illegal trawling while catching shrimp, and the failure to implement fishing regulations. Due to this situation the present Government, through CENDEPESCA of MAG and DIVAGRO of FUSADES, has started developing and implementing programs to improve the fishing industry.

One very controversial policy has been the assignment of fishing licenses. There is no consensus on how many new licenses should be issued, although all the studies indicate there are already too many. The number of licenses increased gradually, and by September 1989 reached a total of 226. There are 166 licenses at present, and about 147 ships in operating condition in El Salvador, although only about 80 ships operate during the year.

The past foreign exchange policy of maintaining an over valued currency contributed to large volumes of unreported offshore sales. This practice reduced the income of the fishing industry as a portion of the benefits were transferred to pirate ships. It also hindered the development of exports of other species that can be produced under confinement. The present Government has revised this policy by equalizing the foreign exchange rate for all products.

This policy has also affected fishing statistics, which do not reflect the unreported sales. Thus, the dimensions of over fishing are probably much higher than estimated.

The overvalued currency also reflects the inadequacy of the budget for controlling fisheries, one problem of budget centralization. This activity generates enough revenue to finance a well-equipped CENDEPESCA, as well as to regulate and develop this sector. It could conduct the necessary research to maintain a sustainable fishing industry.

Actions in other sectors have contributed to the reduction of fisheries resources. Scientific evidence is insufficient to support this conclusion, but it is estimated that the main causes of white shrimp reduction have been contamination by pesticides and destruction of the mangroves. Contamination has declined because production of cotton, the major pesticide user, has been

drastically reduced. Cotton area has gone from 146,000 manzanas in 1979 to about 13,000 this year.<sup>1</sup> Pesticide application rates have also been reduced. On the other hand, destruction of mangroves, the main habitat for reproduction of shrimp and other species, has continued apace.

The destruction of mangroves has also reduced the availability of certain mollusks, such as concha negra (Anadara tuberculosa, Anadara similis, and Anadara grandis), and oysters (Ostrea iriscent).

The policy on fisheries development has not been clearly developed. The five-year economic development plan (1989-1994)<sup>2</sup> indicates that the fisheries objectives are to diversify production and attain a rational use. However, the Government's fisheries policy, set forth in the document, "Política Pesquera," is very ambitious for the present centralized budget system and a fiscal stabilization policy that calls for deficit reduction.

One problem of the General Law of Fisheries Activities has been a conflict over jurisdiction, which originated with creation of the MAG Regional Management Units. It is unclear who is responsible for overseeing the law--the director of CENDEPESPA or the regional manager. The dispute has complicated the resolution of some other conflicts. The Government is studying alternative methods of organization.

One alternative worth studying is the possibility of decentralizing CENDEPESCA so it has its own budget and no transfer of funds from the central Government. Financing for CENDEPESCA could come from revenues generated by yearly auctions of the limited fishing licenses and a fee on fisheries exports. With an adequate budget, CENDEPESCA could develop research and extension programs that would allow the industry to increase productivity, while maintaining a sustainable fishing rate.

Extensive research and extension in aquaculture would foster the development of the industry, which depends less on the natural reproductive capacity of the sea.

#### 5.3.4 Potential Policy Alternatives

- o Issue a coastal protection policy for the country as soon as possible.
- o Put one administrative unit in charge of supervising implementation of the proposed protection policy. Possibly, it could be located in the Navy Department. Meanwhile, key personnel from the Navy, CENDEPESCA, and the Port Authority Executive Commission (CEPA) should be trained in coastal zone

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<sup>1</sup> Anuario de Estadísticas Agropecuarias 1988-1989 MAG, San Salvador, Febrero 1990 and personal interviews.

<sup>2</sup> Ministerio de Planificación y Coordinación del Desarrollo Económico y Social, Plan de Desarrollo Económico y Social 1988-1994. San Salvador, El Salvador: MIPLAN, 1990.

management as soon as possible.

- o Promote an ecological treaty with Honduras and Nicaragua to preserve and protect the Gulf of Fonseca coastal zone. Involve a United Nations' unit such as UNESCO.
- o Adhere to international treaties prohibiting the dumping of radioactive or industrial toxic wastes into El Salvador's territorial waters.
- o Reduce the number of licensed fishing boats. One economical solution to the problem of assigning the limited number of fishing licenses is a public auction. Assignment would be made to the highest bidders.
- o Establish quality control and health control policies.

#### **5.3.5 Recommendations For Future Research and Analysis**

- o Define the research policies to determine actions needed to stimulate the recovery and preservation of the coastal zone.
- o Study funding alternatives for CENDEPESCA to privatize the technology generation and transfer activities of the institution. One alternative could be to establish an export fee on all fishery products to finance the research, extension and control activities of CENDEPESCA.
- o Study the potential for establishing a regionally supported coastal and marine research center.

## 6. CROSS CUTTING ISSUES

Certain issues are common to all or most of the themes addressed in this report. Due to their importance to natural resource policy management in El Salvador, they are treated in greater depth in this separate chapter. These issues include the effects of the war, low educational levels, low income levels, inadequate and centralized budgets, gaps between policy formulation and implementation, policy voids, overlaps in institutional jurisdiction, and conflicts between policies.

### 6.1 The Problem

Conservation of natural resources is often viewed as an issue of preservation and management for future generations. In a country with a 10 year old war, survival is the major concern; it is difficult for anyone to focus on the future. People are afraid to invest, given the possibility of losing everything they care about, even their lives. Destruction of roads, bridges, power stations, buses, cotton mills, factories and other investment stocks happens repeatedly.

The Government itself has been forced to reduce investment in infrastructure and human development, as well as in social programs, due to the need for heavy expenditures to defend a democratic system. An infrastructure sector assessment, conducted by Tech International, Inc. for USAID, identifies a total of \$2.3 billion in infrastructure investment needs through the year 2000.<sup>1</sup> This indicates the present level of infrastructure deterioration. Although the war should be no excuse for the failure to have environmentally sound policies, it is a serious obstacle to policy implementation and controls. Confusion, opportunism, influence peddling, and abuse of authority are all common problems during military conflicts.

On the other hand, the war should provide an additional impetus to the Government and international donors to pay special attention to natural resource policies. The war's negative effect on people's saving habits should justify more generous policies for natural resource conservation than required in peacetime. However, many of these policies and actions require additional resources, which leads to the issue of the inadequate budget for government institutions.

Proper management of natural resources is especially difficult in El Salvador, where the population density puts heavy demands on the environment. This problem is aggravated by the high rate of illiteracy in addition to the low level of education in environmental issues, and widespread poverty.

The issue of budget inadequacy and centralization prevails throughout the Government in El Salvador. In MAG, salaries comprise about 90 percent of the

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<sup>1</sup>Tech International, Inc. et al, "Infrastructure Sector Assessment, Volume I, Summary Report." Draft Final Report. San Salvador, El Salvador: USAID. November 15, 1989. p.1.

budget and fuel, 5 percent, leaving only about 5 percent for operations. The situation is similar in every ministry and decentralized institution. Many qualified technicians have quit the government and others have left the country due to low salaries. Thus, pesticide use, water use and quality, fisheries, and other areas can not be supervised adequately.

Before the armed conflict began in 1979, MAG was well equipped in personnel, physical installations, and operating budgets. Its research capability and results were recognized as among the best in Central America.

With the onset of the armed conflict, the technical level of personnel started to decline, and more of the budget was used to hire unnecessary personnel. Salaries were increased modestly, but not enough to offset double digit inflation, resulting in lower real salaries. Good technicians were replaced by less capable individuals, which crippled institutions. One consequence of this deterioration for MAG has been frequent reorganization over the last decade. The present Government is planning yet another major reorganization.

The Government is going through an adjustment program to put the country back on the path of growth and development. This means a tight fiscal policy to reduce the budget deficit, a difficult proposition even for industrialized nations. With political instability it is difficult to make drastic cuts in personnel, and higher taxes are never popular.

Budget centralization is a common practice in most governments. Congress always wants control over expenditures, and planners want to invest in activities that bring the highest economic return. While congress and politicians usually are motivated by politics, the planning structure is usually dominated by technicians. It is difficult to convince them to invest in natural resources, which usually have a lower economic and social return than competing projects when analyzed with present methodologies. It is difficult to get support to invest in natural resource conservation in a country with so many immediate needs.

Another serious problem that the institutions face is centralization of the budget process and government incomes. For example, the Ministry of Finance determines prices of services offered by CENTA. Soil samples are done without charge, seed certification fees do not cover cost of the service, and plants are sold at subsidized prices. CENTA has insufficient funding to comply with its mandate.

Another common issue is the gap between policy formulation and implementation, a crucial problem in El Salvador. Laws are written with excellent intentions, but implementation leaves much to be desired. The Directorate of Agricultural Defense lacks the personnel to enforce the laws regulating pesticides. The Forestry Service cannot enforce the Forestry Law. CENDEPESCA lacks the resources to enforce the Fisheries Law. In other cases the law's regulations are never written, and implementation becomes difficult due to interpretation problems. Regulations have not been written for either the Forestry Law or the Fisheries Law.

In many instances, the problems of implementation are related to the lack of adequate budget. In other cases, the problem is the Government's lack of political will. Many regulations are difficult to apply in a country undergoing armed conflict.

Policy voids occur in most areas. No specific policies address soil fertility and land use according to soil classes. In pesticide use the country generally follows other countries' standards, although it is in the process of developing its own pesticide standards. There are no set standards on forest management. The commerce of endangered species is not regulated. No information is available on the country's extensive biodiversity, and a coherent set of policies on biodiversity has not been developed. Watershed management is not clearly defined. Coastal zones are not regulated.

The problem of institutional jurisdiction is most severe in the management of critical watersheds. No institutions are in charge of managing an entire watershed, although several institutions use its resources. ANDA uses water for human and industrial consumption, MAG uses water for irrigation, the Ministry of Health is concerned with water quality, and the CEL uses water resources to generate electricity. Even though each institution is a water user, no one takes responsibility for preserving the aquifers, the forest and other components of the watershed. This neglect threatens the permanent water supply. Whenever there is a problem, institutions blame each other or pass the ball to the other players.

Another case of jurisdictional conflict is observed at MAG. The Forestry Law establishes that CENREN is responsible for the forests. After MAG was regionalized, the regional managers assumed the responsibility for forests in their regions. However, in cases that go to court, the law does not recognize them as the authority. As a result of these organizational problems, no one prosecutes the violators. The same is true for CENDEPESCA and the Fisheries Law.

Another major problem is policies that conflict with each other. Some policies conflict due to their inherent nature. For example, defense policy conflicts with development policy. Due to war needs, the army absorbs a large part of the national budget that could be used in development efforts.

Another example of policy conflict is the fiscal policy to reduce inflation and pressure on the foreign exchange rate and the Government's need to invest in development and policy implementation. The coffee export tax conflicts with the objective of increasing coffee production. The policy to provide cheap food for consumers conflicts with the policy increasing incomes of the rural poor and improving income distribution.

## **6.2 Potential Policy Alternatives**

The present Government has a general policy of free open markets. Its philosophy is to let the private sector participate in different functions. This presents an excellent opportunity to privatize many activities and decentralize others.

Agriculture has demonstrated the capacity to pay for its own services at least for the activities that survived the previous government's policies that led to high negative protection coefficients. With the liberalization policies of the present Government, agriculture will receive a fair price, yielding reasonable profits for producers. The profits will not last for long, however, if productivity is not increased and unit costs reduced through research and extension. Without advancement in technology, the country will lose its comparative advantage, resulting in lower living standards.

Likewise, regulating institutions need the resources to effectively control environmental abuse. Otherwise, the entire population will pay higher costs as rivers reduce their flow, water becomes more contaminated, soils get eroded or degraded, shrimp production disappears, and the desertification process takes over.

One alternative to solving some of these problems would be to decentralize institutions that can generate their own resources and give them complete independence by appointing an appropriate board of directors.

Addressing the armed conflict and the education and income problems will take additional efforts and policy changes of society as a whole as well as of the donor institutions. Some policy alternatives are as follows:

- o Reach a peaceful settlement of the present armed conflict and establish a system satisfactory to all parties. This means achieving consensus and compromises among the parties involved and receiving strong assistance from international donors.
- o Invest heavily in development alternatives to provide jobs for people whose present occupation and source of income is the war and who will be demanding jobs once it is over. Without alternatives for these people, serious social disruptions will occur with very negative impacts on the natural resources. The international community could play a significant role by providing investment resources that would create productive jobs while the private sector regains enough trust in the country to invest in productive enterprises.
- o Launch an aggressive education program to reduce the illiteracy rate and educate the population on environmental issues. A good complementary activity would be to use the radio to reach a high percentage of Salvadorans who are illiterate. A parallel program could also be established in the armed forces to train soldiers on environmental issues.

### **6.3 Recommendations For Future Research and Analysis**

- o Study alternative ways to generate resources for the decentralized institutions proposed above. The alternatives could include an export fee or tax for export crops, a sales tax for non-tradable commodities, an import tax or fee for

imported commodities, competitive market rates for services, an auction of restricted licenses to the highest bidder, and high enough fees to cover the cost of regulations, as in the case of pesticides.

## 7. SUMMARY AND CONCLUSIONS

The purpose of a natural resource policy inventory is to examine the wide range of policies and institutions affecting resource use decisions. From the analysis an agenda is developed for more detailed research. Such an agenda assumes several normative conclusions on the part of the analyst. The four problem areas defined in the A.I.D. Central American Natural Resource and Environmental Strategy<sup>1</sup> served as the basis for organizing the natural resource issues in El Salvador. These are sustainable agriculture, forestry, wildlands and biodiversity, and watershed management. These major issues have been used as "themes."

The term "issue" was reserved for the specific problems within these themes. Issues were identified within each of the four major themes. For sustainable agriculture the issues were land use, fertility, land tenure, and pesticide management. In forestry the issues were deforestation, alternative use of forest products, reforestation, and forest management. For wildlands and biodiversity the issues were protection of endangered species, park and reserve management, ecotourism, and biodiversity. For watershed management the issues were watershed management itself, water use, water management, water quality, coastal zone management, and fisheries.

Certain issues were common to all or several of the major themes. These included the combined effects of high population density and low levels of education and income, the armed conflict, budgetary constraints, policy lacunae, gaps between policy formulation and implementation, overlaps in institutional jurisdiction, and conflicting policies.

Policies analyzed within each theme and issue were classified as transnational or regional, macroeconomic, sectoral, and specific. Transnational or regional address Central American regional concerns, or matters beyond the region, as with CITES. Macroeconomic policies address aspects of the entire economy, such as monetary and fiscal policies. Sectoral policies pertain to issues relevant to a sector of the economy, such as health, education, or agriculture. Specific policies focus on a particular issue.

Each policy was analyzed for its impact on natural resources. Even though policies invariably have short-term impacts on certain issues, most policies also have long-term effects on resources. This dichotomy of present versus future benefits presents a serious political and technical dilemma. Politicians face pressures from a population struggling with the effects of extreme poverty, whose basic problem is daily survival. It becomes difficult for Congress to legislate for conservation when it means imposing sacrifices on the poor. On the other hand, technicians face the problem of evaluating the returns of alternative projects that are competing for scarce resources. Unfortunately, present evaluation methodologies seldom consider whether a project depletes or enhances natural resources. The result is a preference for projects and policies

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<sup>1</sup>Agency for International Development/Bureau for Latin American And the Caribbean, Environmental and Natural Resource Management in Central America: A Strategy for A.I.D. Assistance.

that increase the "value added," even if it means a loss to the country's natural resource endowment.

The Government of El Salvador is able to adopt favorable natural resource policies, but it lacks the budgetary resources to invest in conservation projects. Neither does it have the resources required for policy implementation. International donors play a major role in providing technical and financial assistance. An increase in donor assistance would help the Government and the private sector adopt and implement the right policies and investment projects. Policies create the environment for project implementation.

## **7.1 Sustainable Agriculture**

El Salvador has serious problems with all aspects of sustainable agriculture. Land is being used contrary to the recommendations for its use classification, causing serious problems of soil erosion and soil degradation, which reduce soil fertility. Good land is being under-utilized, contributing to the problem of low incomes in rural areas. Due to skewed land distribution before 1980, an agrarian reform process was initiated but it has not achieved the expected results. The poor performance of the reformed sector is not surprising considering the economic policies predominant in the country during the last 10 years. These included currency overvaluation, export taxes, centralized commercialization of major agricultural products, and large budget deficits. Pesticide management leaves much to be desired. High levels of pesticide intoxication are reported by public hospitals. Pesticides banned in other countries are still used in El Salvador. High levels of pesticide residues have been found in milk, as well as in livestock and human tissue. All these problems are the result of misguided policies or failure to apply appropriate policies.

The major policies affecting sustainable agriculture are macroeconomic policies, education, agricultural marketing, credit, land tenure, research, extension, irrigation, and pesticide management.

### **7.1.1 Macroeconomic Policies**

Overvaluation of the colone during the past 10 years has been the economic policy most negatively affecting sustainable agriculture. This provided an implicit subsidy to imports and an implicit tax on exports. An overvalued colone meant producers received less for exported goods, and locally consumed agricultural products cost less. Imports entered the country at a relatively lower price, depressing local prices. Coffee, which was already subject to the coffee export tax, was especially affected by this policy. Farmers took the credits they needed for production, but due to the low prices, their income was insufficient to pay their debts or to increase production. This situation has been particularly hard on the agrarian reform participants, who also have the burden of mortgages from their original land purchases in 1980.

All these factors, in addition to the disruption of the armed conflict, have resulted in serious deterioration of the country's farm areas. The lack of

investment in soil conservation measures and inadequate management of the green cover are among the major causes of the decline.

#### **7.1.2 Education**

The high illiteracy rate is an indicator of the education policy in the country. Illiteracy makes extension training more difficult, because untrained farmers are unable to adopt the modern agricultural techniques needed to maintain soil productivity and produce competitively.

Inadequate education is also a problem for agricultural professionals in the country. Most professionals are trained at the mid-level (agronomist or Perito Agrónomo). They have learned crop production by following a set formula and have too little soil fertility training to manage crop technologies in different settings.

Attempts have been made to design and introduce natural resource awareness to the school curriculum, but no resources have been allocated for teacher training or texts and audiovisual equipment for students.

#### **7.1.3 Agricultural Marketing**

At the sector level, the policy of centralizing agricultural marketing for certain products such as coffee, sugar and cotton, in addition to price controls on other products, magnified the negative impact of the macroeconomic policies. The result was lower farm prices. Investments in the agriculture sector were reduced, and farmers were unable to pay their loans. As stated above, this weakened investment in soil fertility maintenance, proper pruning of coffee trees, and other necessary conservation practices.

#### **7.1.4 Agricultural Credit**

To increase agricultural production, credit was made available to farmers in an unfavorable macroeconomic environment. The resulting low prices translated into low returns on investment. Consequently, farmers were unable to pay back their debts. Present circumstances require a tight money supply, which translates into less credit for agriculture in a highly mortgaged farm sector. Without credit, the level of investment is reduced. With low investments, farms deteriorate, negatively affecting agricultural sustainability.

#### **7.1.5 Land Tenure**

The large and growing population combined with a skewed land distribution has maintained pressure on the use of marginal land for farming despite the agrarian reform of 1980. In the reform, farms larger than 500 has. were expropriated and assigned to agricultural co-ops formed for such purpose. Land renters of less than 7 has. had the opportunity to buy land. Land owners of 245 has. or more were given the option of offering their land for sale.

These land reform operations were done through long term credit to individuals with no capital, so the farms had to be productive enough to pay interest and capital. Forms of credit included land purchase loans as well as production credit. This scheme was unfeasible, given the depressed crop prices farmers were receiving, due to misguided macroeconomic policies. These agrarian reform farmers have been left with a large debt, which they have little chance of repaying. The lack of resources to invest contributes to soil degradation and loss of soil fertility.

A large proportion of the population still lives in the rural areas with each family demanding a piece of land. This puts pressure on the available land, forcing farmers to cultivate steep erodible soils.

Farmers do not invest in the farms because they don't own them. The Government has been slow to assign land titles. Organization into cooperatives deprives farmers of a sense of ownership. The large debt makes them feel that they have no stake in the farm. The fear of losing their lot makes them reluctant to invest in methods that would make this activity sustainable.

#### 7.1.6 Research

Research has been very limited due to the lack of budget resources as well as equipment and qualified personnel. Scientific understanding of sustainable crop production practices for different areas in the country is insufficient. It is impossible to apply the right agricultural practices without such knowledge.

Very little research on pesticide management has been conducted. Little is known of alternative integrated pest management practices for different crops grown in various soil and weather conditions. Similarly, what little research does occur is not shared, so that work on soils, water, and forestry are rarely integrated.

#### 7.1.7 Extension

Besides having no research results to apply, the extension service has been investing its limited resources in too many diverse activities. The proposed new policy of concentrating research activities on agriculture is much more sensible. Extension service personnel need training in sustainable agriculture production practices, so they can transmit them to the farmers.

#### 7.1.8 Irrigation

The irrigation policy has been unorganized. Irrigation management is done by the private as well as the public sector. Good land has been irrigated for pasture production. Farmers at the "front end" of the system use too much water, leaving very little for downstream users. These problems lead to poor returns on irrigation investment, as well as soil erosion due to poor management. Both problems are detrimental to sustainable agriculture. Irrigated land could

be producing higher returns, and erosion could be reduced with proper management.

#### **7.1.9 Pesticide Management**

Several laws regulate pesticide use and commerce. However, the Directorate of Agricultural Defense lacks the budget to apply adequate controls. It has neither the resources to conduct the necessary tests, nor the right policies to obtain the resources. The result is continuing high levels of human intoxication, in addition to the negative long-term effects on sustainable agriculture. The indiscriminate application of pesticides kills natural predators as well as the intended pests, which makes it more costly to apply future integrated pest management practices. The result is an increase in the costs of production. Pesticide residues contaminate the soil and streams, killing the microorganisms that fix soil nutrients, as well as the fishery resources.

#### **7.1.10 Recommended Policy Alternatives**

Several policy alternatives were recommended to create an environment conducive to sustainable agriculture. The most important ones are listed here:

- o Review credit policies to make access easier for agricultural investment.
- o Continue applying the economic adjustment package of the present Government.
- o Eliminate coffee export taxes.
- o Establish a requirement to conduct environmental impact assessments on all projects.
- o Invest more resources in education at the rural level.
- o Design a soil amendment project to subsidize farmers who adopt the recommended practices.
- o Approve the proposed soils law.
- o Review education policies. Improve the literacy rate and incorporate environmental education into the curricula.
- o Make credit available for IPM practices along with pesticide purchases.
- o When pesticide use is required, make available resources for the purchase of adequate handling equipment in the loan program.
- o Eliminate duty-free privileges in the importation of

pesticides to all agencies that have such privileges.

- o Include in every agricultural project a training module on safe pesticide use and alternative pest management techniques.
- o Improve pesticide labeling so an illiterate person can understand safety precautions for applying it.

#### **7.1.11 Recommendations for Future Research and Analysis**

- o Study alternative ways to finance the agricultural research needed to expand the production possibility frontier.
- o Study alternatives for making the extension service more effective.
- o Study the financing system for agriculture to determine alternatives to increasing credit availability for agricultural production.
- o Study the possibility of a land tax.
- o Study the agrarian reform structure. Its economic and social objectives should be reviewed to determine alternatives.
- o Study alternative mechanisms involved in the process of land title transfer to reduce complicated and slow procedures.
- o Study ways to modify the research policy to conduct more IPM research. Focus on extension where technologies exist and on research where research is needed. Design, develop, and implement research with the participation of extension agents and growers.

## **7.2 Forestry**

The issues in forestry were treated as a unit, focusing on deforestation, alternative uses of wood, reforestation, and forest management.

Population pressure has contributed to the rapid depletion of natural forests in El Salvador. This deforestation took place to provide alternative uses of wood (mainly energy), but most significantly, to make room for agricultural production. It has now extended to areas that should be reserved for forest production.

Forest resources are very little understood in El Salvador. Even though forest areas are small, forest resources are rich in varieties of species. Reforestation programs have been very limited, and modern techniques are not used in forest resource management.

The major policies affecting forest resources are education, land tenure, the forestry law, lack of alternative sources of wood, research, and lack of conservation incentives.

#### 7.2.1 Education

Education policy appears again as a major influence on the use and management of natural resources. Education programs do not cover environmental issues. Thus, the population does not understand the interactions of forestry with water production and the ecological balance of the entire eco-system. Forestry has been viewed as an obstacle to expansion of agricultural areas rather than as a valuable resource.

#### 7.2.2 The Forestry Law

Decree 268 of February 8, 1973, the key Forestry Law, is outdated. A regulation has never been written for it. It designates the Forestry Service of CENREN of MAG as the implementing institution. However, after MAG was regionalized, jurisdictional problems arose. The law needs revision to shift the emphasis from sanctions to incentives.

#### 7.2.3 Lack of Alternative Sources of Energy

Firewood continues to be a major source of energy for rural families and agro-industries. Electricity has not reached large areas of the country. The armed conflict has been a major obstacle to the expansion of the present electricity network. Considerable resources are spent replacing lines and equipment sabotaged by the FMLN. Firewood is the only available alternative to the growing demands for energy, a situation that accelerates the rate of deforestation. However, it also presents an opportunity to develop forest plantations to be used as a source of firewood. Multiple-use tree plantations have been one of the priorities of Project MADELEÑA.

#### 7.2.4 Research

Even though El Salvador has many tree species, little is known about their growth in different agro-climatic environments. The lack of knowledge complicates efforts to develop reforestation projects. Neither costs and benefits nor returns of investment can be estimated. One alternative is to extrapolate results from other countries. This is a risky practice for investment alternatives, however, unless the associated country and business risks are considered. Heavy subsidies may be needed to counteract this risk while research is conducted.

#### 7.2.5 Lack of Incentives

Given the lack of knowledge described above, it is no surprise that the

banking system does not assume a lending risk in the agricultural sector. Thus, no credit lines are available for reforestation. There are no subsidy or incentive programs for reforestation. Given the small forest area remaining, social benefits of reforestation are much greater than the private benefits. Thus, agricultural subsidies are needed the activity to compensate for the high private costs associated with the risks involved. Forests are critical to preservation of the aquifers and the ecosystem balance. The benefits for the entire society, not just for the investor who reforests, justify the subsidy.

#### **7.2.6 Potential Policy Alternatives**

- o Establish a national environmental policy, in which the interrelationship of all natural resources is clearly delineated.**
- o Develop an objective and practical national forestry plan that includes a detailed description of the research needed to improve the quantity and quality of this resource.**
- o Carry out reforestation programs for wood production, watershed management, recreation, and other uses as a national priority at the highest level of government.**
- o Establish appropriate long-term, low-interest credits to stimulate reforestation projects throughout the country.**
- o Complement the credit program with additional incentives, such as fiscal deductions and technical assistance, to ensure initial success.**
- o Design an incentive package for investment in reforestation including a subsidy to compensate for social benefits and the risks involved in forestry.**
- o Recentralize the Forest Service with a national, specialized focus.**

#### **7.2.7 Recommendations for Future Research and Analysis**

- o Carry out a detailed economic study that quantifies the direct and indirect benefits of forests and forest products in El Salvador.**
- o Carefully study and monitor species growth and behavior in different, representative sites, as a basis for production and economic projections for planning, credits, and other needs.**
- o Carefully estimate the demand for wood and wood products, both the national market and the international demand, for production purposes.**

- o Measure and monitor the role of forests in water production per unit area, particularly in the Salvadoran highlands.
- o Carefully study financial models that have proved successful in promoting reforestation in other regions of the world and devise an appropriate model for El Salvador.

### **7.3 Wildlands and Biodiversity**

Four issues were identified under wildland and biodiversity: protection of endangered species, biodiversity, park and reserve management, and ecotourism. Due to the size of the country, wildland areas are relatively small. The five most important natural areas are El Imposible (5,000 has.), Montecristo (8,000 has.), Nancuchiname (1,200 has.), Barra de Santiago (2,000 has.), and Los Volcanes (7,000 has.). Only four of these areas have park wardens.

The country's biodiversity includes about 750 species of trees, 500 of birds, 900 of butterflies, and over 800 of marine fish. Little research has been conducted on wildlife, and very little has been published on the country's biodiversity. Basic studies are lacking and no formal education programs on wildlands and biodiversity are included in the school curricula.

The small size of parks and reserves makes it difficult to preserve large species of wild animals. Hunting and fishing are non-regulated activities. Wild animals are sold on city streets. Sales of animals classified as endangered species has reduced their population to very low levels. The list of extinct species is growing rapidly. Protection of natural areas as such is still believed to compete with rather than complement rural and urban development. Ecotourism is very limited. None of the natural areas have infrastructure for formal and open recreational services.

The major policies are the CITES convention, CENDEPESCA's regulations, and regulations lacunae, including lack of control in the commerce of wildlife, lack of regulations for national park management and for hunting and fishing.

#### **7.3.1 The CITES Convention**

In 1987 El Salvador ratified the CITES convention, which has contributed to reducing the international commerce in endangered species. Besides El Salvador's endangered species, species from other countries were exported through El Salvador before ratification of CITES. However, the country has yet to define Appendix 3. In addition, clear uniform procedures are needed for custom officials who frequently encounter problems in interpreting the laws and regulations.

#### **7.3.2 CENDEPESCA's Regulations**

Resolution 265 of 1990 banned the fishing of dolphins, marine turtles,

and lobsters with eggs and those under 20 cms. long. This is a step in the right direction for protecting endangered species. The National Parks and Wildlife Service should adopt similar measures to protect endangered species and define Appendix 3 of CITES. The question of enforcement capabilities remains unanswered. It is doubtful whether CENDEPESCA has sufficient muscle to enforce Resolution 265.

### **7.3.3 Regulation Lacunae**

No laws or regulations cover the commerce of endangered species, hunting and fishing, or parks management, a void that limits the power of authorities to control activities.

The lack of regulations on the commerce of wildlife has led some municipalities, like San Salvador and La Libertad, to establish local controls for their jurisdictions. Without a national law or regulation, the Government lacks the legal instrument to regulate the commerce. This problem is further complicated by the jurisdictional problem created with the decentralization of MAG. NPWS lacks the personnel at the regional level to control wildlife commerce.

A proposed law for the management of national parks and equivalent reserves was drafted in 1980, but did not progress beyond MAG. The lack of regulations makes management of parks and reserves a difficult task. A further need is to define the private sector role in park and reserve management, since the private sector could probably do a better job of managing parks and reserve. Incentives are needed to establish private parks and reserves.

Hunters and fishermen would benefit from laws and regulations to establish hunting and fishing seasons according to the reproduction and growth patterns of the species regulated. This would make the business or sport of hunting and fishing a sustainable activity.

### **7.3.4 Potential Policy Alternatives**

- o Approve a law to protect and manage wildlife, including regulations covering wildlife commerce, hunting, importation, and exportation, and protection and recovery of endangered species.
- o Define the CITES Appendix 3.
- o Establish a mixed private enterprise/government administration for the Museum of National History.
- o Develop economically viable wildlife production programs on both the artisan and the commercial scale.
- o Revise the publications policy to make the information available more accessible to the entire population.

- o Establish a national conservation policy.
- o Transfer management of national parks and reserves to private foundations.
- o Alternatively, return administrative authority to the National Parks and Wildlife Service, together with the necessary funds to provide basic required support.
- o Design a system of incentives for private owners to create parks and reserves.
- o Approve a law for the management of national parks and reserves.
- o Use national parks as effective instruments of environmental education.

#### **7.3.5 Recommendations for Future Research and Analysis**

- o Study alternatives for organizing research efforts to study life cycles and environmental requirements of native plants and animals with identified commercial potential and/or in danger of extinction.
- o Study alternative ways of financing activities to protect endangered species.
- o Complete a satisfactory system for classifying natural areas in El Salvador as a basis for conserving them.
- o Study the economic and social returns of ecotourism in El Salvador.
- o The previous recommendation implies the need for careful studies of distribution, behavior, reproduction, feeding habits, and other basic environmental requirements of most sought-after wildlife (or equivalent traits of natural ecosystems) as a basis for planning trips and promoting ecotourism.

#### **7.4 Watershed Management**

The major watershed management issues are watershed management as such, water use, water management, water quality, coastal zone management, and fisheries. The country has 590 rivers and streams and is covered by 17 major watersheds, some of which are shared with neighboring countries. For management purposes, the country is divided into 10 hydrographic regions.

Watersheds are not managed as units. Several institutions use part of the watershed resources, but no one oversees the entire system. Water quality is low, and management of water resources is inadequate. This causes problems of unfair distribution among users, wastes, and severe water erosion. Coastal zones are being destroyed and contaminated. Fisheries are being over-exploited. The number of shrimp-catching ships exceeds the recommendation for sustainable production. Mainland fisheries development is at a very early stage.

The major policies affecting watershed management are inadequate agreements with neighboring countries on managing common watersheds, inadequate and old water laws and regulations, inadequate management of water resources, and inadequate fisheries regulations.

#### **7.4.1 International Bilateral Agreements**

The Lempa, El Salvador's major river, and some of its tributaries originate in Honduras. Other watersheds are shared with Guatemala. Existing treaties are very limited and offer little protection for El Salvador. Thus, bilateral agreements are an area of utmost importance for the country.

Special attention should be placed on the Gulf of Fonseca, which is a resource shared by three countries and has been in dispute for many years. Negotiations underway in the international courts should include a management plan for the future that would encourage sustainable use of the gulf and avoid future disputes.

#### **7.4.2 Water Laws and Regulations**

The many laws and regulations covering the use and management of water have been the subject of extensive studies and seminars. They have been revised and analyzed. One product of the analysis was a draft of a new law on irrigation and drainage to be submitted to congress.

#### **7.4.3 Management of Water Resources**

Poor management by both the private and the public sectors results in poor water quality, as well as misuse and waste of water resources. Policies are needed to improve the management of water resources, addressing these problems. ANDA plays an essential role in this area, and its pricing and management policies need special attention.

#### **7.4.4 Fisheries Regulations**

The general law of fishery activities, approved in 1981, has no regulation as yet, which gives rise to discrepancies and differences in interpretation. The law currently has jurisdictional problems, since MAG was decentralized after it was approved. The law designates CENDEPESCA as the responsible institution but with decentralization, the regional offices were

assigned responsibilities for supervising the region. This created a conflict between CENDEPESCA and the regional offices, complicating application of the law.

#### **7.4.5 Potential Policy Alternatives**

- o Use the Central America Agreement for the Protection of the Environment to develop actions and programs to better manage the watersheds whose areas cover more than one country.**
- o Revise the treaties with Guatemala and Honduras to define common management of the watersheds and waterways common to more than one nation.**
- o Design a policy on integrated watershed management.**
- o Approve the proposed irrigation and drainage law.**
- o Look at water use alternatives as a way to reach the optimum for the entire system, not just specific sectors.**
- o Design a policy to stimulate and regulate the multiple uses of lakes created by hydroelectric dams.**
- o Design a policy to conserve and protect superficial and underground water sources.**
- o Develop a policy to protect and conserve water sources for human consumption.**
- o Develop a policy to control and use rainwater in critical watersheds.**
- o Develop a policy on the management of rainwater in urban areas. This management must be integrated into watershed management as uncontrolled drainage causes the largest alterations of natural watersheds.**
- o Establish uniform water quality standards for the entire country.**
- o Review the water quality testing policy and investment procedures to provide testing laboratories for the three regions of the country: West, Central, and East.**
- o Review the sanctions system to make it practical in its applications.**
- o Review ANDA's water fees to include financing of municipal wastewater treatment plants.**
- o Review irrigation fees to include water quality and**

**maintenance financing.**

- o Issue a coastal zone protection policy for the country as soon as possible.**
- o Define the research policies to determine actions needed to stimulate the recovery and preservation of the coastal zone.**
- o Establish a single centralized administrative unit to be in charge of supervising the implementation of the proposed protection policy.**
- o Promote an ecological treaty with Honduras and Nicaragua to preserve and protect the Gulf of Fonseca's coastal zone.**
- o Adhere to international treaties prohibiting the dumping of radioactive or industrial toxic wastes into territorial waters.**
- o Reduce the number of licensed fishing boats.**
- o Establish quality control and health control policies.**

#### **7.4.6 Recommendations for Future Research and Analysis**

- o Study alternative organizational schemes for managing the country's major watersheds.**
- o Study alternative ways of organizing to assure adequate coordination among institutions using water for different purposes.**
- o Study alternatives for centralizing water quality control in a single unit.**
- o Study policies on standards to systematically test the water quality of rivers, lakes, lagoons, underground sources, and the coastal zones.**
- o Study funding alternatives for privatizing the technology generation and transfer functions of CENDEPESCA.**
- o Study the potential for establishing a regionally supported coastal and marine research center.**

#### **7.5 Cross Cutting Issues**

**Certain issues were common to all or several of the major themes, including the effects of the war, the combined effect of low levels of education**

and income and a growing population, inadequate and centralized budgets, gaps between policy formulation and implementation, policy voids, overlaps in institutional jurisdiction, and conflicting policies.

In a country with a 10 year old war, it is difficult to think of the future; survival is the present worry. People are afraid to invest given the eventuality of losing everything, including their own lives. The widescale destruction of roads, bridges, power stations, buses, cotton mills, factories and other investment stocks continues unabated. In a war situation people become reluctant to invest in the future, and El Salvador has been no exception. The Government has been forced to reduce investment in infrastructure and human development, as well as in social programs. Confusion, opportunism, influence peddling, and abuse of authority are all common problems in situations of military conflict.

Proper management of natural resources becomes especially difficult in El Salvador, where the high population density puts heavy demands on natural resources. This problem is aggravated by the high rate of illiteracy and the low level of knowledge on environmental issues.

Inadequate and centralized budgets are an issue throughout the Government in El Salvador. In MAG, salaries comprise about 90 percent of the budget and fuel uses another 5 percent, leaving only about 5 percent for operations. The same problem applies to every ministry and decentralized institution. Good technicians have quit the Government, and others have left the country due to low salaries. Thus, supervision of pesticide use, water use, water quality, fisheries, and other areas cannot be adequately carried out.

Another cross cutting issue is the gap between policy formulation and implementation, a crucial problem in El Salvador. Laws are written with excellent intentions, but implementation leaves much to be desired. The Directorate of Agricultural Defense lacks the personnel to enforce the laws regulating pesticides. The Forestry Service is unable to enforce the Forestry Law. CENDEPESCA lacks the resources to enforce the Fisheries Law. In other cases the law's regulations are never written and implementation becomes difficult due to interpretation problems. Regulations have not been written for the Forestry Law or the Fisheries Law.

The limited implementation is frequently related to the previous issue, lack of adequate budget. In other instances it is the Government's lack of political will. On the other hand, many regulations are difficult to apply in a country undergoing armed conflict.

Policy voids are observed in most areas. There are no specific policies on soil fertility and land use according to soil classes. In pesticide use, El Salvador tends to follow other countries' standards, although it is in the process of developing its own pesticide standards. There are no set standards on forest management. Commerce in endangered species is not regulated. Knowledge of the country's biodiversity is lacking. A coherent set of policies on biodiversity has not been developed. Watershed management is not clearly defined. Coastal zones are not regulated.

The problem of institutional jurisdiction is most severe in the management of critical watersheds. No institution has responsibility over watersheds as a whole, although several institutions use watershed resources. Severe jurisdictional conflict is also an issue at MAG.

Policy conflicts constitute another major problem. Coordination in the pursuit of common goals should be stressed.

#### **7.5.1 Potential Policy Alternatives**

- o Decentralize institutions that can generate their own resources and give them complete independence. Appoint a good board of directors and develop policies that will assure success.
- o Invest heavily in development alternatives to provide jobs for people whose current occupation and source of income is the war.
- o Launch an aggressive literacy program and educate the population on environmental issues.

#### **7.5.2 Recommendations For Future Research and Analysis**

- o Study alternatives for generating resources for the decentralized institutions proposed above.

## **APPENDIX A**

### **USAID/ROCAP RENARM PROJECT NATURAL RESOURCE POLICY INVENTORY IN EL SALVADOR**

#### **SCOPE OF WORK**

A Policy Inventory for Natural Resources will be conducted for USAID/ROCAP in cooperation with USAID/San Salvador by a team under the auspices of the USAID/S&T Agricultural Policy Analysis Project, Phase II (APAP II) over a four weeks period starting on June 18, 1990.

The Policy Inventory will identify policies and regulations that affect the natural resource base in El Salvador. The natural resource issues which will be emphasized in the Inventory concern:

- 1. Sustainable agriculture issues including land utilization, land tenure, soil fertility and pesticide use.**
- 2. Production from natural forest issues including deforestation, energy source, reforestation and forest management.**
- 3. Wildlands and biodiversity issues including endangered species protection, park and reserve management as well as other biodiversity and resource use interdependencies.**
- 4. Watershed management issues including water use, energy source, fisheries, water quality and water management.**

The inventory is designed to serve as the basis for in depth policy analysis and to facilitate policy dialogue concerning natural resources in El Salvador.

There are four major components to conducting the Policy Inventory:

- 1. Identification of policies and regulations of both public and private institutions at the regional, macroeconomic, sector and subsector level which affect the natural resource base. The main objective(s) of the respective policies and regulations will be stated.**
- 2. Identifications of the public and private institutions which make or implement the respective policies and regulations stated in (1).**
- 3. A preliminary qualitative assessment of the impact of these policies and regulations on each of the natural resources.**
- 4. Identification of the main policy alternatives and factors affecting possible policy reform.**

## APPENDIX B

### GUIDELINES FOR CONDUCTING A NATURAL RESOURCE POLICY INVENTORY <sup>1</sup>

**B.1 Introduction.** A policy inventory is a tool developed by the APAP as an aid to decision-makers. The inventory consists of (1) a list of major policies affecting the natural resources and (2) a preliminary assessment of their impact on key natural resources. In addition, the inventory comprises a catalog of government and private agencies responsible for policy implementation and specifies policy alternatives.

The policy inventory is a highly flexible tool. It can be scaled upward or downward, depending on the needs of the particular country or agency, the availability of information, and access to analytic resources for the inventory.

This annex presents some guidelines for conducting a natural resource policy inventory in El Salvador. It was developed with the intention of providing a common language and focus for all the members of the team.

**B.2 Causes of Environmental Degradation.** The causes of environmental degradation and depletion of natural resources can usually be grouped into:

1. Population pressures.
2. Market failure.
3. Policy failures.

The most important market failures affecting resource use and management are usually the following:

1. Ill-defined or totally absent property rights.
2. Unpriced resources and absent or thin markets.
3. External diseconomy caused by an inability to assess individuals and enterprises for all the costs which their activities impose on society.
4. Public goods that cannot and/or should not be provided by the private sector through the market.
5. Lack of competition in the form of monopolies, oligopolies or segmented markets.

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<sup>1</sup> This annex uses the concepts developed in Jennifer Bremer-Fox, Samir Zaman, John Tilney and Leroy Quance, "The Agricultural Policy Inventory - A Tool For Setting Priorities for Analysis and Dialogue," APAP STAFF PAPER NO. 24. Washington, D.C.: Abt Associates Inc., August 1988. These concepts are then adapted to natural resource policy.

6. Myopia in the sense of "too short" planning horizons or "too high" discount rates, arising from poverty, impatience, and risk or uncertainty which affect individuals but not society as a whole.

7. Irreversibility. This is when market decisions under uncertainty lead to irreversible results.

Growing pressures to convert forests to other uses is leading to soil degradation and decertification, declining water quality, rising costs of hydropower and irrigation, and loss of valuable non-wood products and services of forests.

**B.3 Evaluation of Policy Impacts.** Policy interventions are intended to improve welfare in the agricultural sector, the economy as a whole, or for particular segments of society such as consumers, producers, or both. However, since policies distort markets, they inevitably impose costs, both in terms of resource reallocation and distributional effects. Policies and programs also involve financial costs which are generally associated with policy implementation and administration. Further, costs and benefits generally accrue to different socioeconomic groups.

In the past, very little attention was placed on the impact of policies on natural resource depletion or degradation. Objectives of the policies were concentrated on the goals stated above. This has led to regional, macro, sectoral and sub-sectoral level policies that inadvertently have had a negative impact on the natural resources.

A central objective of policy ought to be correcting, or at least reducing the adverse impact of market failures. While governments do sometimes act in this way, at other times their actions are perverse, thereby exacerbating the effects of a market failure or creating a policy milieu in which the free play of market forces leads to environmental degradation and resource depletion. Examples of policy failure include subsidies on capital, pesticides use and irrigation water. Also, failure to issue secure land titles, interest rate ceilings, failure to accommodate customary rights of communities to use and manage resources, tax regimes and provision of free (or cheap) services and infrastructures which underwrite the conversion of tropical forests are other examples of policy failure.

The areas of impact will vary from country to country according to the priority areas identified by the client. In the case of El Salvador, the Scope of Work (Annex A) identifies the following areas: (1) sustainable agriculture; (2) production from natural forests; (3) wildlands and biological diversity; and (4) watershed management.

The first step in a qualitative analysis of impacts is to list the relevant policies.

The next step is a more detailed evaluation of each policy. The types of questions of interest are the following:

1. a. How effective is the policy in meeting the objective?
  - b. If the policy is not effective, is it due to implementation problems? Or are there other (institutional) problems?
  - c. Is the selected policy at fault? In other words, is this an appropriate policy given the objective?
2. a. What are the benefits and costs of the policy?
  - b. How are the benefits and costs distributed?
  - c. Do the costs outweigh the benefits or vice versa?
3. a. Are there unintended consequences?
  - b. Do the unintended consequences improve the natural resources.
  - c. How are the benefits and costs of the unintended consequences distributed?

**B.4 Identification of Institutions.** For each policy identified, it is important to determine the implementing agency or agencies and the division of authority and responsibility between them. Then it is necessary to determine whether the implementing agencies are provided adequate financial and staff resources to be effective. The capabilities, training, and efficiency of agency personnel are also significant factors in effective policy implementation. In conducting the inventory, the following questions should be asked:

1. What institutions are involved in implementation of current policy? Can they play a constructive role in policy reform? Alternatively, are there local management options which would be more effective? What incentives would be required?
2. What role should national governmental institutions play?
3. How can NGOs, think tanks, academic institutions, the private sector, and international donors be helpful?

**B.5 Identification of Alternatives.** Once the analyst has determined that a policy or set of policies ought to be reformed, it is useful to provide the policy makers and donor with a set of recommendations for alternative courses of action.

The analyst may decide that a particular issue or set of issues requires additional research and analysis. Some issues may be too complex or sufficient data may not be available during the course of a policy inventory for the analyst to decide whether or not the policy should be changed. In this case, the analyst can provide a useful service by identifying issues that need further

investigation and analysis. The analyst can also make suggestions as to the most useful analysis for further decision-making. In the process of determining these alternatives, the analyst should consider the government's overall objectives and use the following questions to guide his or her thinking:

1. Is this an appropriate set of objectives given current conditions in the macro-economy and the natural resource base?

2. Do the stated objectives "match" the objectives as "revealed" by the government's actions in implementing natural resource policies?

3. Can the objectives be met by natural resource policies?

The analyst may suggest that the policy or set of policies should be rescinded. Such a drastic solution should be offered only if it is determined that the cost of continuing the policy in economic, financial, political or other terms is not sustainable. It is necessary for the analyst to support this recommendations with strong evidence.

A second alternative is to suggest that the policy should be continued with modifications. This would be a solution if a policy was considered basically sound, the benefits outweighed the costs, and the distribution costs were socially and politically acceptable but there were implementation problems. This recommendation should be accompanied by suggestions for alternative courses of action to solve the implementation problems.

The third alternative is for the analyst to suggest that a policy be replaced by other, more appropriate policies. In many cases, a selection of alternatives is available to meet a policy goal.

When the policy inventory information set is complete, it should be carefully reviewed for completeness, consistency and accuracy.

## **APPENDIX C**

### **INTERVIEWS CONDUCTED AND POTENTIAL CONTACTS FOR FURTHER RESEARCH**

**Adolfo Flores Arias - Credit Manager, ISTA**  
**Ana Luz Mena - USAID/Agriculture**  
**Angel Vaquero - MAG/Directorate of Agricultural Economics**  
**Antonio Cabrales - Minister of Agriculture, MAG**  
**Boanerges Villagrán - Chief, Forestry and Fauna Service, CENREN, MAG**  
**Carlos Bendesul - FAO**  
**Carlos Marino Garcia - MAG/CENTA/Seed Certification**  
**Carlos Roberto Hasbún - Director, National Zoo**  
**Clemence Weber - USAID/Agriculture**  
**Dinora Yamagishi - Planning Department, FINATA**  
**Ernesto López Zepeda - Chief, Biology Department, University of El Salvador**  
**Ernesto Soto Gomez - Banco Salvadoreño**  
**Ever Anaya - MAG/CENTA**  
**Francisco Banegas - MAG/Directorate of Agricultural Economics**  
**Francisco Guido - Planning Department, ISTA**  
**Francisco Molina - USAID/EPA**  
**Gonzalo Martinez - Director, General Directorate of Irrigation and Drainage, MAG**  
**Hugo Huevo - Chief, Turicentros and National Parks Department, ISTU**  
**Hugo Zambrana - Director, MADELEÑA Project, CATIE/CENREN**  
**Jorge Garcia - Advisor, Forestry and Fauna Service, CENREN, MAG**  
**José E. Mixco Sol - Deputy General Manager, ISTU**  
**José Rosa Moreno - Chief, Planning Office, Genral Directorate of Irrigation and Drainage, MAG.**

**José Roberto Duarte - Salvadoran Ecological Foundation**

**José Roberto Ochoa - ANDA**

**José Luis Rodríguez - MAG/CENREH**

**Juan Marco Alvarez - Salvadoran Ecological Foundation**

**Manuel Ponce - Agro-forestry Support Project for Low Income Communities, FAO,  
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**Maria Teresa de Reyes - MAG/Directorate of Agricultural Defense**

**Marino Molina - FUSADES/DIVAGRO**

**Marisol de Toledo - MAG/Office of the Minister**

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**Ricardo Barahona - UCA**

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**Rodolfo Cristales - USAID/Agriculture**

**Rutilio Díaz, Legal Advisor - CENDEPSCA**

**Salvador Urrutia - Director PERA**

**Saul Contreras - MAG/Directorate of Agricultural Defense**

**Zulma de Mendoza - Director, National Patrimony, Education Ministry**

## APPENDIX D

### REFERENCES

- Asociación de Productores de Leche de El Salvador, "Diagnostico y Planteamiento de Políticas para el Rescate de la Ganadería de Leche en El Salvador". San Salvador, El Salvador: Asociación de Productores de Leche de El Salvador, Abril 1990.
- Asociación Demográfica Salvadoreña y Centro de Control de Enfermedades, Encuesta Nacional de Salud Familiar, FESAL-88 El Salvador. San Salvador, El Salvador: Asociación Demográfica Salvadoreña y Centro de Control de Enfermedades, Marzo 1989.
- Banco Central de Reserva de El Salvador, "Presupuesto Monetario 1990". San Salvador, El Salvador: Banco Central de Reserva de El Salvador, 1990.
- Banco de Fomento Agropecuario, "Memoria de Labores 1989". Nueva San Salvador, El Salvador: Banco de Fomento Agropecuario, Febrero 1990.
- Banco Interamericano de Desarrollo, "Informe Económico, El Salvador". Washington, D.C.: BID, Octubre 1984.
- Benítez Arias, Manuel, "Estrategias Para el Desarrollo Ecológico Nacional de El Salvador." San Salvador, El Salvador: Centro de Investigaciones Tecnológicas y Científicas.
- Comisión Ejecutiva Hidroeléctrica del Río Lempa (CEL), "Primer Plan Nacional de Desarrollo Energético Integrado 1988-2000." San Salvador, El Salvador: CEL, 1987.
- Centro de Desarrollo Pesquero, "Anuario Pesquero 1989." San Salvador, El Salvador: MAG, CENDEPESCA, 1990.
- Centro de Desarrollo Pesquero, "Política Pesquera." San Salvador, El Salvador: MAG, CENDEPESCA, junio 1990.
- Consortium for International Crop Protection, "An Environmental Assessment of Pest Management Practices and Pesticide Use in El Salvador". Maryland: Consortium for International Crop Protection, January 5, 1989.
- Daugherty, Howard E., "Man-Induced Ecological Change in El Salvador." Ph.D. Dissertation University of California. Los Angeles, California, 1969.
- Daugherty, Howard E., and Daniel Sherrill, "National Strategy for Natural Resource Management - Preliminary Design." San Salvador, El Salvador: USAID, September 1989.
- Deras Cortez, J. et al., "Zonificación Agroclimática para el Cultivo de el Café en la Zona Occidental de El Salvador." Tesis Universidad de el

- Salvador. San Salvador, El Salvador: Universidad de El Salvador, 1989.
- Dirección General de Economía Agropecuaria, Anuario de Estadísticas Agropecuarias 1988-1989. San Salvador, El Salvador: Ministerio de Agricultura y Ganadería, 1989.
- Fernández, D.A., y Parejo G., J., Aspecto Económicos de la Meteorología. Madrid, España: Instituto Nacional de Meteorología, 1984.
- Flores, R.D., "Disponibilidad de Humedad en el suelo por medio del Método del Balance Hídrico." Publicación Técnica #30. Servicio Meteorológico. San Salvador, El Salvador, 1985.
- Foy, George and Herman Daly, "Allocation, Distribution and Scale as Determinants of Environmental Degradation: Case Studies of Haiti, El Salvador, and Costa Rica". Washington, D.C.: The World Bank, September 1989.
- Fundación Salvadoreña para el Desarrollo Económico y Social, "Memoria de Labores 1989". San Salvador, El Salvador: FUSADES, 1990.
- Guerra y Guerra, Hugo, "Ecological Crisis in El Salvador. A National Challenge". Paper presented at Duke University, Durham, North Carolina, May 1990.
- Guevara Moran, Joaquin Alonso y otros, El Salvador, Perfil Ambiental, Estudio de Campo. San Salvador, El Salvador: EMTECSA de C.V., USAID, April 1985.
- Guzmán, G.T., "La Canícula Interestival en El Salvador." Turrialba, Costa Rica: CATIE, 1979.
- Guzmán, G.T.: "Estación Básica de Contaminación Ambiental en el Cerro Verde, El Salvador." Primeros Resultados. San Salvador, El Salvador: Servicio Meteorológico, 1979.
- Hansen, Stein, "Debt for Nature Swaps: Overview and Discussion of Key Issues". Washington, D.C.: The World Bank, February 1988.
- Hargreaves, G., "La Canícula en El Salvador." San Salvador, El Salvador: FUSADES, 1988.
- Kushalappa C., "Un Sistema de Previsión de Roya del Cafeto y su Empleo en la Selección de Epoca de Aplicación de Fungicidas." Traducción ISIC.
- Kushalappa C. et al., "Ferrugem do Cafeeiro: Avaliacao de Progósticos Simples e Complexo, Para Escolher as Epocas de Aplicacao de Fungicida." XI Congresso Brasileiro de Pesquisas Cafeeiras.
- Larios, J. Editor, "Agricultura en Zonas Afectadas por Canícula Interestival en El Salvador." San Salvador, El Salvador: CATIE-CENTA, 1982.

- Lemus Serrano, F. "Planificación de los Recursos Naturales Para el Aprovechamiento Racional Múltiple de los Recursos Hidráulicos en El Salvador." San Salvador, El Salvador: Dirección General de Recursos Naturales, MAG, 1973.**
- Leonard, Jeffrey H., Natural Resources and Economic Development in Central America: A Regional Environmental Profile. Washington, D.C.: International Institute for Environment and Development, 1987.**
- Madrid Cerna, Emilio, "Principios Básicos Programa Nacional, Investigación - Extensión Agrícola, Proposición Nuevo CENTA." San Salvador, El Salvador: CENTA, Junio 1990.**
- Martinez Cruz, Ana Carolina, "Situación Ecológica en El Salvador y Alternativas de Solución." Monograph, August 1989.**
- McArthur, R.H., E. Q. Wilson, The Theory of Island Biogeography. Princeton, N.J.: Princeton University Press, 1967.**
- McReynolds, Samuel A., Thomas M. Johnston, Peter H. Gore and Joe D. Francis, "The 1989 El Salvador Agricultural Land Use and Land Tenure Study." Washington, D. C.: National Cooperative Business Center, November 1989.**
- Mijers, N. A Wealth of Wild Species: Storehouse for Human Welfare. Boulder, Colorado: Westview Press, 1984.**
- Ministerio de Agricultura y Ganadería, "Documento del Proyecto: Agrometeorología Como Ayuda a la Producción de Alimentos (1983 y 1987)." San Salvador, El Salvador: MAG.**
- Ministerio de Agricultura y Ganadería, "Diagnostico del Centro de Tecnología Agrícola." San Andrés: Centro de Tecnología Agrícola, Enero 1990.**
- Ministerio de Agricultura y Ganadería, "Lineamientos Basicos para el Mejoramiento del Sistema Nacional de Investigación". San Salvador, El Salvador: MAG, Mayo 1990.**
- Ministerio de Agricultura y Ganadería, "Manual de Organización General del Ministerio de Agricultura y Ganadería". San Salvador, El Salvador: Oficina Sectorial de Planificación Agropecuaria, Marzo 1990.**
- Ministerio de Agricultura y Ganadería, Políticas Generales y Específicas del Sector Público Agropecuario. San Salvador, El Salvador: Oficina Sectorial de Planificación Agropecuaria, Mayo 1988.**
- Ministerio de Agricultura y Ganadería, "Política Nacional de Riego." Soyapango, El Salvador: Dirección General de Riego y Drenaje, 1990.**
- Ministerio de Planificación y Coordinación del Desarrollo Económico y Social, Plan de Desarrollo Económico y Social 1989-1994. San Salvador, El Salvador: Ministerio de Planificación y Coordinación del Desarrollo**

**Economico y Social.**

- Murillo S., R. et al, "Zonificación Agroclimática de los Cultivos de Soya, Maní y Melón en las Areas Algodoneras de las Regiones Paracentral y Oriental de El Salvador." Tesis Universidad Evangélica de El Salvador. San Salvador, 1989.**
- Nathan Robert R. Associates, Inc., "An Inventory of Policies Affecting Agriculture in El Salvador". San Salvador, El Salvador: USAID\El Salvador, August 1984.**
- Norton Roger D. and Mercedes Llort, "Una Estrategia Para la Reactivación del Sector Agropecuario en El Salvador." San Salvador, El Salvador: Fundación Salvadoreña para el Desarrollo Económico y Social, Octubre 1989.**
- Norton Roger D. and Mirna Liévano, "Food Imports, Agricultural Policies and Agricultural Development in El Salvador, 1960-1987." Washington, D.C.: Robert R. Nathan Associates, June 1988.**
- Oficina Especializada del Agua (OEDA), "Diagnóstico de la Situación Jurídica Sobre el Riego en El Salvador." San Salvador, El Salvador: MAG, Marzo 1989.**
- Oficina Sectorial de Planificación Agropecuaria, "Plan Quinquenal de Desarrollo Agrario y Pesquero." San Salvador, El Salvador: MAG, 1985.**
- PNUD/GOES, "Plan Maestro de los Recursos Hídricos en El Salvador." San Salvador, El Salvador: PNUD/GOES, 1982.**
- Proyecto Planificación y Evaluación de la Reforma Agraria, (PERA), "VIII Evaluación del Proceso de Reforma Agraria." San Salvador, El Salvador: Oficina Sectorial de Planificación Agropecuaria, Ministerio de Agricultura y Ganadería, Septiembre 1989.**
- Saravia, L.A., "Condiciones Meteorológicas que intervienen en el Desarrollo de los Tizones del Tomate." Publicación Técnica #21. San Salvador, El Salvador: Servicio Meteorológico, 1980.**
- Servicio Forestal "Anuario Forestal." El Salvador: Ministerio de Agricultura. Dirección General de Recursos Naturales Renovables, Servicio Forestal y de Fauna, 1982.**
- Serrano Caceres, Rafael Antonio, "El Problema Legal del Medio Ambiente en El Salvador y Posibles Soluciones." San Salvador, El Salvador: Centro de Investigaciones Tecnológicas y Científicas.**
- Serrano, Francisco, Supervivencia o Extinción; el Dilema de Nuestra Fauna. San Salvador, El Salvador: Impresos Litográficos de Centro América, 1978.**
- Serrano, Francisco, "Estudio Básico Para el Desarrollo de un Parque Zoológico en Especies Nativas." Unpublished. San Salvador, El Salvador, 1977.**

- The World Bank, **El Salvador: Country Economic Memorandum**, August 14, 1989. Washington, D.C.: The World Bank, 1989.
- The World Bank, "Trends in Developing Economies 1989." Monograph. Washington, D.C.: The World Bank, 1990.
- The World Bank, "World Development Report 1989." Monograph. Washington, D.C.: The World Bank, 1990.
- United Nations, **Informe Anual 1987**. Nairobi: Programa de las Naciones Unidas para el Medio Ambiente, 1988.
- USAID/EL SALVADOR, "Environment and Resource Conservation in El Salvador." Monograph. San Salvador, El Salvador: USAID.
- USAID/EL SALVADOR, "Environmental and Natural Resource Management in El Salvador." Annex.
- Wilson, E. O., F. M. Peter, **Biodiversity**. Washington, D. C.: National Academy Press, 1988.
- Wise Michael L., "Agrarian Reform in El Salvador, Process and Progress". San Salvador, El Salvador: USAID\El Salvador, September, 1986.
- World Meteorological Organization, "Meteorological Aspects of Certain Processes Affecting Soil Degradation-Especially Erosion." Technical Note No. 178. Geneva, Switzerland, 1983.
- World Meteorological Organization, "CagM Report No. 31 Part III: Crop Protection Models." Geneva, Switzerland, (1988).