AGRICULTURAL POLICY ANALYSIS PROJECT, PHASE II

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1. INTRODUCTION

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 "policy areas" defined in the Scope of Work serve as the inventory's basis for organizing the natural resource issues in the DR. The areas are watershed management, forestry, wildlands and biodiversity, and sustainable agriculture. These major areas have been used as "themes."

Policy issues were identified within each of the four major themes. For watershed management the issues were inadequate watershed management, ineffective water use planning, poor water quality regulation, and contamination of the coastal zone and fisheries. In forestry the issues included deforestation, limited reforestation, and inadequate forest management. For wildlands and biodiversity the issues were inadequate protection of endangered species, limited park and reserve management, inattention to ecotourism potential, and diminishing biodiversity. In the area of sustainable agriculture, the issues were land use planning, declining soil fertility, conflicting land tenure arrangements, and effective pesticide management.

Certain issues are common to all or several of the major themes. These include: the combined effects of high population density and low levels of education and income, conflicting policies, budgetary constraints, and gaps between policy formulation and implementation, overlaps in institutional jurisdiction and the lack of institutional development, conflicting institutional objectives, tolerance for corruption, overcentralization, and inadequate basic information on natural resources.

The policy inventory has four major tasks:

1. To identify policies and regulations of both public and private institutions at regional, macroeconomic, sector and sub-sector levels that affect the natural resource base;

2. To identify the public and private institutions that make or implement the respective policies and regulations;

3. To conduct a preliminary qualitative assessment of the impact of these policies and regulations on each natural resource; and

4. To discern the main policy alternatives and factors affecting possible policy reform.

Natural resource depletion in the DR is largely the result of inappropriate policies combined with the effects of population pressure and poor management. In economic terms, private costs for this depletion have been less than the overall cost to society. Policies must be adopted to equate private and social costs.

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An environmental consciousness should be developed in relation to virtually every policy decision. Too much attention has been focused on development efforts without careful consideration of 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 the DR's policy climate as a basis for recommending actions, measures, and research ideas that will induce the population to better utilize its natural resource endowment.

This study has been conducted under a buy-in of USAID/Santo Domingo to the Agricultural Policy Analysis Project (APAP II). The field work was performed from July 1 to August 4, 1992. USAID/Santo Domingo also provided guidance on the scope and orientation of the work.

Similar studies have been conducted in Guatemala, Honduras, Belize, El Salvador and Costa Rica. 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 practices. The study treats both kinds of policies, according to their impact on natural resources.

The DR population has grown from 3.2 million people in 1960 to about 7.5 million in 1992. This results in an average density of 154 persons per square kilometer. Population growth rates have dropped from 2.9 percent in 1960 to an estimated two percent in 1992. The structure of the population has also shifted from rural to urban. The population was 70 percent rural in 1960, and is now 40 percent. However, there is still a larger number of people in the rural areas putting a greater pressure on the natural resources. Rural population has increased from 2.2 million people in 1960 to three million in 1992 (World Bank, 1992a. p. 61).

The DR experienced a healthy trend of economic growth in the 70's as the effects of an import substitution policy favorably impacted the economy, and the prices of major agricultural exports (mainly sugar) were favorable. Real growth rates in GDP ranged from 12.9 percent in 1973 to two percent in 1978. However, when this model of import substitution eventually began to reach its limits, a new development model was designed based on export promotion and the development of non-traditional agroindustry and tourism. GDP grew faster than population through 1981, but started to decline in 1982. GDP per capita was RD$346 of 1970 pesos in 1970, increased to RD$510 of 1970 pesos in 1980, and decreased to RD$483 in 1990 (World Bank, 1992a. p.65).

GNP grew at an average annual rate of eight percent from 1965 to 1980, dropping to an average of 2.1 percent from 1980 to 1990. GNP per capita was estimated at US$830 in 1990,

making the DR the fourth poorest country in the Americas and the Caribbean (World Bank, 1992b. p. 218, 220).

The Government in 1990 adopted an economic policy package that has achieved greater stability. Improvements include the reduction of the Government deficit from 6.9 percent of GDP in 1988 to a surplus in 1991, the alignment of the exchange rate with market forces, and the modification of import tariffs to reduce the range. Also, new and beneficial labor and tax codes have been approved and discussions have been launched to modify the overall financial system. Monetary policy has been very tight. Although interest rates are market determined, real interest rates are very high, due to tight money supply. Interest rates for borrowers ranged from 30 to 34 percent per year during July 1992, with an inflation rate close to zero for 1992. The exchange rate has remained fairly stable at around RD$12.50 per US$1.00 in 1992.

The present challenge is to stimulate economic growth without creating instability. One apparent goal of the Government's monetary policy is to maintain the exchange rate at around RD$12.50 to a US$1.00. But this is creating high interest rates that are not sustainable. High interest rates constrain investments and trigger an expectation of high inflation rates. It will be interesting to observe the economic changes in the near future.

Relevant quantitative data on resource depletion are not available to help assess the magnitude of the environmental problem countrywide. Up-to-date information on the condition of the natural resource base is scarce. Earlier studies suggest that deforestation, soil losses, ecosystem deterioration, marine pollution, wetlands, genetic erosion and the accumulation of undesirable chemicals are at a critical point, and that environmental deterioration and resources extraction continue unchecked. There are several studies that document those problems for very specific areas (Paulet 1978; Freistadt, et. al. 1979; Olson, et. al. 1984; DVS/DED 1991). Physical and biological resource depletions were more significant in the coastal plains and wetlands areas where most of the vegetation was cleared for sugarcane plantations and livestock production. However, given the small population and the technological factors involved, the impact of sugarcane expansion on physical resources was not overly significant.

The country's conversion of forest land and wetland to crop and pasture land was brought on by different factors in different regions. At present, there are 3,191,200 hectares of crop and pasture land, representing 66 percent of the national territory. These conversions have severely impacted the natural resources of the country. Forest resources decreased by 28 percent from 1971 to 1987 (Christiansen, Per. 1987); and 89 species of vertebrates are reported to be threatened (DED/DVS, 1991). The extent of habitat and ecosystem losses is not well documented, but is estimated to be significant.

In spite of the limited information, the general perception of the Dominican population is that resources are over-exploited and that resource depletion is occurring on scales that greatly exceed their renewal capabilities. Dominicans also perceive that present use will further diminish the quality of life of a population already in a state of socioeconomic impoverishment.

The implementation of natural resource conservation practices has been set in the context of many laws promoted over the last 100 years. On the operational side, resource conservation is very recent. The first soil conservation projects were designed to cope with environmental problems developing on the watersheds of the Taveras and Valdesia Dams (World Bank, 1978). These projects were oriented toward soil erosion control practices and reforestation. Many of the causal forces that work against the wise use of water resources were not properly addressed.

In 1978, the Government made a major effort to design a natural resources management plan, mandating a significant reorganization of the Undersecretariat of Natural Resources of SEA and related agencies. Establishment of the Wildlife Department, the Fishery Resources Department, the Land and Water Department, the Natural Resources Inventory Department, and the Environmental Education Department were all products of that reorganization.

Several factors, at present, are responsible for the depletion and degradation of the DR's biophysical resource base. Organizational and technological factors are among the most important. Sustainability is not achievable without an efficient administrative system capable of properly managing natural resources. Proper management requires the development of a supportive legal framework, the formulation of natural resource use policies, formalization of the decision-making environment, and national planning, implementation and monitoring. This is only possible with well staffed and properly motivated institutions. The country's administrative apparatus must be oriented toward effective prevention and correction of factors which may be detrimental to conservation and development.

The lack of appropriate policies, a well defined legal framework, and adequate administrative structures will perpetuate the present environmental situation. There is some indication that with Government political will—and with NGO participation—the public sector will advance in seeking sustainable development. This study reviews natural resource policies, discusses alternatives, and identifies areas that need further research to achieve better resource management.

2. WATERSHED MANAGEMENT

There are roughly 108 rivers in the country, all of which are combined into 14 major hydrographic regions covering the total area of the country (48,442 km^2). The major issues in this category are inadequate watershed management, ineffective water use planning, poor water quality regulation, and contamination of the coastal zone and fisheries.

2.1 Major Policy Considerations

The major considerations for watershed management policy in the DR include the following:

- Deterioration of watersheds due to non-sustainable farming practices, which lead to accelerated deforestation, soil erosion, decreasing yield productivity, and sedimentation of water reservoirs and infrastructure;
- Contamination of surface and ground water supplies from domestic- and industrial-point discharge into rivers, streams and marine waters;
- Poor water quality and its severe consequences for health and overall economic development. Gastrointestinal diseases are a major cause of morbidity and mortality. Diarrheal diseases accounted for 36 percent of major diseases reported in 1991;
- Direct disposal of raw liquid waste into streams;
- Lack of treatment of domestic and industrial discharges;
- Non-restricted non-point pollution from pesticides, sedimentation, saline contaminated irrigation wastewater, poor solid waste disposal, dump-site waste percolating into ground water, and direct injection of sewage into aquifers;
- Degradation of mangroves, coral reefs, beaches, coastal waters, lakes and estuaries;
- Alteration of fauna populations due to fertilizer and pesticide runoff into water bodies; and
- Destruction and contamination of coastal zones from shortsighted tourism development strategies.

2.2 Policies

The key policies affecting poor watershed management are inappropriate water pricing policies, weak institutional policies, inadequate water laws and regulations, a lack of a national strategy on natural resources management, inadequate fisheries regulations, and a lack of comprehensive coastal resource legislation.

2.2.1 Water Pricing

Water is a scarce resource in the country, but present policies do not adequately address its scarcity value. For example, irrigation fees are extremely low and are based on the area irrigated rather than the volume of water used. The fee for irrigation water is between RD$ 60 and RD$ 150 (US$ 4.80 - US$ 12.50) per hectare/year, no matter what volume the farmer consumes. The rate doubles for rice production or if the farmer irrigates more than 10 hectares. There is no connection between the crop grown and the quantity of water required for that crop at a specific time. Present fees are insufficient to cover even the costs of operation and maintenance of irrigation systems. However, in those cases where irrigation districts are run autonomously, fees are reported to be higher and collection rates better. The Districts still do not collect sufficient funds to cover all operation and maintenance costs, and self-sufficiency should be a goal.

User fees for domestic consumption are higher, but they are also established on a fixed-fee basis; very few water meters are installed in the country. Water fees are set at RD$ 50 (US$ 4.00) per household per month, regardless of the volume of water consumed, thereby providing no incentive to conserve water. INAPA is subsidized by the central government for 60 percent of its costs.

2.2.2 Institutional Policy

The key institutional policies in watershed management include:

- Overlapping institutional jurisdiction;
- Creation of commissions with parallel functions;
- Institutions that don't pay for water or electricity;
- Poor coordination among institutions; and
- Inability to enforce existing regulations.

The public sector is dominated by relatively weak institutions that often have overlapping jurisdictions and few resources to respond to their mandates. For example, an analysis of the legislation indicates that INDRHI, INAPA, DGF and the Land and Water Department of SURENA/SEA have responsibility for the protection and rehabilitation of watersheds. Yet none of these entities has demonstrated a capacity to develop and undertake an integrated approach to watershed management.

Given this institutional paralysis, the Executive Branch—in response to public pressure—has created various commissions to address specific environmental issues, even though government institutions already exist to address many of the same issues. One example is the Management Commission of the Nizao Watershed. This commission was created by the government to address the deterioration of the Nizao watershed, which threatens the operation of the Valdesia, Higuey-Aguacate Dams and the aqueduct for the city of Santo Domingo. Several government agencies, however, already have mandates to focus on the very same problem.

Creation of commissions with functions parallel to official institutions increases the ineffectiveness of those institutions and reduces their leadership and coordination. Furthermore, financial and technical resources from formal institutions typically must be assigned to the commissions. For example, most of the work of the Nizao commission is done with the support of the watershed management unit at INDRHI.

Another example is the creation of the National Ecological Sanitation Commission, which represents a super-imposition of authority over established institutions in an effort to address what was considered an urgent problem, especially in the cities of Santo Domingo and Santiago.

A different problem is the current policy of allowing government institutions to receive electric energy without charge. According to CDE, state agencies owe considerable sums of money for electric power. This "free" energy distorts the costs of providing water, sewer and other services. It also promotes inefficient power usage. CDE cannot operate on a commercial basis or develop a program for energy conservation when it must provide a significant portion of its energy free of charge. According to CDE, the various water authorities owe CDE millions of dollars that it cannot collect.

Institutional policy formulation as a whole requires reform as well. Policy formulation is often hampered by coordination problems among the various organizations with overlapping jurisdictions. This inability to coordinate activities leads to poor implementation of programs and breeds resentment among institutions. For example, in the development of the new water law, the GODR created a Water Commission composed of INAPA, CDE, INDRHI, CORAASAN, CAASD and various irrigation districts. INAPA voiced concern that the final draft of the law was submitted to the President without its final review; in fact, INAPA was unaware that the proposed law had been submitted in the first place. This lack of coordination will most likely lead to greater conflict between INDRHI and organizations such as CDE and INAPA who have legitimate claims to management roles that INDRHI wants to control.

The DR has sufficient legislation already in place to deal with the problems of water contamination from both point and non-point sources of pollution in the country. Water quality responsibilities are under the control of quite a few institutions that have legal authority. The contamination problem arises as a result of an apparent inability to implement existing legislation. None of the public institutions charged with controlling water quality has the resources to adequately monitor discharges. Overlapping functions, institutional weakness, and a lack of financial resources are the main problems facing those institutions.

2.2.3 Water Laws and Regulations

There are many laws and decrees dealing with water management. Principle among them are:

- Law 6 of 1965, creating INDRHI with the mandate of watershed management as well as management of water for irrigation;
- Law 5994 of 1962, creating INAPA; Law 498 of 1973, creating CAASD; Law 582 of 1977, creating CORAASAN;
- Law 4471 of 1956, which establishes the Health Code;
- Law 487 of 1969, which establishes groundwater control;
- Decree 1638 of 1969, creating the Commission to regulate groundwater use; and
- Decree 226 of 1990, creating the National Commission for Ecological Sanitation.

A proposed new Water Law (Water Code) has been submitted to the Executive Branch to integrate all regulations and responsibilities. It addresses the issue of water fees for irrigation, proposing that water rates be established annually by the Executive Branch based on a proposal by INDRHI. The rates will take into account construction, administration, conservation and maintenance costs in an apparent effort to recuperate costs that are currently covered by government subsidies. Yet the proposed law does not determine whether fees will be based on the volume of water used or—as is presently the case—on the land area.

The law also proposes that public and private firms pay a specially set fee when using water in any watershed whose runoff feeds hydroelectric plants. The fee, paid monthly to INDRHI, would be equal to 2 percent of the value of the electricity generated by the same amount of water were it used in the hydroelectric plants. The money collected from this surcharge would be used exclusively to undertake watershed conservation measures.

One weakness of the new water law is that it does not adequately deal with potable water or make reference to health laws or institutions charged with controlling drinking water supply. For the most part, it states only that drinking water should receive the highest priority use. Also, the law establishes INDRHI as the preeminent institution in water, while ignoring the role of other institutions. This poor coordination has left the legislation relatively incomplete. On the positive side, the law states that INDRHI will charge other institutions for water use; but nothing is said regarding the level of fees and how they will be levied.

2.2.4 Lack of a National Strategy on Natural Resources Management

At present, no national strategy exists for natural resources management. Nor is there a national watershed management plan to help public and private organizations focus on priority watersheds. Policies on watershed management have focused on the preservation of resources rather than on a sustainable management approach. The GODR's preservationist policy addresses resource protection from a biological viewpoint only, without incorporating the main element: the people living in the watershed.

2.2.5 Fisheries Regulations

Fishing activities are regulated and administered by SEA's Department of Fisheries. Major policies include:

- Law 8 of 1965, which assigns functions to the Department of Fisheries on the regulation of fisheries; and
- Law 5914 of 1962, which provides general control and administrative measures as well as the protection of fishing areas.

2.2.6 Lack of Comprehensive Coastal Resources Legislation

There is no integrated policy for the management of coastal resources in the DR. Control of marine and coastal resources has primarily been attempted through the issuance of decrees. A myriad of decrees has been approved to control the destruction of mangroves and to prevent the extinction of marine species through the control of harvesting and sale. These include:

- Presidential Decree 2011 of 1980, creating the Commission for the Conservation of Marine Flora and Fauna. The Commission has not been active and has not contributed much to coastal resource management;
- Decree 303-87, which declares the protection and rehabilitation of mangroves. The decree is very specific in nature, identifying species as well as particular geographic areas in the country where destruction is prohibited.
- Laws establishing national parks along the coast. If protection of the parks is enforced, important coastal resources will be preserved; and
- Law 305 of 1968, which regulates construction along the coast. The legislation prohibits construction within 60 meters of marine and tidal zones along the coast. This law, however, has been ineffective in that it has not been enforced and the 60-meter limit represents an arbitrary distance that does not take into account ecological considerations.

2.3 Potential Policy Alternatives

- Design a policy on integrated watershed management under the leadership of INDRHI, and provide it with adequate resources to carry out the policy;

- Develop a national watershed management plan and a strategy for sustainable natural resource management;

- Incorporate the assistance of NGOs on watershed management activities, utilizing their technical capabilities;

- Undertake efforts to increase irrigation efficiency through improvements in irrigation infrastructure and on-farm water use;

- Design a mechanism to eliminate the waste of water from leakage losses;

- Develop a policy to pass responsibility for the management, operation and maintenance of water systems to communities, giving them ultimate authority to establish water-use fees based on true costs;

- Consolidate proposals for new water and health laws—before their approval—to better define institutional roles and responsibilities;

- Develop a policy stimulating participation of the public and private sectors to successfully provide drinking water treatment as well as provide proper disposal and treatment of human wastes;

- Develop an education policy in schools and in extension programs that addresses the problem of non-point pollution and offers realistic alternatives for all Dominicans. The program will need to stress the need for integrated watershed management;

- Undertake a plan to consolidate all laws and decrees that deal with coastal resources, and transform them into a comprehensive piece of coastal resources legislation; and

- Design a policy to promote education on coastal resources to increase the technical capacity of government workers and to educate the public, especially the hotel and restaurant sector, on the ecological and economic importance of managing coastal resources.

2.4 Recommendations for Future Research and Analysis

- Carry out a study to determine the economic value of water in the country so as to move water prices closer to their true economic value. Study a more coherent water-pricing policy to stimulate more efficient use of water;

- Study mechanisms for strengthening the capacity of institutions to respond to watershed management and water resource management problems in the country;

- Study in more detail the institutional framework in order to reduce overlapping functions and to update functions focusing on conceptual approaches to watershed management and water resources management;

- Study the feasibility of decentralizing and privatizing water treatment and waste water treatment, thus giving the State more of a monitoring role only;

- Study mechanisms for improving the control of dumping and discharge into coastal waters;

- Investigate the potential for fisheries in the country and determine a package of incentives and controls to promote a sustainable fisheries and aquaculture industry; and

- Analyze discharges of hotels and restaurants along the coast and create a plan that will eliminate the direct discharge of wastes into costal waters.

3. FORESTRY

The issues in forestry include deforestation, limited reforestation, inadequate forest management, education and forest resource ownership.

3.1 Major Policy Considerations

The major considerations for forestry policy in the DR include the following:

- Approximately two-thirds of the Dominican population depend on firewood and charcoal for their energy needs;
- Unlike manufactured wood products, which are imported, firewood and charcoal are supplied entirely by native forests, mostly dry forests;
- Current levels of removal are creating a deficit which translates into a net loss of forested land over time;
- COENER estimated that total consumption of solid wood for energy was around 4,172,700 cubic meters in 1985 with a total of 728,400 families in the country using either charcoal or firewood. FAO estimated a total consumption of solid wood for charcoal and firewood of four million cubic meters in 1987;
- Although wood is expensive in the DR, small farmers place a negative value (utility) on tree growing on their properties due to administrative problems and resource rights issues. This discourages farmers from ensuring natural regeneration with pine and broadleaf forests;
- The importance of the forest sector to the Dominican economy is poorly understood in the country. Market controls have been deliberately introduced to protect/preserve the forest resource base as opposed to using it in a sustainable manner;
- Private participation is still limited in the sector. There is a general perception that conservation and development of forest resources are mutually exclusive matters; and
- Forest lands have significantly decreased over the last 35 years. Forest resources need to be looked at from a sustainable production viewpoint, recognizing the dynamic and complex interactions of the system.

Exploitation of native Dominican forests is due, among other things, to:

- The use of slash and burn agriculture within forest lands;
- The harvesting of wood material from pine and broadleaf forests for the furniture industry; and
- The harvesting of wood material from dry forests for charcoal and firewood production.

The major consequences of the deforestation process can be summarized as follows:

- Destruction of flora and fauna habitat together with a reduction of biodiversity; this despite the fact that most forest land (6,448 km^2) has been confined to National Parks and Protected Areas;

- Alarming rates of soil erosion which significantly diminish the productive capacity of the soil and increase the sedimentation of rivers and dams. This creates instability in the water supply for human consumption, irrigation and hydropower generation;

- Increased pressure on rural peasants by increasing the time and effort required to find and collect wood material; and

- General decrease in the country's welfare.

3.2 Policies

Policies were found to affect forest resources through the impact of inadequate forestry laws and regulations, limiting access to and/or failing to encourage the use of alternative energy sources, restricting incentives for agroforestry investment, creating problems with resource ownership, and serving the need for greater education and forest research.

3.2.1 Forestry Laws and Regulations

Forest legislation in the DR has focused on the conservation and preservation of forest resources for over 100 years. It is estimated that more than 120 legal instruments dealing with forest policy have been approved. From 1884, with Decree 2295, to 1962, with Law 5856, legislation has focused on conservation without considering forests as productive resources. The major laws and regulations on forestry are:

- Law 5856 of 1962. This key forestry Law is outdated. The Law includes aspects on conservation, management and exploitation of forest resources. The Law outlines the need for forest management plans and the promotion of research and education. It also created a Forestry Fund and the **Dirección General Forestal** (DGF - General Forestry Directorate) by Decree 8086-1962;

- Law 67 of 1974 created the **Dirección Nacional de Parques** (DNP - National Parks Directorate), an autonomous institution charged with the development, administration, ordering, and care of recreative, historical, natural, and indigenous areas located within national parks and other protected areas;

- Law 206 of 1967 transferred the DGF to the Armed Forces, and Decree 3777 of 1969 banned the cutting of live trees without a permit from the DGF; and

- Law 705 of 1982 created the CONATEF which is charged with the supervision of all forestry activities in the DR. Law 705 also closed down all sawmill operations once again.

3.2.2 Lack of Alternative Sources of Energy

Charcoal and firewood continue to be the main sources of energy for domestic use in both rural and urban areas. Institutions relevant to the forestry sector do not believe an energy substitution policy can significantly improve the situation due to the inability of the GODR to meet current demands for imported energy materials. Increasing demands for wood energy contribute to high rates of deforestation. These demands, however, should also serve as an incentive to develop plantations (i.e. energy farms).

3.2.3 Limited Incentive Programs

Private sector participation in Dominican forestry was accelerated with the passage of Law 290 of 1985 and Law 55 of 1988. By offering tax exemptions of up to 100 percent for reinvestment in agroforestry, these laws promoted reforestation projects for sawtimber, pulp, energy and many other industrial exploitation practices. However, Law 290 has just been eliminated by the new tax code of June 1992 and no alternative avenues have been established to make existing incentives more efficient. Results were mixed under Law 290. On the one hand, relevant GODR agencies lacked the proper supervision and follow-up systems to safeguard the Law from misuses; on the other hand, there were several interest groups making maximum use of the tax exemptions permitted under the Law.

Decrees 1432 and 1758 of 1980 declared some areas as public domains to be administered by Plan Sierra, a private development NGO. Likewise, Decree 417 of 1989 declared several scientific reserves of Ebano Verde (*Magnolia pallescens*) to be administrated by Progressio, a private foundation. Agreements such as these between the GODR and NGOs may provide the transitional phase needed before the DR can move fully from public to private administration of forest resources.

To provide incentives for energy wood production in the country, Decree 25-1987 approved the designation of certain regions as charcoal and firewood material production zones. But the zoning program has had limited results in stopping illegal cutting of energy wood material.

3.2.4 Resource Ownership

Resource ownership is another crucial factor that must be promoted if management programs are to be operational. In the case of the forestry sector, property rights exist but not resource rights. Forest resources have been nationalized and can only be exploited with a harvesting and commercialization permit from DGF, both within private and public forest lands.

Until a better definition of forest resource rights is in place, the domestic private sector will be reluctant to invest since there is no assurance of resource utilization at the end of the rotation.

3.2.5 Education

The DR's education system operates mostly within a traditional framework that does not stress environmental education. Even though forest legislation calls upon educational programs to include natural resources issues, the legislation has not been adequately implemented.

Environmental education is taught only at a few graduate-level programs. The UNPHU, which manages a private forest, has a one-year post-graduate program on Forestry. INTEC has a one-year program on environmental education, and UASD is just starting a similar program. ISA created and supervises one of the few legal commercial forests in the country. ISA also has a forest science curriculum and has been involved in a number of research projects on dry-forest management during the last ten years.

3.2.6 Forest Research

Research and development constitute the weakest area of forest policy in the DR. There are no specialized public or private organizations studying forest policy and its effects on resource use, conservation, and development in the country. Even though the Dominican forestry sector has received much attention with respect to other natural resources, little is known about native species' agro-climatic environments. A number of hurdles inhibit economic analysis concerning the estimated costs, benefits and return to investment within dry forests. A national research agenda in forestry should be established to overcome these limitations.

3.3 Potential Policy Alternatives

- Categorize and regionalize the timber concession permit system;
- Allow agencies other than just DGF to use the Forestry Fund;
- Establish a set of policies for each one of the following categories:
    - Forest areas and forest projects;
    - Agroforestry projects;

- Forestry protection projects; and
- Reforestation projects with multiple-purpose trees;

- Clarify reforestation objectives for each institution. DGF could concentrate its efforts in non-protected forest areas deemed to have potential commercial value, while DNP could focus on protected forest areas;

- Reinforce the policy of allowing NGOs to manage forest areas in the country. This should become an explicit policy;

- Orient forest policy towards the sustainable management of the forest resource base, rather than towards forest resource preservation;

- Increase NGO participation in protected area management through the use of Debt-for-Nature swaps; and

- Promote public forums for forest policy discussions.

3.4 Recommendations for Future Research and Analysis

- Study alternatives to design a national comprehensive natural resource management policy;

- Study the establishment of a comprehensive forest management incentive package, including:

  - Flexible long-term credit programs
  - Stumpage fee management programs
  - Tax incentive programs
  - Supervision and follow-up programs
  - Revised import tax policies for wood products;

- Study the feasibility of a national policy on energy farms in the short and medium term;

- Study the comparative advantages of institutional program alternatives, including the following:

  - Re-arranging the actions and functions of DGF, DNP, SURENA, INDRHI and CONATEF to increase efficiency within the existing framework;
  - Giving increased influence to NGOs in managing forest areas; and
  - Establishing salary and benefit alternatives for public servants to attract highly qualified professionals; and

- Study ways to establish a research program on forest policy and forest management in the country. Areas of research could include:

    - Adaptability studies—prior to large-scale planting in the country—of foreign species introduced to the DR;
    - Basic research on native species behavior;
    - Definition of areas suitable for each type of forest according to capability; and
    - Forest restoration possibilities in degraded soils, deforested areas, and in areas severely altered by over-extraction.

4. WILDLANDS AND BIODIVERSITY

The issues identified under the theme of wildlands and biodiversity concerning the public and private sectors were: inadequate protection of endangered species, diminishing biological diversity, limited park and equivalent protected area management, and inattention to ecotourism potential.

4.1 Major Policy Considerations

The major wildland and biodiversity considerations in the DR include the following:

- The DR is a small country with small wildland areas that receive increasing pressure from expanding agricultural and livestock activities;
- Many wildland areas are legally protected but are not considered pristine environments due to the increasing introduction and propagation of exotic species;
- Forest clearing for non-agricultural purposes is destroying large portions of wildland every year; such clearing includes the effects of ill-planned roads, poorly located dams, and haphazard urban expansion.
- The natural protected areas are managed as "islands of protection" without considering the local economy and without regard to the delicate balance upon which protected areas depend;
- Inventories exist covering some basic habitats and ecosystems, but there is an urgent need to understand the structure and functions of these ecological areas. The variety of ecosystems and the range of genetic stocks within each species of wild and domesticated organisms are unknown;
- At present, studies do not provide enough information for conserving biodiversity on the island of Hispaniola as a whole. The island (shared by the DR and Haiti) is a common environment to many species that are not restricted to a particular habitat. Rapid extinction is inevitable for some populations if both nations don't cooperate;
- School curricula and educational programs do not show a national concern for highly threatened species and biodiversity;
- The sale and consumption of some endangered species has reduced their population, eliminating survival chances even in protected areas. The iguana, sea turtle, crocodile, parrot, parakeet, and pigeon are among the species undergoing this kind of pressure. Illicit export of the Hispaniola parrot and other species

continues unimpeded, but shipments of wildlife species to signatory countries of CITES have declined;

- Hunting and fishing are regulated activities but exploitation rates are unregulated. Overexploitation seems to be the rule for a wide range of directly harvestable natural resources;

- Ecotourism is very limited. The country has experienced a significant improvement in its tourism capacity, particularly in coastal areas. Yet, most tourists going to Los Haitises and Del Este National Parks, key biodiversity sites, do not enjoy a firsthand experience with the biological world; and

- Protected areas do not have on-site infrastructure, posted boundaries, protected facilities or research stations.

4.2 Policies

The major wildlands and biodiversity policies are included in the Hunting Law, the Fishing Law, and the National Park Law. Some important regulations are also formulated by CITES. Other laws and measures for regulating user-group activities are formulated by the various institutions involved with forestry, tourism, agriculture, land reform and mining. But again, human and financial resources are scarce in these policy areas.

4.2.1 The Hunting Law

Historically the most important biodiversity policies have been the hunting and fishing laws. Hunting and fishing activities have been regulated by annual decrees without scientific information on the distribution and abundance of wildlife populations. In addition, the Wildlife Department and the Fishery Resource Department lack trained local personnel capable of managing hunting and fishing laws on-site.

4.2.2 National Parks and Equivalent Protected Areas

Several laws and decrees have created national parks and equivalent protected areas in the last 50 years. Since 1974, with the establishment of the National Parks Directorate, the DR has become particularly involved in wildland intervention and control practices.

The National Park Directorate was established by Law 67 of 1974. Other laws and decrees have established various national parks, scientific reserves, fauna sanctuaries and equivalent protected areas. However, not all protected areas are under the administration of the National Parks Directorate.

4.2.3 Lack of Coordination Among Government Agencies

The authorities on forestry, tourism, agriculture, land reform and mining seldom recognize protected areas in their activities. There is little evidence of integration between protected area management and regional and national planning.

4.2.4 Management Policies

National and international private organizations are increasingly participating in wildlands and biodiversity conservation. There are several joint ventures currently under way between national and international NGOs and the Dominican Government. This has provided good examples of public and private sector cooperation in protecting areas in isolated places. As always, though, community participation is crucial to all entities sharing responsibility for managing wildlands and preserving biodiversity.

4.2.5 Budgetary Procedures

The Department of Wildlife, the National Parks Directorate, the Forestry General Directorate, the National Zoological Park, the National Botanical Garden, the National Museum of Natural History and the National Aquarium receive resources from the Central Government, from donations and from fees. These revenues include the forest fund, the income earned by parks through ecotourism, and the zoological park's admittance fee. In many cases, if properly managed, these revenues would be sufficient to improve park working conditions and increase private sector support. This would, in turn, improve the development of desirable strategies and policies to manage the natural resource system.

Low salaries and inadequate working incentives are common problems. At such institutions as the National Museum of Natural History, deteriorating facilities and equipment create an extremely poor work environment. In addition, low wages and tenuous job security adversely affect workers' performance. More prudent fiscal management could reverse this situation.

4.2.6 Regulation Lacunae

Some of the major lacunae include:

- Lack of a development strategy that recognizes wildlands and biodiversity in terms of their general value to society; and

- Lack of a comprehensive environmental law and/or regulation to guide the decision-making process. The legal basis for protection is too dispersed.

4.3 Potential Policy Alternatives

- Approve the Fauna Law proposal which would improve the management of wildlife commerce and would strengthen policies concerning the hunting, export, protection and recovery of endangered species;
- Define the individual and shared institutional responsibilities of DVS and DRP with respect to marine fauna protection;
- Establish a clear inter—institutional boundary between DNP, DGF, DRP, and DVS concerning all functions in wildlife and wildland management;
- Locate the DVS under a more suitable administrative structure;
- Define CITES Appendix 3;
- Establish wildlife commerce legislation;
- Develop an inter-institutional educational program—focusing on both technical and decision-making aspects—in order to heighten the awareness of the value of wildlife;
- Direct extra—budgetary revenues to wildlife- and biodiversity-defined priorities;
- Develop a model national park to demonstrate that a well managed, protected natural area can be economically self-sufficient;
- Define the roles of DNP and the Secretariat of Tourism in promoting ecotourism;
- Formulate an action plan for natural resources management;
- Expand Isla Cabritos National Park; and
- Expand Del Este National Park.

4.4 Recommendations for Future Research and Analysis

- Conduct studies on the biodiversity of protected areas in the DR;
- Conduct an inventory of flora and fauna in critical areas in order to better protect valuable endangered species and their habitats;
- Study the economic and social values of specific wildlife species;

- Study alternatives to increase the financial sustainability of the Botanical Garden and other similar institutions;

- Intensify national wildlife studies, and increase inventories;

- Study ways to develop a vertebrate pest control program;

- Conduct studies to develop a definitive wildland protection system for the DR;

- Study budgetary possibilities to create, within the DNP, an environmental education unit which includes a component dealing with ecotourism;

- Analyze alternatives for private sector participation in natural protected areas management; and

- Study the possibility of using debt-for-nature swaps to acquire privately held land in protected areas.

5. SUSTAINABLE AGRICULTURE

Sustainable agriculture, as used herein, is defined as "an agriculture that can evolve indefinitely toward greater human utility, greater efficiency of resource use, and a balance with the environment that is favorable both to humans and to most other species (Harwood, 1990)." The issues examined in sustainable agriculture are land use planning, declining soil fertility, land tenure arrangements, and effective pesticide management.

5.1 Major Policy Considerations

The DR's major policy considerations in sustainable agriculture include the following:

- Soil fertility is affected by a high rate of erosion. This implies a decline in productivity and economic returns. Eventually, eroded soils will be abandoned;
- Current land use does not maximize production capability. Land that is suitable for forestry is in crop production and land that could be cropped intensively is in pasture;
- Soils in some areas are affected by salinity due to poor irrigation management;
- Land-use planning is absent at all levels;
- Agricultural output has been declining;
- Most hillside farmers do not qualify for credit due to the size of their plots or due to unclear land tenure status. In many cases land is owned by absentees who have preference for pasture;
- Farmers do not invest in soil conservation practices. The profit of such investment is only realized in the long run and most farmers generally plant cash crops;
- An agroforestry approach to hillside agriculture is lacking, as is farmer training in this technique;
- IAD distributes land that is not suitable for agricultural production. Farmers who receive such land under agrarian reform should not crop intensively;
- Violation of pesticide laws is common. Violations include pesticide misuse, unsafe handling, and the use of inappropriate containers. Applicators do not use protective equipment and children are often applicators;

- Enforcement of pesticide laws and regulations is deficient due to SEA's lack of resources;

- Some agricultural products have been prohibited from entering US ports due to unacceptable levels of pesticide residue and the use of unregistered pesticides on certain crops;

- Crop production is hindered by new exotic pests due to an inefficient quarantine system;

- Pesticides are frequently overused and applied at inappropriate times, affecting predators and soil organisms;

- Integrated pest management practices are used on a limited basis; and

- Information on pest and pesticides management is lacking.

5.2 Policies

The main policy categories affecting sustainable agriculture are macroeconomic (foreign exchange, trade, fiscal policy, and tax code), sectoral (research, extension, and agricultural credit), land use, land tenure, and pesticide management.

5.2.1 Macroeconomic Policies

Macroeconomic policies affect the prices of items both purchased by and sold by farmers. As these prices diverge from the true social costs involved, resources are misallocated, production is less than socially optimal, farmers are pushed to fragile lands, and soils are degraded and eroded. The main macroeconomic policies affecting sustainable agriculture are the following:

- **Foreign exchange policy**. Foreign exchange was highly controlled from 1986 to 1990, creating a significant difference between the official and non-official exchange rates. This policy was subsequently modified to allow for a market-determined exchange rate. However, the government has the explicit objective maintaining a stable exchange rate, and the present non-official rate differs by about five percent from the official exchange rate. This leaves the Dominican Peso currently overvalued, which subsidizes imports and penalizes exports. This also creates distortions affecting the agricultural commodities market and its inputs, most of which are tradable.

- **Trade.** Imports of most agricultural commodities are controlled, and the application of import tariffs and surcharges is not uniform. This creates distortions in commodity prices and in the inputs markets. The Government is

currently moving towards unifying import tariffs. The first effort has been to try to reduce the range, which is now between 5 and 35 percent, with a few exceptions. There is a temporary import surcharge that is scheduled to be phased out in the next few years.

- **Fiscal policy**. In the past, Government deficits have resulted in major economic imbalances and record-high inflation rates. However, the Government has made corrections since 1990, operating now with a surplus. Yet government spending continues to concentrate mainly on infrastructure construction, and very little is invested in salaries, conservation of natural resources, health, or education services. This is detrimental to adequate natural resource management.

- **Tax code**. The Government's newly adopted tax code will have negative effects on the agricultural sector. The new code eliminates the incentives of Law 532 on Agricultural and Livestock Promotion, Law 409 on Agroindustrial Promotion, and Law 290 on Forestry Incentives. This will reduce the level of investment in agricultural.

5.2.2 Sectoral Policies

The most significant sectoral policies related to sustainable agriculture are research, extension, and agricultural credit.

- **Research**. Agricultural research policy is in disarray. SEA has lost leadership; its centers are short of trained personnel and equipment, and there is no direction in setting priorities for national needs, much less in defining a sustainable agricultural production system. At present, private-sector efforts are still in the organizational stage, with insufficient guidance and resources to meet the country's research needs.

- **Extension**. The public extension service is deficient. Even with the few crops on which it focuses, it does not emphasize sustainable agricultural practices. Some private companies now offer limited extension services to promote their products, such as agrochemicals and fertilizers. In other cases, some agroindustries provide technical assistance as part of a contractual agreement with farmers.

- **Agricultural credit**. The new economic package eliminated selective reserves and specialized credit lines. This, in addition to the elimination of Law 409—which provided incentives for offering funds for agroindustrial investments—has left the agricultural sector with very few sources of credit in the formal financial markets. Newly proposed monetary and financial codes would modify the financial system further, creating a "multibank" as the only type of

financial institution in the country other than savings and loan associations. This will further constrain the availability of credit for agriculture.

5.2.3 Land Tenure

There are two key factors in land tenure and its relation to sustainable agriculture: land security and land markets. Land security promotes investments, which in turn increase soil conservation and productivity. Efficient land markets allow land prices to better reflect the land's productive capacity. This reduces the possibility of rent-seeking behavior, and promotes better utilization of land according to its potential.

Land is viewed in the DR as a common right. The Government owns most of the country's land, and embedded in the constitution is a philosophy that the Government should provide land for farmers in the same way it should provide education and housing for all Dominicans. This philosophy permeates agrarian reform laws, which provide mechanisms for capturing additional land and distributing it to needy farmers. Yet the philosophy of Government as provider results in the assignment of use rights instead of ownership rights.

Some of the key land tenure policies detrimental to natural resources at present include the following:

- **Agrarian reform titles.** Agrarian reform titles are not transferable, which contributes to a lack of investment in soil conservation practices and soil productivity. Recently, the GODR created a commission to study this situation and to determine which farmers should receive transferable titles.

- **Titling procedure.** The titling procedure is long and tedious. This induces people to make land transactions under notarized private arrangements. The people then take possession of the property without bothering to obtain a title. This makes it difficult to establish an efficient land market and to secure credit from formal sources.

- **Government land ownership.** In areas where it is most prevalent, Government ownership of large land holdings distorts land markets by reducing the availability of privately owned land.

- **Definition of *latifundio*.** The definition of *latifundio* (large land holding) is too strict, reducing the flexibility needed for establishing large agroindustrial ventures.

- **Lack of soil conservation clauses in Government land leases.** Government land leases do not include land quality requirements for people who lease land from the Government. This provides no incentive for renters to maintain the soil

production capacity, especially when higher levels of investments are required and the renter knows he will relinquish the land in a given period of time.

5.2.4 Lack of Land Use Planning

Land is misused in the DR. Forest lands are planted with crops and fertile lands are dedicated to grazing. There is no country-wide planning or regulation of land use, except in the case of national parks, reserves, and tourism areas.

5.2.5 Pesticide Management

The most important elements of pesticide management policy in the DR are the legal framework itself and the enforcement efforts within that framework.

- **Legal framework.** Law 311 of 1968 and its Regulations 322-88 of 1988 regulate pesticide use and commerce. New pesticides must be registered, and registration is renewed every five years. The fee for pesticide registration is not based on product toxicity. Nonetheless, this law and its regulations, if enforced, could deal effectively with pesticide management in the country.

- **Lack of enforcement.** The Secretariat of Agriculture is in charge of implementing the law and its regulations on pesticide use. However, SEA lacks the necessary budget and trained personnel to enforce the law, apply adequate controls, and advise pesticide users.

5.3 Potential Policy Alternatives

- Reactivate the National Agricultural Council to promote vigorous input from both the public and private sectors in agricultural policy discussions;

- Design a comprehensive agricultural policy that eliminates distortions, provides stability, and fosters investment in the agricultural sector;

- Review credit policies to make access easier for agricultural investment;

- Define a credit policy for hillside crop production;

- Expand the definition of *latifundio* (Law 314 of 1972) to allow inclusion of large agro-industrial and agro-forestry projects that require sizable extensions;

- Design a soil conservation program for agrarian reform participants.

- Strengthen private organization participation in current IPM activities designed to encourage adoption of biological controls and other practices that could eventually decrease pesticide use;

- Establish mandatory research on new agrochemicals submitted for registration, charging a fee for research costs; and

- Include protection equipment in agricultural loans.

5.4 Recommendations for Future Research and Analysis

- Analyze ways to stimulate investment in the agricultural sector to compensate for losses in sugar and other crops and to compensate for the vacuum created by the elimination of Law 409;

- Conduct further analyses to determine distortions in the economy, using simple methodologies such as the Policy Analysis Matrix (PAM);

- Study alternative ways to finance the agricultural research needs of the country. Research is the way to expand new agricultural possibilities and overall future production;

- Study alternative ways to make the extension service more effective;

- Study the financing system for agriculture to determine alternatives for increasing credit availability for agricultural production;

- Study the potential for establishing an environmental fund with an EAI account set aside within the fund;

- Study ways to invest more resources in rural education;

- Study ways to design a soil amendment project that subsidizes farmers who adopt the recommended practices;

- Study ways to improve the SEA administration with fewer and better-trained personnel, and with adequate resources to establish a soil conservation service with well-trained technicians;

- Study restructuring the agrarian reform as a whole by giving it more functions applicable to the DR's special needs. The Government does not have the resources to comply with the social functions stated in the Constitution and the agrarian laws. A more viable system must be developed to allow farmers to purchase their land with the right to sell;

- Study alternative mechanisms for land title transfers to reduce complicated and slow procedures;

- Study ways to modernize and speed up land titling procedures at the National Land Titling Office and the Superior Land Court ;

- Dedicate funds to complete and update the rural cadastre started in the late 70's;

- Study ways to amend government land leasing contracts to include clauses requiring that soil productivity be maintained and erosion be kept to a minimum;

- Under agrarian reform, identify land too poor for intensive agriculture, and design alternative management schemes to maintain or improve its productive capacity;

- Study ways to convert poor land to wildland, wetland or forest;

- Consider modifying Article 24 of Law 311 to increase fines applied to violators of the law and its regulations;

- Study the country's quarantine system for ways to improve its technical capability and logistical support;

- Study ways to establish an appropriate monitoring system for the early detection of pesticide residue in the blood of people dealing with these chemicals;

- Study alternatives to establish an appropriate pesticide management information system that includes applicators, farmers, technicians, and agrochemical companies;

- Study ways to improve the wise use of pesticides. Focus on better protection equipment, more appropriate application levels to crops, better timing, and better product handling to avoid run-off contamination and heavy pesticide residue left on agricultural and livestock products (both on and off the farm);

- Study the impact of IPM on pest and pesticides management;

- Study the possibility of levying import taxes on pesticides to finance research on IPM, improve staff salaries, hire qualified technicians, and equip the regulating institutions; and

- Study ways to encourage agrochemical companies to pay for pesticide-related research.

6. CROSSCUTTING ISSUES

6.1 Major Policy Considerations

- Declining per capita income and the increasing proportion of Dominicans below the poverty line;
- A natural resource preservation policy that conflicts with the poverty level of the country;
- Low budgets and salaries at institutions dealing with natural resources;
- Ignorance of both the causes and effects of natural resource destruction;
- Lack of viable institutions and effective coordination among existing institutions;
- Conflicting institutional objectives;
- Tolerance for corruption;
- Over-centralization;
- Low participation and undefined relationships between GODR institutions and private organizations involved in natural resource management;
- Lack of commitment for implementing and supporting a well planned national training program on natural resources and related issues; and
- Inadequate basic information on the present status of natural resources, and the lack of a system to maintain an updated data base.

6.2 Potential Policy Alternative

- Adoption of a set of economic policies that will foster sustainable economic development to increase family income and reduce the pressure on natural resources; and

- Adoption of a natural resource management policy based on community development, incorporating the population in the management and conservation of resources.

6.3 Recommendations for Future Research and Analysis

- Study ways to modify the Government's budgetary policy to reduce personnel, increase salaries and improve efficiency in the public sector. If this cannot be achieved, the donor community should find ways to work with NGOs in the management of natural resources, focusing on regional or local organizations;

- Study ways to reorganize public-sector units that deal with natural resources in order to improve their coordination, reduce redundancy, eliminate conflicting objectives and increase efficiency;

- Study ways to make the Government's judiciary branch more independent, with its own budget and an income generated from the services it offers. This way the judicial system can be modernized and improved to become a watchdog of the other branches of government; and

- Study ways to decentralize government services in natural resource management, incorporating local communities in the management of local resources and utilizing their traditional ecological knowledge.

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ACRONYMS

AECI	Agencia Española de Cooperación Internacional (Spanish Agency for International Cooperation)
A.I.D.	Agency for International Development
BOTANICO	Jardin Botánico Nacional "Dr. Rafeal M.Moscoso" (National Botanical Garden)
CAASD	Corporación de Acueducto y Alcantarillado de Santo Domingo (Corporation of Aqueducts and Sewerage of Santo Domingo)
CAPRE	Comité Coordinador Regional de Adiestramiento a Instituciones de Agua Potable y Saneamiento (Regional Coordinating Committee for Potable Water Institutions Training)
CASTA	Centro de Agricultura Sostenible y Tecnología Aplicada (Sustainable Agriculture and Applied Technology Center)
CATASTRO	Dirección General del Catastro (National Cadastre Office)
CATIE	Centro Agronómico Tropical de Investigación (Tropical Agronomic Research Center)
CDE	Corporación Dominicana de Electricidad Dominican Electricity Corporation
CDSS	Country Development Strategy Statement
CEA	Consejo Estatal de Azúcar (Governmental Sugar Council)
CEDOIS	Centro Dominicano de Organizaciones de Interés Social Dominican Center for Organizations of Social Concern
CEDOPEX	Centro Dominicano de Promoción de Exportaciones (Dominican Center for Exports Promotion)
CENDA	Centro Norte de Desarrollo Agropecario (Northern Center for Agricultural Development)

CESDA	Centro Sur de Desarrollo Agropecuario (Southern Center for Agricultural Development)
CEUR	Centro de Estudios Urbanos y Regionales (Center of Urban and Regional Studies)
CIAZA	Centro de Investigación Agrícola en Zonas Aridas (Agricultural Research Center for Arid Zones)
CIBIMA	Centro de Investigación de Biologia Marina (Marine Biology Research Center)
CIMPA	Centro de Investigaciones y Mejoramiento de la Producción Animal (Research Center for Animal Production Improvement)
CITES	Convention on International Trade in Endangered Species
CMC	Center for Marine Conservation
CNPV	Consejo Nacional de Población y Vivienda (National Population and Housing Council)
COENER	Comsión Nacional de Política Energética (National Energy Policy Council)
CONATEF	Comisión Nacional Técnica Forestal (National Technical Forestry Commission)
CONIFOR	Consorcio para Inversión Forestal (Forestry Investment Consortium)
CORAASAN	Corporación de Aqueducto y Alcantarillado de Santiago (Aqueduct and Sewage Corporation of Santiago)
CRIES	Comprehensive Resource Inventory and Evaluation System, SEA
DAJABON	Escuela Agricola de Dajabón
DED	German Social-Technical Cooperation Service
DGF	Dirección General Forestal (General Forestry Directorate)
DIRENA	Departamento de Inventario de Recursos Naturales (Natural Resources Inventory Department)

DNP	Dirección Nacinal de Parques (National Parks Directorate)
DR	Dominican Republic
DRP	Departamento de Recursos Pesqueros (Department of Fishery Resources)
DTA	Departamento de Tierras y Aguas (Land and Water Department)
DVS	Departamento de Vida Silvestre (Wildlife Department)
EAI	Enterprise for the Americas Initiative
EEC	European Economic Community
ENDA-CARIBE	Environment and Development in the Third World
FAO	Food and Agriculture Organization of the United Nations
FDA	Fundación para el Desarrollo Agrícola (Agricultural Development Foundation)
FDD	Fundación Dominicana de Desarrollo (Dominican Foundation for Development)
FEDA	Fundo Especial para el Desarrollo Agropecuario (Special Fund for Agricultural Development)
FEDOMASEC	Federación Dominicana de Asociaciones Ecologistas (Dominican Federation of Ecological Associations)
FENACOOPES	Federación Nacional de Cooperativas Pesqueras (National Federation of Fisheries Cooperatives)
FIRENA	Fondo de Inversiones en Recursos Naturales National Forestry Investment Fund
GDP	gross domestic product
GODR	Government of the Dominican Republic
GTZ	German Society for Technical Cooperation

IAD	Instituto Agrario Dominicano (Dominican Agrarian Institute)
IDB	Inter-American Development Bank
IEPD	Instituto de Estudios de Población y Desarrollo (Institute for Population and Development Studies)
IICA	Inter-American Institute of Agricultural Cooperation
IMF	International Monetary Fund
INAPA	Instituto Nacional de Aguas Potables y Alcantarillados (National Institute of Potable Water and Sewage)
INDENOR	Instituo para el Desarrollo del Noroeste (Northeast Development Institute)
INDESUR	Instituto Para el Desarrollo del Suroeste (Southern Development Institute)
INDOTEC	Instituto Dominicano de Tecnologia Industrial (Dominican Institute for Industrial Technology)
INDRHI	Instituto Nacional de Recursos Hidráulicos National Institute of Hydraulic Resources
INFRATUR	Departamento para el Desarrollo de Infraestructura Turística (Tourism Infrastructure Development Department)
INTEC	Instituto Tecnológico de Santo Domingo (Technology Institute of Santo Domingo)
IPM	integrated pest management
ISA	Instituto Superior de Agricultura (Superior Agricultural Institute)
IUCN	World Conservation Union
JAD	Junta Agroempresarial Dominicana (Dominican Agribusiness Board)
JBN	Jardín Botánico Nacional (National Botanical Garden)

JICA	Japan International Cooperation Agency
MAB	Man and Biosphere
MNHN	Museo Nacional de Historia Natural (National Museum of Natural History)
MW	megawatt
NARMA	Natural Resource Management Project
NGO	non-governmental organization
OAS	Organization of American States
ONAP	Oficina Nacional de Administración y Personal (National Office for Personnel Management)
ONAPLAN	Oficina Nacional de Planificación (National Office of Planning)
ONAPRES	Oficina Nacional de Presupuesto (National Budget Office)
ONE	Oficina Nacional de Estadísticas (National Statistics Office)
PAFT	Plan de Acción Forestal Tropical (Tropical Forestry Action Plan)
PAHO	Pan American Health Organization
PIDAGRO	Programa Integrado de Desarrollo Agropecuario (Integrated Program for Agricultural Development)
PLAN SIERRA	Plan de Desarrollo Integral "La Sierra" (Integrated Development Plan "La Sierra")
PRODAS	Proyecto de Desarrollo del Valle de San Juan (Development Project for the San Juan Valley)
PROGRESSIO	Fundación para el Mejoramiento Humano Foundation for Human Improvement
PRONATURA	Fundación Pro Naturaleza (Foundation for Nature)

PVO	Private Voluntary Organization
RD$	Peso Dominicano
RPU	Resource Production Unit
SEA	Secretaria de Estado de Agricultura (Secretary of Agriculture)
SEAPLAN	Subsecretaria de Planificación Sectorial Agropecuaria (Undersecretariat for Agricultural Sector Planning)
SEEBAC	Secretaría de Estado de Educación, Bellas Artes y Cultos (Secretariat of State for Education, Fine Arts and Culture)
SEFA	Secretaría de Estado de las Fuerzas Armadas (Secretariat of State of the Armed Forces)
SEIECA	Subsecretaria de Investigación, Extensión y Capacitación (Undersecretariat for Research, Extension and Training)
SESPAS	Secretaria de Estado de Salud Pública y Asistencia Social (Secretariat of State for Public Health and Social Assistance)
STP	Secretariado Técnico de la Presidencia (Technical Secretariat of the Presidency)
SURENA	Subsecretaria de Estado de Recursos Naturales (Undersecretariat for Natural Resources)
TDZ	tourism development zone
TFAP	Tropical Forest Action Plan
TNC	The Natural Conservancy
TR&D	Tropical Research and Development
UASD	Universidad Autónoma de Santo Domingo (Autonomous University of Santo Domingo)
UCE	Universidad Central del Este (Central University of the East)
UCMM	Universidad Católica Madre y Maestra (Catholic University Mother and Teacher)

UEPA	Unidad de Estudios de Política Agropecuaria (Agricultural Policy Analysis Unit)
UN	United Nations
UNDP	United Nations Development Program
UNEP	United Nations Environmental Program
UNPHU	Universidad Nacional Pedro Henriquez Ureña (Pedro Henriquez Ureña National University)
US	United States of America
US$	Unites States Dollar
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
USDA-APHIS	United States Department of Agriculture-Animal and Plant Health Inspection Service
USEPA	United States Environmental Protection Agency
USFDA	United States Food and Drug Administration
WHO	World Health Organization
WWF	World Wildlife Fund for Nature
ZOODOM	Parque Zoológico Nacional (National Zoological Park)

ABSTRACT

USAID/Dominican Republic has funded this study of policies affecting the management of natural resources in the Dominican Republic.

Volume I of this report is a non-technical synthesis of the results and conclusions of the Dominican Republic 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 the Dominican Republic are analyzed, along with the interactions among institutions involved in the policy-making 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.

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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 *policy areas* defined in the Scope of Work serve as this inventory's basis for organizing the natural resource issues in the Dominican Republic (DR). The areas are watershed management, forestry, wildlands and biodiversity, and sustainable agriculture. These policy areas have been used as *themes*.

The term *issue* is reserved for the policy concerns identified within each of these themes. For watersheds, the issues include inadequate watershed management, ineffective water use planning, poor water quality regulation, and contamination of the coastal zone and fisheries. In forestry the issues are deforestation, limited reforestation, and inadequate forest management. For wildlands and biodiversity the issues include inadequate protection of endangered species, limited park and reserve management, inattention to ecotourism potential, and diminishing biodiversity. In the area of sustainable agriculture, the issues are land use planning, declining soil fertility, conflicting land tenure arrangements, and effective pesticide management.

Certain issues are common to all or several of the major themes. These include the combined effects of high population density and low levels of education and income, conflicting policies, budgetary constraints, gaps between policy formulation and implementation, overlaps in institutional jurisdiction and the lack of institutional development, conflicting institutional objectives, tolerance for corruption, overcentralization, and inadequate basic information on natural resources.

Policies analyzed within each theme and issue were classified as transnational, macroeconomic, sectoral, and specific. Transnational policies address matters beyond the country, 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.

There are roughly 108 rivers in the country, all of which are combined into 14 major hydrographic regions covering the entire country (48,442 km^2). Several institutions, including NGOs, deal with watershed resources use and watershed management. These include INDRHI, INAPA, SURENA/SEA, DGF, and CDE. INDRHI has the specific mandate in this area and maintains leadership among other agencies. A lack of coordination and limited resources characterize all of these institutions. This constrains the achievement of their goals. Commissions have been created to overcome institutional inertia and coordination problems among agencies with responsibility for managing watersheds.

Policies addressing watersheds focus on specific resources, rather than on the watershed as a system, where the human element is considered a main component of watershed

management and sustainable development. Thus, watersheds are not managed as units to overcome natural resource deterioration. Clearly, much of the legislation in this area is outdated.

Drinking water is the first priority for water use, followed by irrigation and hydroelectric generation. Water is a scarce resource in the country, but present policies do not adequately address its scarcity. Irrigation fees are extremely low and are based on the area irrigated rather than on the volume of water used. Fees for drinking water are not assigned by volume either. This policy of not using volume-based fees has resulted in great inefficiency in water resource use. There are many laws and decrees dealing with water management.

The poor quality of the nation's water resources severely constrains improvements in health and overall economic development. Gastrointestinal diseases are a major cause of mortality in the country. Most of the country's surface water is contaminated and groundwater supplies are either polluted or subject to contamination from domestic and industrial points that discharge into rivers, streams and marine waters.

Institutions with responsibilities for drinking water and sewage, such as INAPA, CAASD and CORAASAN, have limited resources to provide secure water quality and water system maintenance. There is now a new Health Code proposal, that must be approved by the Executive Branch and implemented by SESPAS in substitution of the 1956 Health Code.

There are reports on degradation of mangroves, coral reefs, beaches, coastal waters, lakes and estuaries, as well as the alteration of fauna populations, and abuse in the use of fertilizers and pesticides that are washed into water bodies. Control of marine and coastal resources has primarily been attempted by the issuance of decrees. Some of the most effective legislation in addressing coastal resources may actually consist of laws establishing the national parks along the coast. If protection of the parks is enforced, important coastal resources will be preserved. Coastal resources management has also been affected by tourism legislation. Shortsighted tourism development strategies have a depletion impact on coastal resources and could ultimately threaten tourism development.

Fishing activities are regulated and administered by SEA's Department of Fisheries, whose functions are defined by Law 8 of 1965. The most important function of this department is to regulate fishing by enforcing Law 5914 of 1962. The legislation provided for general control and administrative measures as well as the protection of fishing areas.

Key policy alternatives needed to address watershed management issues include: designing a policy on integrated watershed management under the leadership of INDRHI, and providing it with adequate resources; developing a policy to transfer the responsibility for the management, operation and maintenance of water systems to communities, giving them ultimate authority to establish water use fees based on true costs; consolidating the new water and health law proposals before their approval to better define institutional roles and responsibilities; and

undertaking a plan to consolidate all laws and decrees that deal with coastal resources and design comprehensive coastal resources legislation.

Although there is considerable protective legislation on forestry, the forest resource base has steadily deteriorated over time. More than two-thirds of the DR's population depends on firewood and charcoal for its energy consumption. These are produced from native dry forests. Current levels of removal are creating a deficit which translates into a net loss of forested land over time.

Forest products are very expensive in the country. However, small farmers maintain a negative attitude towards these resources due to existing policies and the institutional framework. The importance of resources in the DR's overall economy is little understood. Market controls have been deliberately introduced to protect and preserve the forests as opposed to managing them in a sustainable manner.

Law 5856 of 1962, the key forestry Law, is outdated. This law is very complex and there is still confusion on implementation mechanisms and institutional responsibilities. The combination of Law 5856 of 1962, Law 67 of 1974, and Law 705 of 1982 provide the mandates and functions that DGF, DNP and CONATEF--respectively--should follow. These laws, however, overlap in delimiting individual functions.

The forest incentive laws (290 of 1985 and 55 of 1988) have been eliminated by the new Tax Code (Law 11 of 1992). These laws promoted reforestation projects for sawtimber, pulp, energy and other industrial exploitation processes, by recognizing tax exemptions up to 100 percent for reinvestment in agroforestry. However, no alternative avenues were established to promote reforestation programs. The recent Decree 260 of August 1992 indicates that the Government will pay farmers RD$0.60 for each tree planted, in addition to RD$0.30 per tree for maintenance every six months during the first year. The results of this new Decree are still unknown.

Resource ownership is a crucial factor for the forestry sector. Even though there are public and private land ownership rights, there are no forest resource ownership rights. Forest resources have been nationalized and can only be exploited with a harvesting and commercialization permit from DGF, both within private and public forest lands.

Key policy alternatives needed to address forestry problems include: categorizing and regionalizing the timber concession permit system; allowing other agencies, beside DGF, to use the Forestry Fund; clarifying reforestation objectives for each institution; reinforcing the policy of allowing NGOs to manage forest areas in the country; orienting forest policy towards the sustainable management of the forest resource base, rather than towards forest resource preservation; and promoting public fora for forest policy discussions.

There is a general lack of knowledge in the DR about the merits of preserving biodiversity. There are increasing needs to develop a value system that will recognize the

contributions of wildlife and biodiversity to the local and national economy. A significant portion of the national territory is now under some sort of protection category. The most important management issues seem to be related to the lack of multiple management. Most protected areas are managed for a single purpose.

The potential for ecotourism has not been assessed and present ecotourism practices are disorganized, without adequate regulation and information. Prices charged by private individuals in some parks are very high in response to a "rent-seeking" behavior, with disregard for proper management. There is no control over the number of people visiting the national parks, and there are tourists visiting scientific reserves that should not be disturbed by humans.

Key policy alternatives needed to address issues in wildlands and biodiversity include: approving the Fauna Law proposal for managing wildlife commerce, as well as hunting, export, protection and recovery of endangered species; establishing a clear interinstitutional boundary between DNP, DGF, DRP, and DVS concerning their functions in wildlife and wildlands management; defining CITES Appendix 3; establishing wildlife commerce legislation; developing a model national park to demonstrate that a well managed, protected natural area can be economically self-sufficient; defining roles for DNP and the Secretariat of Tourism in promoting ecotourism; and expanding Isla Cabritos and del Este National Parks.

Land in the DR is being used in ways contrary to the recommendations for its use classification, causing serious soil erosion and soil degradation problems. Good land is being underutilized, contributing to the problem of low incomes in rural areas. There is low productivity in the agricultural and livestock sectors. Land markets are distorted. There is a lack of security in land ownership, because agrarian reform beneficiaries do not have permanent and transferable titles. Land distribution is skewed, with two percent of the farmers owning 56 percent of the land. Eighty percent of farmers own less than five hectares per capita. Land transfer procedures are cumbersome. Pesticide management leaves much to be desired. There is misuse and unsafe handling of pesticides. Pesticides banned in other countries are still used in the DR. High levels of pesticide residues have been found in agricultural products exported to other countries and marketed in the DR. Pesticide regulations are poorly enforced.

Economic imbalances have affected agricultural output negatively, which contribute to lower levels of employment in rural areas and to greater pressures put on limited resources by landless farmers. Agriculture's contribution to value added is still below the 1983 levels. Macroeconomic policy misalignment has resulted in a very high effective protection coefficient for some products and a negative one for others.

The budgetary policy of the Government is skewed towards urban areas, especially in the area of construction. Very little attention is given to Government institutions dealing with agriculture. The result is very low salaries and operating budgets to provide the research, promotion and extension services required by the agricultural sector. Most farmers operate on a small scale, and have little education, or in many cases, are illiterate.

The new tax code (Law 11 of 1992) eliminated the tax incentives provided by Law 532 on agricultural promotion and Law 409 on agroindustrial promotion. This will contribute to a reduced investment in the agricultural sector in the future. The new monetary and fiscal policies eliminated most of the specialized credit programs for agriculture, leaving the sector with limited access to credit. This will have a very negative impact on agricultural production.

Law 311 and its Regulation 322-88 regulate pesticide use and commerce. If enforced adequately, these legal instruments could effectively control pesticide misuse. However, SEA lacks the budget to apply adequate controls. It has neither the trained personnel nor the logistical support. Regulation 322-88 states that registration fees are to be used to satisfy the needs of the enforcing unit; whereas Law 311 indicates that fees should go to the central Government. In general, this regulation on pesticide management has been in place since 1988, but it has not been applied. Presently, SEA is trying to enforce it. But SEA does not have the required operational structure to achieve the objectives of such regulation.

Key policy alternatives needed to address sustainable agriculture issues include: designing a comprehensive agricultural policy that eliminates distortions, provides stability, and fosters investments in the agricultural sector; reviewing credit policies to make access easier for agricultural investment; designing a soil conservation program for agrarian reform participants; and using the import taxes on pesticides to finance research on IPM, improve staff salaries, hire qualified technicians, and equip the regulating institutions.

1. INTRODUCTION

The development and conservation of natural resources are essential components for sustainable development (IUCN/UNEP/WWF, 1980). The aim of sustainable development is to improve the quality of human life, while maintaining and improving the carrying capacity of the supporting ecological system. Sustainability requires an integrated approach in which the natural resource base, the population, and the interrelationships between these two must be considered in their socioeconomic, political and cultural contexts (Center for the Environment, 1992). The components of an integrated approach are:

- The natural resource base, along with the organizational and technological levels of the Dominican society;
- The nature and criteria of previous development and conservation policies, strategies and programs;
- The externalities from policies, perceptions, behavior and expectations generated by the modernization process; and
- The increasing concern for finding ways to balance developmental activities with environmental integrity.

In the application of a sustainable approach, the interests of development and conservation must converge. In a country like the Dominican Republic, sustainability demands that scarce resources be managed effectively. This is not an easy objective. Inappropriate policies for economic growth efforts generate externalities in biophysical, socioeconomic and cultural environments that, in many cases, are constraints to sustainable development. Sustainable policies and strategies must ensure that present development efforts and practices do not impact negatively on other components of the natural resource system, while maintaining biodiversity in order to preserve ecologically and economically important species, varieties and cultivars. This also implies the equitable distribution of benefits from resource utilization.

Sustainable economic development in the DR requires policies and strategies that combine economic growth with sustainable utilization of resources. Economic growth is needed to improve human welfare. Sustainable use of resources means using them at a rate within their renewal capacity. Sustainable utilization of resources is a prior condition for sustainable development (IUCN/UNEP/WWF, 1991).

A careful analysis indicates that sustainability concepts and principles touch virtually every national policy decision. In the DR, policies and practices dating to the last century, and development and conservation policies and strategies which prevailed in the seventies and eighties, suffer from a lack of sound natural resource management. This is exacerbated by a simplistic, sectoral approach to development and a misconception of resource management.

Institutional legacies that perpetuate problems related to the character and personality of the agencies and those related to the lack of efficient allocation of financial, intellectual and organizational resources are major obstacles to improving the quality of Dominican life in ways that are environmentally sustainable.

The stated objective of this particular study is "to carry out a policy inventory of the DR and to provide an overview of environmental and agricultural policies and regulations having an impact on the environment and the management of natural resources." The study recognizes that creating ecologically sound economic growth is a long-range undertaking that must be integrative. The following natural resource policy inventory concentrates on the areas of watershed management, production from natural forests, wildlands and biodiversity, and sustainable agriculture.

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 of 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 policy inventory is designed to provide a clear view of the DR's policy environment and to recommend actions, measures, and research ideas that will induce the population to better utilize its natural resource endowment.

This study has been conducted under a buy-in of USAID/DR to the Agricultural Policy Analysis Project (APAP II). The field work was performed from July 1 to August 4, 1992. USAID/DR also provided guidance on the scope and orientation of the work.

Similar studies have been conducted in Guatemala, Honduras, Belize, El Salvador and Costa Rica. 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 practices. The study treats both kinds of policies according to their impact on the natural resources.

This introduction briefly reviews the demographic, historic, and economic backgrounds 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 through 5 present the inventory of policies and institutions under the four *policy areas* or *themes*: watershed management, forestry, wildlands and biodiversity, and sustainable agriculture.

The four *policy areas* or *themes* were defined in the Scope of Work and serve as this inventory's basis for organizing policies affecting natural resources in the DR. The term *issue* was reserved for policy concerns within each of the four themes.

For watersheds, the issues include inadequate watershed management, ineffective water use planning, poor water quality regulation, and contamination of the coastal zone and fisheries. In forestry the issues are deforestation, limited reforestation, and inadequate forest management. For wildlands and biodiversity the issues are inadequate protection of endangered species, limited park and reserve management, inattention to ecotourism potential, and diminishing biodiversity. In the area of sustainable agriculture, the issues included land use, soil fertility, land tenure, and pesticide management.

This organization accommodates readers searching for specific areas of interest within the report. The four chapters which cover the themes are organized by issues selected according to the priorities and conditions in the DR. 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 how 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, and a list of the interviews conducted and potential contacts for further research.

1.2 Geographic, Demographic, Historic, and Economic Background

The DR occupies the eastern two-thirds of Hispaniola Island. It has a total area of 48,442 square kilometers. The physical geography of the DR is characterized by large and medium mountain ranges that run almost parallel to each other, dividing the country into several physiographic regions. Figure 1.1 shows the surface configuration of Hispaniola.

Throughout the history of the DR, its natural resources—land, water, forest and wildlife—have been considered valuable resources by the majority of its population. Dominicans have traditionally depended upon agricultural and related natural resources for their livelihood.

Colonial economic activities were oriented toward livestock and sugarcane production. This experience created a lasting effect on the nation's economy. The DR's economic structure still exhibits some characteristics of its colonial heritage. It continues to specialize as an agricultural exporter of so-called traditional crops: sugar, coffee, cocoa and tobacco. In the past, most of the arable land remained in mixed-cropping patterns with little demand for high

agricultural technology and financial aid. The agricultural sector depended on local technology. The majority of Dominicans remained isolated from the outside world. Even by the middle of this century, the bulk of the DR's territory probably qualified as "wilderness."

The country's modern era started after the death of the dictator Trujillo in 1961. Modernization policies and strategies that had an impact upon the natural resource sector were implemented in an accelerated fashion. The Government of the Dominican Republic (GODR) used investment and expenditures to:

- Promote land distribution to modify land tenure systems;
- Build large irrigation infrastructures to guarantee water for agricultural and domestic consumption;
- Expand transportation networks;
- Provide agricultural credit and technology;
- Provide preferential treatment for agribusiness;
- Provide a massive educational and training effort; and
- Build institutions to support basic modernization.

Given that some of these activities did not consider resource management, they contributed to the partial or total destruction of ecosystems and habitats, and the reduction of species populations. To reverse this process, the DR must adopt sustainable development policies and strategies for better management of its watersheds, agriculture, water, forestry, fisheries, biodiversity conservation, pollution prevention, and population.

The DR population has grown from 3.2 million in 1960 to an estimated 7.5 million in 1992, resulting in an average density of 154 persons per square kilometer. Population growth rates have dropped from 2.9 percent in 1960 to an estimated 2.1 percent in 1992. The structure of the population has also shifted from rural to urban. The population was 70 percent rural in 1960, and is now 40 percent rural. However, there are still large numbers of people in the rural areas putting a greater pressure on the sector's natural resources. Rural population has increased from 2.2 million in 1960 to three million in 1992 (World Bank, 1992a. p. 61).

The DR experienced a trend of economic growth in the 1970s as the effects of an import substitution policy favorably impacted the economy, and the prices of major agricultural exports (mainly sugar) were favorable. Real growth rates in GDP ranged from 12.9 percent in 1973 to two percent in 1978. This model of import substitution eventually reached its limits, however, and a new development model has been designed based on export promotion and the development of non-traditional agroindustry and tourism. GDP grew faster than population through 1981 and started to decline in 1982. GDP per capita was RD$346 (1970 prices) in 1970. It increased in real terms to RD$510 in 1980, but by 1990, fell to RD$483. (World Bank, 1992a. p. 65).

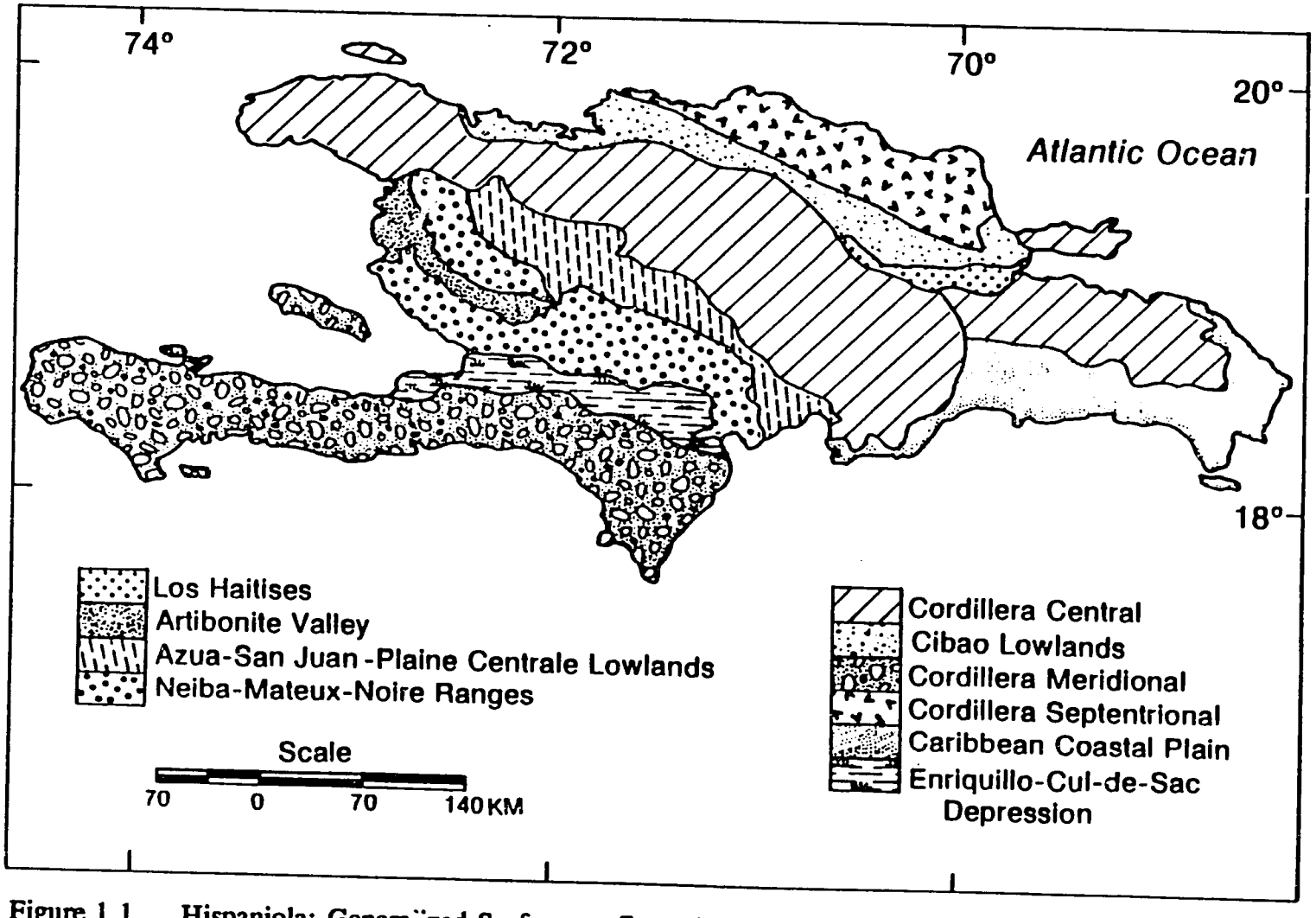

Figure 1.1 Hispaniola: Generalized Surface configuration. (Modified after Guerra Peña, in Llinás 1977).

Even though there was an export promotion law, the foreign exchange policy and the benefits of Law 199 on industrial incentives continued to favor import substitution over export activities. Economic management became unbearable and the Government signed a stand-by agreement with IMF in 1983. The abrupt adjustments, mainly the devaluation of the Dominican Peso, created a situation that resulted in riots and the deaths of many people. Economic mismanagement continued, resulting in very low growth rates (below the population growth rate), and in some cases (1985) a reduction in GDP.

GNP grew at an average annual rate of eight percent from 1965 to 1980, dropping to an average of 2.1 percent from 1980 to 1990. GNP per capita was estimated at US$830 in 1990, placing the DR as the fourth poorest country in the Americas and the Caribbean (World Bank, 1992b. p. 218 and 220).

Part of the country's growth was achieved through a foreign debt that grew 300 percent from US$360 million in 1970 to $1,079 million in 1978. Foreign debt redoubled its size in three years from 1978 to 1981 to US$2,293 million, and this figure doubled to US$4,106 million by 1989. Servicing this foreign debt placed a heavy demand on the nation's capacity to generate foreign exchange.

The elected Government of 1986 adopted an expansionary demand-driven economic policy of massive housing construction. This policy, along with the rest of its economic policies, contributed to a real growth of 7.8 percent of GDP in 1987, which wasn't sustainable, collapsing in 1988. Economic problems continued, and the country started to experience annual inflation rates above 50 percent, in addition to a lack of dollars to import basic goods such as petroleum. The year 1990 was a very difficult year for Dominicans, who experienced inflation rates close to 100 percent, long lines to buy gasoline, very few hours of electricity service, and shortages of many products. GDP declined by 5.2 percent in 1990 and 0.5 percent in 1991.

The Government adopted an economic policy package in 1990 that achieved stability. The Government deficit was reduced from 6.9 percent of GDP in 1988 to a surplus in 1991. Also, the exchange rate is now market-determined, import tariffs have been modified in an attempt to reduce the dispersion, new labor and tax codes have been approved and discussions to modify the financial system have started. Monetary policy has been very tight. Interest rates are market-determined, but due to the tight money supply, real interest rates are very high. Present interest rates for borrowers range from 30 to 34 percent per year, with an inflation rate close to zero in 1992. The exchange rate has stayed fairly stable at around RD$12.50 per US$1.00.

The present challenge is to stimulate economic growth without creating instability. Apparently the Government has a target to maintain the exchange rate around RD$12.50 to a US$1.00 through monetary policy. This is creating a situation of high interest rates that are not sustainable. High interest rates trigger an expectation of high inflation rates and constrain investments. It will be interesting to observe the economic changes in the near future.

The structure of the economy has been changing, with the agriculture sector reducing its contribution to GDP as opposed to growth in the service sector. Agriculture's contribution to GDP, including livestock, forestry and fisheries, dropped from 23.2 percent in 1970 to 17.4 percent in 1990. The composition of exports has also changed. Merchandise exports have declined from US$962 million in 1980 to US$658 million in 1991, while exports of non-factor services have grown from US$309 million in 1980 to US$1,270 million in 1990.[1]

1.3 The Natural Resource Situation

The biophysical environment is characterized by a series of mountainous ridges, inter-mountain valleys and coasts, and a diverse vegetative cover. There are six distinct physiographic regions and a wide variation of climate, soil types, and flora and fauna species living within small areas.

Historically, natural resource use by pre-colombian, colonial and pre-modern populations are expressions of a resource use ethic that represents an ecological and socioeconomic adaptation to the physical environment (Boserup, 1965; Geertz, 1967). This use does not damage the generative capacity of the physical world. Those agroecosystems maintained crop biodiversity and did not depend on agricultural inputs requirements that characterize modern agriculture. The *conuco* is still the most generalized agricultural landscape feature of the country.[2]

Physical and biological resource depletion was more significant in the coastal plains and wetlands where most of the vegetation was cleared for sugarcane plantation and livestock production. However, given the small population, the negligible cost of living, and the technological factors, the impact of the sugarcane expansion on the physical resources was not that significant. Natural resource depletion in less developed nations is directly associated with rapid population growth and inappropriate technical and organizational dimensions. These factors are generally considered the generating forces for socioeconomic and environmental conflicts in the less developed nations (Eckholm, 1976; Brown, 1981). The DR's demographic profile is certainly an important contributing factor; the DR population increased five-fold in a 60-year period (Peña Franjul, 1978).

Acreage in farmland increased sharply from 1920 to 1970 (ONE 1971). The increase in total farmland has been achieved primarily through the expansion of cropping activities onto marginal and non-agricultural land. This expansion has occurred in vulnerable areas where topography, soils, and climate conditions are major obstacles for intensive agricultural production. Agricultural expansion in the absence of land conservation practices has induced

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[1] Economic data for this introduction is from the Central Bank. October-December 1991. "Boletín Mensual," and the World Bank. 1992. "Dominican Republic: Updating Economic Memorandum: The Challenge of Sustainability." Washington, D.C.

[2] A *conuco* is a farm area in which the farmer grows different crops, mainly for home consumption.

a further deterioration of vital resources and the environment. The externalities of those activities have directly affected infrastructure projects that were created to help the development process.

Relevant quantitative data on resource depletion with which to assess the magnitude of the environmental problem countrywide are not available. Up-to-date information about the condition of the natural resources is scarce. Early studies suggested that deforestation, soil losses, ecosystem deterioration, marine pollution, wetlands, genetic erosion and the accumulation of undesirable chemicals are at a critical point, and that environmental deterioration and resources extraction continue unchecked. There are several studies that have documented those problems for very specific areas (Paulet, 1978; Freistadt, et al., 1979; Olson, et al., 1984: DVS/DED 1991).

The country's conversion of forestland and wetland to crop and pasture land has been caused by different factors in different regions. At present, there are 3,191,200 hectares of crop and pasture land, representing 66 percent of the national territory. These conversions have severely impacted the natural resources of the country. The forest resources decreased by 28 percent from 1971 to 1987 (Christiansen, Per. 1987); and 89 species of vertebrates are reported to be threatened (DED/DVS, 1991). The number of habitat and ecosystem losses are not well-documented, but it is estimated to be significant.

The need for more agricultural land is due in some areas to inadequate economic systems. The conservation and development of natural resources will depend on the country's capacity to improve the food supply without the expansion of agricultural lands. The population, estimated to be over seven million people, can be fed by properly managing lands already in production. More land or other solutions will be needed by the turn of the century when the population will reach 10 million people.

In spite of limited information, the general perception of the Dominican population is that—resources are over-exploited and that in forestry, agricultural land, water, soil, wildlife and other components of the environment—resource depletions are occurring on scales that greatly exceed their renewal capabilities. Dominicans also perceive that present use will further diminish the quality of life of a population already in a socioeconomic pauperization stage.

Natural resource conservation practices have been introduced through many laws promoted in the last 100 years. On the operational side, resource conservation is very recent. The first soil conservation projects were designed to cope with environmental problems on the watersheds of the Taveras and Valdesia Dams (World Bank, 1978). These projects were oriented toward soil erosion control practices and reforestation. Many of the causal forces that work against the wise use of water resources were not properly addressed.

In 1978, the Government made a major effort to design a natural resources management plan, mandating a significant reorganization of the Undersecretariat of Natural Resources of SEA and related agencies. The Wildlife Department, the Fishery Resources Department, the Land

and Water Department, the Natural Resources Inventory Department and the Environmental Education Department were established as a result of that reorganization.

SURENA implemented the Bao Project, funded by the GODR through the **Fondo Especial de Desarrollo Agropecuario** (FDA - Special Fund for Agricultural Development). This Project offered soil conservation assistance directly to hillside farmers in the Bao watershed. This Project also trained many technicians that are now providing services for different activities. SURENA also implemented the Natural Resource Management Project (NARMA) with technical and financial assistance from USAID. NARMA overcame the traditional lack of financial resources and technical personnel, acquainted Government officials with resource depletion problems, provided an environmental outreach program with local farmers, purchased conservation equipment, promoted soil conservation practices, conducted farming systems research, and built some essential infrastructures. In addition, it undertook some institution building activities. There has been continuous progress in the natural resource sector since NARMA. The DR continually searches for methods that will assure conservation and development of both its natural resources and human environment.

At present, the environmental threats faced by the DR are not only a matter of depletion and degradation of the biophysical resource base. Organizational and technological factors are perhaps more important threats. Sustainability is not achievable without an efficient administrative system capable of properly managing natural resources. Proper management requires a supportive legal framework, formulation of natural resource use policies, formalization of the decision-making environment, national planning, implementation and monitoring. This is only possible in well staffed and properly motivated institutions. The country's administrative structure must be oriented toward effective prevention and correction of factors that may be detrimental to conservation and development.

The lack of appropriate policies, a well defined legal framework, and adequate administrative structures will perpetuate the present environmental situation. There is some indication that with Government political will, and with NGO participation, the sector will advance in seeking sustainable development. This study reviews the natural resource policies, discusses alternatives and identifies areas that need further research for better resource management.

2. WATERSHED MANAGEMENT

This chapter initiates the discussion of natural resource policy in the DR by addressing the importance of watersheds, specifically their role in the regulation of water supplies and their contribution to the country's economic development. A watershed is a biophysical unit or system where all water drains toward one natural outlet. The outlet is generally a river or stream which conducts water from the watershed to the ocean. The watershed system is characterized by the interaction of various factors including precipitation, vegetation, slope, and human intervention, all of which have an impact on the natural equilibrium, structure, and function of the system.

Non-sustainable use of watersheds creates negative consequences that result in serious environmental, social and economic problems. This specifically leads to a deterioration of the natural resource base, manifested in increasing erosion, greater flooding potential, and diminishing water productivity. Some of the externalities of watershed degradation are to:

- Shorten the useful life of hydroelectric dams;
- Increase maintenance costs for infrastructure such as irrigation works and roads;
- Destroy riverine and coastal ecosystems; and
- Modify or eliminate freshwater fish populations.

In addition, the erosion caused in watersheds negatively affects soil quality, thereby threatening the livelihood of small farmers dependent on hillside farming for subsistence income.

A sustainable watershed management approach should lead to improved human welfare and environmental quality in the country. Community participation in the planning and implementation of watershed development projects is paramount. Eventually, the process will result in the utilization of appropriate technologies and farming-systems approaches that do not lead to the deterioration of the natural resource base.

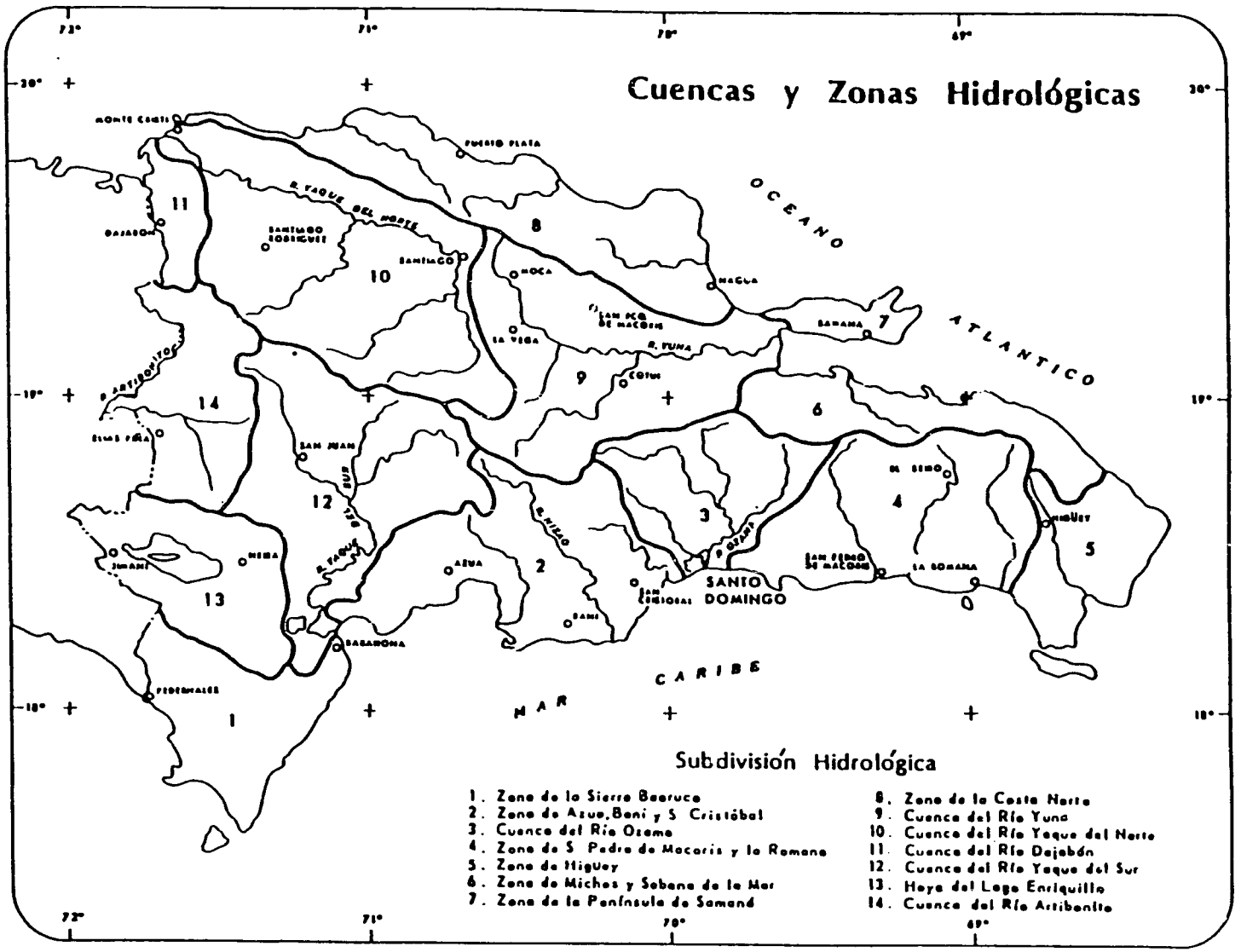
Issues related to watershed management and other relevant water issues such as water use planning, poor water quality regulation, inadequate coastal zone management, and contamination of fisheries are analyzed here. This chapter also includes a multi-sectoral analysis of the policies and institutions involved with these resources in the DR.

The organization of this chapter presents first a section on watershed management, water use, and water management. This is followed by a section on water quality, and a final section on coastal zone management and fisheries.

2.1 Watershed Management, Water Use, and Water Management

There are roughly 108 rivers in the country, all of which are combined into 14 major hydrographic regions covering entire 48,442 km^2 of the country (Figure 2.1). The regions are

Figure 2.1 Location of Major Watersheds in the Dominican Republic, 1967



Source: OAS. 1967. *Reconocimiento y Evaluación de los Recursos Naturales de la República Dominicana.*

formed within four mountain ranges that run parallel across the country from east to west (Table 2.1).

TABLE 2.1 Hydrographic Regions of the Dominican Republic, 1981

Hydrographic Region	Rivers Included	Area in Km^2
Sierra de Bahoruco Zone	Pedernales & Nizaito	2,814
Azua, Bani, & San Cristobal Zones	Haina, Nigua, Nizao, Ocoa & Bani	4,460
Ozama River Watershed	Ozama, Yabacao Canal	2,706
San Pedro de Macoris & La Romana	Chavon, Dulce, Soco, Cumayasa & Macoris	4,626
Higuey Zone	Yuma	2,207
Miches Zone & Sabana de la Mar	Small Rivers	2,265
Samana Peninsula Zone	-(**)	-(**)
Costera del Norte Zone	Boba, Nagua, San Juan, Yasica, Bajabonico	4,266
Yuna River Watershed	Jima, Camu, Yuna	5,630
Yaque del Norte River Watershed	Yaque del Norte	7,053
Dajabon Watershed River	-	858
Watershed of the Yaque del Sur River	San Juan, Rio del Medio, Las Cuevas & Los Baos	5,345
Hoya del Lago Enriquillo	Guayabal, Las Damas, Margarita, Barrero, Los Arroyos, Los Pinos	3,048
Artibonito River Watershed	Macasia	2,643

Source: Hartshorn et al., 1981. Country Environmental Profile of the Dominican Republic.

The mountain ranges and their interconnecting valleys form the principal drainage areas in the country, whose waters originate in the mountains of the western and central regions. Of the mountain areas, the central range is the most important. It is the highest of the four ranges and is the source of the three most important river systems in the DR, the Yaque del Norte, Yuna, and Yaque del Sur. At 296 kilometers in length, Yaque del Norte River alone has a watershed that drains an area representing 15 percent of the country.

Based on OAS and other sources, the production of water from the 14 watersheds varies between 15 and 20 x 10^9 m^3 per year, while groundwater resources are estimated at 1.5 x 10^9 m^3 per year. Recharge takes place over three major aquifers as a result of an average rainfall of 1,400 mm/yr (Hartshorn, et al., 1981).

These figures demonstrate the importance of surface water resources. The watersheds of the DR are the major sources of water for irrigation, domestic and industrial water supply and the generation of electricity. The significant role that watersheds play have been recognized in the country, but there have been relatively few efforts to develop an integrated approach to watershed management.

Deforestation, slash-and-burn agriculture, and the use of inappropriate agricultural practices on hillside land are degrading the quality of the watersheds' natural resource base in the DR. Soil erosion produced at the watershed level has been estimated in 507 mt/ha/year at the Ocoa watershed (Hartshorn, et al. 1981 p.64). Table 2.2 shows the level of erosion in selected watersheds.

TABLE 2.2 Estimated Erosion Level in Selected Watersheds in the Dominican Republic, 1981

Watershed	Area in ha.	Erosion in mt/ha/ year
Las Cuevas	56,900	275
Taveras	73,700	275
Bao	93,330	346
Nizao	99,200	125
Ocoa	56,300	507
Guayubin	73,400	111
Chacuey	38,600	95
Maguaca	17,200	294

Source: Hartshorn et al., 1981. Country Environmental Profile.

Watersheds yield year-long supplies of water and provide food and fuel for a significant portion of the population. For example, 80 percent of the country's staple bean and tuber crops are produced on hillsides which are prone to erosion if not properly managed (TR&D, 1992). According to COENER, 70 percent of the energy for cooking is supplied by firewood and charcoal whose sources are remaining forests, often located in upland watershed areas.

Groundwater use has generally been limited to industrial and domestic consumption and is currently estimated at only 25 percent of capacity (TR&D, 1992). Use has been historically limited due to the abundance of surface water, lack of energy for pumping and treatment requirements (treatment is mostly for hardness).

Groundwater may play an increasingly important role due to the growing demands on surface water sources as well as the reduction in supply caused by deterioration of watersheds resulting from deforestation and small-farmer cultivation practices. Not only must the DR address the issues of competing water use among sectors, it must also address the competition for watershed use. Demand for domestic water consumption will increase as a result of overall population growth (currently around 2.1 percent annually) and increasing urbanization. About

60 percent of all Dominicans live in urban areas where water consumption rates are much higher than in rural areas (World Bank, 1992a).

Even though most urban areas have water systems, not everyone has access to piped water supplies. In rural areas this access is severely limited. Rural access to piped water is estimated at 14 percent, while the same figure for urban areas is 50 percent, according to INAPA. In Santo Domingo, present supply does not meet the demand and the problem appears to be exacerbated by large system losses due to leaking pipes. The **Secretaría de Salud Pública y Asistencia Social** (SESPAS - Secretariat for Public Health and Social Assistance) estimates losses from leakage at 45 percent of the total water produced (SESPAS, 1992). An expansion of the water system is underway to begin addressing the demand problem, but sources indicate that the system is still unlikely to meet the needs of an urban population predicted to reach 3 million by the year 2000. Given the amount of losses in the system, increased volume may have only limited effect. It is certain that the pressure to satisfy urban drinking water needs will result in greater competition in the future among the various users.

Another, but lower-priority, use for surface water sources is the generation of electricity. The main supplier of electric energy is the **Corporación Dominicana de Electricidad** (CDE - Dominican Electricity Corporation).[1] Installed hydroelectric capacity satisfies approximately 10 percent of the total demand for electricity in the country and 18 percent of CDE's capacity (World Bank, 1992a). Estimates established the annual demand for electricity in the country in 1991 at 2208 MW, of which 216 MW/year were met by hydroelectric power. Fourteen new projects are under study, which would increase installed capacity to 480 MW/year. This figure may be optimistic since hydroelectric power generation will depend both on adequate rainfall and the implementation of successful measures to arrest the deterioration of watersheds. As a result, hydroelectric energy will not supply any significant proportion of the country's energy requirements.

The DR saw its greatest growth in areas put into irrigation during the period between 1930 and 1945. The creation of INDRHI in 1965 resulted in the establishment of a national autonomous body charged with the regulation of the headwaters of rivers through construction of storage dams and irrigation systems. Approximately 60 percent of the water used for irrigation in the country is supplied by nine storage dams, while the remaining 40 percent comes from run-off and groundwater supplies.

According to INDRHI, there are 250,000 hectares irrigated by 250 irrigation systems at the present time. These areas lie mainly in the regions of Yaque del Norte (39 percent), Yuna (16 percent) and Yaque del Sur (13 percent). The total irrigated area supports 58,000 producers with an average farm size of approximately four hectares. These farmers use approximately 45 percent of the estimated potentially irrigable land area of 552,000 hectares. The most common

[1] It is estimated that 44 percent of the total electricity is generated by private groups, including residential diesel generators. This is due to CDE deficiencies in supplying enough electricity to satisfy current demand.

method of irrigation is by furrows. In areas of slopes, counter furrows are used, while basin irrigation is used for rice.

The effectiveness and efficiency of irrigation systems in the DR are quite low. Studies indicate that 75 percent of the water channeled to irrigation systems is lost. There are several reasons for this low efficiency:

- Poor planning and design, incomplete systems and lack of maintenance;
- Low tariffs which discourage efficient use of water resources;
- Natural resource degradation in upland watersheds that lowers irrigation-system performance;
- Limited institutional capacity;
- Lack of appropriate training and extension activities to establish norms, procedures, and a better understanding of water use; and
- Lack of continuity and commitment to proven interventions.

Irrigation uses the highest volume of available water, and irrigation-water use is accorded a priority second only to that of domestic consumption. Until now, there has been little competition for the water use between domestic and agricultural users. However, with the rising demand for domestic consumption in large urban areas, such as Santo Domingo, competition is likely to increase. For example, at the Valdesia dam, 12 m^3/s has been allocated for irrigation and 6 m^3/s for the Santo Domingo drinking water system.

According to INDRHI, there is no guarantee that the watershed can actually produce sufficient water to provide the apportioned 18 m^3/s throughout the year. There is already concern about the quantity of water allotted to CAASD, for the water system may be inadequate to meet future demand. As more water is channeled to cities, irrigation water may become scarce even as demand presumably grows. Given growth in demand, the deterioration of the resource base and the Government's limited institutional capacity, conflicts over water use may become quite common in the future and pit cities against the countryside to determine who has the right to water.

Another conflict arises because the water for domestic use must be captured above the dam to have sufficient head to feed the Santo Domingo distribution system by gravity flow. Water for domestic use is therefore taken out of the system before it can pass through the turbines to generate electricity. The diversion from the dam of drinking water eliminates an estimated one-third of Valdesia's generating capacity.

CDE would like to be able to use that water to increase its electric energy capacity and suggests that the benefits accruing to the country from greater hydropower capacity would offset the costs required to pump the water to supply Santo Domingo. A cost analysis should be carried out to determine the most appropriate method for generating electricity and providing drinking water to Santo Domingo.

2.1.1 Policy Framework

Many policies contribute to watershed management, water use and water management in the DR. Some are external in nature (transnational), but most are internal. Only the major policies are mentioned here.

Table 2.3 lists the policies affecting watershed management, water use and water management. The analysis section synthesizes the major policies. They have been organized into transnational, macroeconomic, sectoral, and specific categories.

Transnational and regional policies extend beyond the territorial frontier. Important to the DR is an international protocol with Haiti for sharing international waters of the Masacre and Pedernales Rivers. Any future planning on water management must be approved by both countries. The DR is a member of the Watershed Management Network of FAO and the International Convention of Hydrographic Organizations.

Macroeconomic as well as specific policies impact on watershed management and water use. Many macroeconomic policies have a more direct impact on agricultural production, which affects the way farmers and the population in general use watersheds and water. These policies are discussed in more detailed in Chapter 5 on Sustainable Agriculture. Macroeconomic policies have been classified into monetary, fiscal, and trade policies.

At the national level there are numerous laws, regulations and decrees that affect watershed management, water use and water management. The plethora of legislation has resulted in overlapping institutional responsibilities and jurisdictions. A list of legislation related to watershed management, water use and water management appears in Table 2.3

One of the most comprehensive pieces of water resource legislation was passed in 1965. Law 6 of 1965 established the **Instituto Nacional de Recursos Hidráulicos** (INDRHI - National Water Institute) as an autonomous government agency with sweeping responsibilities for carrying out studies and developing projects and programs for the development of irrigation systems and dams for energy production. INDRHI was also assigned responsibility for coordinating its activities with other institutions to conserve water sources. Although the law does not specifically mention the conservation and management of watersheds, the implication is clear; there was obvious concern for watersheds protection and INDRHI was given the power by mandate to develop measures of protection. INDRHI's mandate in the water resources sector did not extend to potable water supplies. The health sector was instructed to specifically deal with domestic water supply. These laws are discussed later in this section.

Table 2.3 Policies Related to Watershed Management, Water Use, Watershed Management. and Water Quality by Type, Dominican Republic, 1992.

Type of Policy			
Transnational	Macroeconomic	Sectoral	Specific
– Resolution 356 of August 1972. – International Convention for Hyrographical Organization – International Protocol with Haiti for Sharing Masacres and Pedernales Rivers – FAO Watershed Management Network	– Foreign Debt – Fiscal– Budget Deficit – Monetary– Exchange Rate – Trade– Export Policy – Monetary –Credit Policy – Fiscal– Tributary Code	– Integrated Watershed – Health – Water Resource – Agriculture – Livestock – Agrarian Reform – Energy – Population – Education – Infrastructure Investment – Forestry	– Presidential decree 199–92 of June 1992 establishing office to implement protection and management of Rio Nizao watershed. – Law 3841 of May 1954; establishes measures for protecting the Bao River watershed. – Law 4389 of February 1956; establishes a forest reserve and the Armando Bermudez National Park for the preservation of the headwaters of Rivers Yaque del Norte, Jagua, Bao, Amina, Mao and Guayubin. – Law 5056 of 1954; to protect headwaters of Yaque del Sur, San Juan and Mijo rivers. – Law 4991 of September 1958; prohibits disturbance in Haina and Duey watersheds. – Law 627 of 1977; protects all highland public areas – Decree 2724 of August 1968; prohibits disturbance of headwater of La Catalina river and adjacent areas. – Resolution 24 of 1978; creates Department of Land and Water in SURENA to implement studies and education programs in water use and conservation. – Public Health Code, Law 4471, 1956, assignes potable water supply control to SESPAS – Law 5994 of 1962; creates INAPA. – Law 8955 of 1963; INAPA role expanded to include watershed protection through aforestatio – Law 487 of 1973; priority use of groundwater for domestic purposes. – Law 498 of 1973; creates the CAASD. – Law 582 of 1977; creates the CORASAN. – Law 1710 of May 1948; free water for livestock use. – Law 5852 of March 1962; outlines general water use. – Law 436 of October 1964; modifies Law 5852. – Law 6, 1965; creates the INDRHI. – Law 221 of 1967; Law 134 of 1971; Law 126 of 1980; Law 238 of 1966; Law 281 of 1966; Law 501 of 1973; and Law 414 of 1969, which modify articles of Law 5852. – Law 263 of March 1968 gives Executive control to process land transfers at dam sites. – Law 264 of March 1968 designates INDHRI and CDE as managers of Tavera dam.

Table 2.3 Continuation.

Type of Policy			
Transnational	Macroeconomic	Sectoral	Specific
			– Law 487 of October 1969; control groundwater use. – Law 214 of October 1971; legal situation of INDRHI. – Law 278 of December 1975; irrigation control by INDRHI. – Decree 2213 of March 1968; Taveras Dam water diversion. – Decree 1638 of September 1969; creates Commission to regulate the use of groundwater. – Decree 3287 of March 1973; gives INDRHI responsibility for managing all canals pertaining to the State. – Decree 3288 of March 1973; Creates a central body to manange irrigation in the area of Tavera dam. – Decree 1112 of July 1975; Creates the State Corporation of Dams. – Decree 1294 of November, 1979; Creates the Irrigation District of the Valley of San Juan. – Decree 2659 of August 1981; creates the Irrigation District for the Valley of Azua. – Regulation 1558 of June 1966; for application of Law 6, creating INDRHI. – Regulation 2889 of May 1977; for application of Law 483 on groundwater. – Law 4371 of January 1956; establishes reforestation a an issue of national interest. – Law 4890 of April 1958; modifies articles of Law 4371 and stresses importance of protecting water resources through reforestation. – Law 5856 of April 1962; creates DGF and establishes forest and fruit tree for watersehed protection and conservation. – Law 632 of May 1977; prohibits tree cutting at headwaters. – Law 705 of 1982; establihes the CONATEF. – Law 290 of 1985 tax incentives for forest development; – Law 55 of 1988 modifies Law 290 of 1985. – Decree 25 of 1987; CONATEF to restrict charcoal production. – Decree 584 of January, 1979; created the COENER. – Decree 2610 of July, 1981; modifies Decree 584, establishes to advise presidency on energy policy specifically on the racional use of potential energy resources and on the use of appropriate technology. – Decree 301 of October 1978. Created a Coordinating Commission DGF, DNP and SURENA to formulate policy guidelines on renewable natural resources. – Decree 309 of October 1978 on the protection of Bao River Dam. – Decree 260–92. The Government will pay RD$0.60 per tree planted, in addition to RD$0.30 for maintenance every six months during the first year.

Law 6 of 1965 represented an attempt to deal with watershed deterioration, but essentially INDRHI did very little to fulfill that part of its mandate. This lack of action led to continued deterioration of watersheds and growing concern about issues such as erosion, sedimentation of dams, changing micro-climates and reduction of year-round water supplies.

This growing concern manifested itself recently in Presidential Decree 199-92 of June 27, 1992. The purpose of the decree was to insure the viability of the watershed that includes the Nizao-Mahoma-Mahomita and Yuna Rivers, that provide water to the Valdesia-Jiguey-Aguacate and Hatillo Dams, as well as the Santo Domingo water system. The Decree calls for the resettlement of people living in the upland areas of the watershed and a complete ban of human activity in those areas without evaluating the role of local people in watershed management. The resettlement issue has raised some controversy in the country, but support appears strong for protecting the watershed. A presidential commission, in coordination with existing institutions, will be charged with implementing the decree.

The GODR has tried to legally protect upland watersheds by law since the mid-fifties. Laws were passed to establish forest reserves in areas where the priority was protection of watersheds. The Armando Bermudez National Park was specifically created in 1951 to preserve the headwaters of the Yaque del Norte, Jagua, Bao, Amina, Mao and Guayubin Rivers. In each decade since then, laws have been passed to offer either blanket protection of watersheds or to provide protection of specific areas as shown in Table 2.3. While these pieces of legislation have been successful in preserving some national parks, they haven't had their full impact due to a lack of resources to enforce the legislation and promote activities involving the participation of the local population. The Haitises National Park is one example of these failures.

Legislation has occasionally been passed that does not directly regulate water use or water management, but has an impact on water use. The forestry sector offers the greatest number of laws related to deforestation. Since the fifties, legislation has attempted to either preserve forests in the upland watersheds to protect water sources or to promote afforestation of lands that have deteriorated due to deforestation. In the eighties, legislation was passed (Law 705 of 1982 and Law 290 of 1985) to provide incentives for cutting upon approval of management plans by the **Comisión Nacional Técnica Forestal** (CONATEF - National Technical Forestry Commission). These management plans specified the inclusion of plans for afforestation of harvested areas to insure minimal environmental damage.

In the irrigation sector, efforts were undertaken to decentralize the management of irrigation systems and grant power to local irrigation authorities. Law 5852 of 1962 provided for the creation of **Asociación de Regantes** (Water Users' Associations), but no action was taken to create them until 1990. So far, associations have been created at the district level for three projects, employing irrigation professionals from the private sector to manage the systems.

The policy under which the associations operate is one of local management. Association representatives are democratically elected and manage the irrigation systems by charging user fees for service. Water use is more efficient and fee collection rates are much

higher. Unfortunately, the fees are not sufficiently high to cover all administrative and operational costs. Revenue shortfalls occur and cause the associations to forego needed maintenance.

Currently two pieces of legislation are before Congress and each would have a major impact on water resource legislation. INDRHI, with technical support from the **Deutsche Gesellschaft fur Tehnische Zusammenarbeit** (GTZ), a German development organization, has submitted a new water law that addresses some of the weaknesses of present water legislation. A new health law is also before Congress. Both could be passed this year. If they are, they would supersede much of the legislation regarding water use and management discussed in this section.

Energy-sector legislation was dealt minimally with the water issue. Decree 584 of 1979, which created the **Comisión Nacional de Política Energética** (COENER - National Commission for Energy Policy), established the basis for the development of energy policy. The policy agenda focused on watershed protection to limit sedimentation of dams and to reduce levels of deforestation caused by the reliance on firewood and charcoal by promoting firewood plantations and promoting alternative sources of energy. These policies were consistent with those promoted by other sectors to protect watersheds and improve the use of water for the country's economic development.

Infrastructure policy on watershed resource use was begun in 1972 with the construction of the Taveras Dam for energy, irrigation and drinking water purposes. This policy of dam construction has been ongoing for the past twenty years. As a result of this, there have been over ten major dams built (Table 2.4). None of them has a watershed management plan. Because of dam siltation, INDRHI has drafted watershed management plans for such major watersheds as: Yaque del Sur,[1] Nizao, Bao, Mao, and Artibonito. These plans are to be financed by international agencies. Once developed and effectively implemented, these plans will have a positive impact on the preservation of the natural resource base and water quality.

2.1.2 Institutional Framework

Various international institutions have influenced policies on watershed management and water quality. These include: the Organization of American States (OAS), the United States Agency for International Development (USAID), GTZ, the Japanese Agency for International Cooperation (JICA), and the Inter American Development Bank (IDB).

Several institutions have responsibilities related to watershed management, water use and water management in the DR (Table 2.5). The government agencies are: INDRHI, CDE, **Instituto Nacional de Agua Potable y Alcantarillado** (INAPA - National Institute for Drinking Water and Sewage), **Corporación Acueducto y Alcantarillado de Santo Domingo** (CAASD -

[1] Sustainable Development Project for the San Juan Valley (PRODAS).

Drinking Water and Sewage Corporation of Santo Domingo), **Corporación de Acueducto y Alcantarillado de Santiago** (CORAASAN - Drinking Water and Sewage Corporation of Santiago), the **Subsecretaria de Estado de Recursos Naturales** (SURENA - Under-Secretariat of State of Natural Resource) in SEA, the **Dirección General Forestal** (DGF - Forestry General Directorate), **Dirección Nacional de Parques** (DNP - National Park Directorate) and the **Comisión para el Manejo de la Cuenca del Río Nizao** (Nizao Watershed Management Commission). Some of these institutions will be considered in section 2.2 on water quality and in chapters on biodiversity and forestry.

TABLE 2.4 Existing and Future Dams Dominican Republic, 1992

Construction Year	Dam	Purpose		
		Energy	Irrigation	Water
1973	Taveras	X	X	X
1975	Valdesia	X	X	X
1978	Rincon	X	X	X
1979	Sabana Yegua	X	X	-
1979	Maguaca-Chacuey	X	-	-
1981	Sabaneta	X	X	-
1984	Hatillo	X	X	-
1988	Lopez Agostura	X	X	-
1992	Jiguey y Aguacate	X	-	-
1994a	Rio Blanco	X	-	-
*b	Artibonito	X	X	-
*	Manabao-Bejucal-Taveras	X	-	-
*	Las Placetas	X	-	-
*	Moncion	X	-	-
*	Boba	X	-	-

a/ In construction and will be finished in 1994.
b/ Includes two dams.
*/ Future infrastructure.

Sources: Consenso Agrario 2. Santo Domingo. No date; and INDRHI.

The most important NGO dealing with these resources are: The **Plan Sierra**, the **San José de Ocoa Development Association** (JUNTA of Ocoa), **Enda-Caribe**, **Pronatura** (Foundation Pro-Nature), and the **Junta de Regantes** (Farmer Associations for Water Irrigation Use).

TABLE 2.5 Institutions Involved in Watershed Management, Water Use, Water Management, and Water Quality, by Type, DR, 1992

Type of Policy			
Transnational	Macroeconomic	Sectoral	Specific
USAID	The Central Bank	SEA	INDRHI-Watershed Management Unit
IDB	Secretariat of Finance	CDE-Hydroelectric Department	INDRHI- Department of Planning
FAO	Technical Secretariat of the Presidency	State Coordination and Auditing Office	National Commission for Ecological Sanitation
IICA		DGF	SEA-SURENA
WHO		DNP	SURENA- Land and Water Department
PAHO		The Navy	Nizao Watershed Commission
CAPRE		SESPAS	INAPA
OAS			CAASD
JICA			COSAASAN
EEC			Junta de Regantes
AECI			JUNTA of Ocoa
			Plan Sierra

International Institutions. During the last two decades, some international institutions have been involved in activities related to watershed management. The most important are described below:

IDB is financing a feasibility study for the Bao River watershed. It has also sponsored several projects in the past. It will probably fund two watershed-management projects: San Juan River watershed (PRODAS), and Bao and Mao River watersheds.

USAID has played an important role in natural resources and watershed management since 1981. An Environmental Profile of the country, sponsored by USAID in 1981, was the first step in recognizing the natural resource degradation process. Other activities have been implemented with USAID support: the Natural Resources Management Project (NARMA), which included watershed management activities and institutional strengthening; the Water Management Project, which focused on farm-water management; and the Comprehensive Resources Inventory and Evaluation of Natural Resources (CRIES).

The **Agencia Española de Cooperación Internacional** (AECI - Spanish Agency for International Cooperation) has been working on the agroecological organization of the Nigua River as well as reforestation. The AECI has also supported a study for developing a management plan for the Haitises and the Parque Nacional del Este.

GTZ has given technical assistance and collaboration to INDRHI in the institutional strengthening of hydrological activities. Some of these activities are: legal assistance (water code), water resource inventory, meteorological stations, and water data base.

JICA has been working on four feasibility studies related to water and watershed management. These studies focus on the irrigation project for Nagua and Yuna Rivers in 1986; the hydroelectric dam "El Torito and Los Veganos" (in coordination with CDE, but never implemented); the Constanza Valley Irrigation Project (1990) with the participation of INDRHI; and the Groundwater Development Project in the Western Region of the country, now underway in coordination with INAPA.

OAS has been supporting natural resources management. It sponsored an inventory of the natural resources base in 1967.

Government Institutions.[1] **INDRHI** was created by Law 6 of 1965 as an autonomous institution with authority regarding water sources conservation and management. Its mandate includes the management of watersheds to insure the conservation of surface-water sources. INDRHI is also in charge of:

- Planning and programming all the energy and water infrastructure for the integral development of hydrographic watersheds;
- Development and management of national irrigation systems;
- Management of watersheds, reservoirs, springs and underground water; and
- Planning and construction of all major hydraulic, storage and hydroelectric infrastructure.

INDRHI has eight departments: Planning, Finance, Administration, Hydrology, Pipeline Projects, On-going Projects, Small Dams, and Supervision and Irrigation Districts. Last year the unit for watershed management was created in order to fulfill the mandate of Law 6 of 1965, with the purpose of developing and planning watershed management. INDRHI is planning to create a Watershed Management Department with the technical support of FAO.

CDE was created as an autonomous institution by Law 4115 of 1955. It is in charge of the production, transmission and distribution of electrical energy. CDE has four departments (administrative and financing, operations, hydroelectric, and planning) as well as offices around the country.

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[1] INAPA, CAASD, and CORAASAN are discussed in the water quality section.

DGF was created by Law 5856 of 1962 initially under SEA with the mandate of Decree 8086 of 1962. Law 5856 declares that the protection and reforestation of forest land is of national interest. Because of the Law, DGF plays an important role in watershed management and protection of forest resources. It provides farmers with certificates allowing them to plant trees and gives harvest rights to those who establish new forest plantations on their properties. Chapter 3, on forestry, provides more details about DGF functions.

SEA, through **SURENA,** has the responsibility to promote the preservation of natural resources, to regulate their use, and to improve the quality of the natural resources base. Within SURENA is the Land and Water Department, which is in charge of providing soil and water conservation services to critical watersheds.

Nizao Watershed Commission was created by Decree 199 of 1992 to implement a protection watershed management plan for the Nizao watershed.

Non-Government Institutions. Plan Sierra, Inc. implements an integrated rural development plan for an area of about 2,000 km^2 (the "sierra region"). This area includes the municipalities of San José de las Matas, Jánico and Monción. The development of agroforestry systems, soil conservation and forest management are important activities carried out by Plan Sierra with community participation. Financial support comes from the government and international donors.

The JUNTA of Ocoa located in the Ocoa watershed, implements soil conservation practices, agroforestry, and reforestation, all with community participation. The financial support is provided by the government and international donors.

ENDA-Caribe, a subsidiary of ENDA in Senegal, has its offices in Santo Domingo and is implementing agroforestry systems and soil conservation practices within the Chacuey watershed in Zambrana, Cotuí. Enda-Caribe receives financial support mainly from international donors.

Pronatura is an umbrella organization of persons and NGOs dealing with natural resources development activities. Its main objective is conservation and sustainable development of renewable natural resources. Pronatura provides institutional and financial support for activities implemented by NGO members.

Junta de Regantes was created in 1990 to provide responsibility for the administration and maintenance of the irrigation systems, as well as to establish and collect water tariffs. The creation of the Juntas is specified in Law 6 of 1962. There are two Juntas de Regantes that are doing a successful job in Azua and Santiago.

2.1.3 Analysis

The policy framework indicates the existence of a plethora of legislation that deals specifically with watershed management, water use and water management in the country. Several institutions have been created to deal with watershed management or to use watershed resources: INDRHI, INAPA, CURENA/SEA, DGF, DNP, CDE and others. Unfortunately, the existence of legislation which empowers institutions to address issues related to water use and watershed management does not necessarily translate into coherent plans of action.

INDRHI's mandate is the provision of water for irrigation purposes and even though it was created in 1965 to be responsible for watershed management (Law 6), it did not make significant efforts on watershed management activities until 1991, when a watershed management unit was created. The institution has focused primarily on construction of irrigation canals and dams. Because the main objective has been construction, the Executive Director must be a Civil Engineer (as specified by Law 6). In addition to management, most of the technicians are civil engineers.

Presently, INDRHI is developing a watershed management plan for the Nizao watershed with FAO technical cooperation. There are two technicians involved in this plan with specialization in watershed management from CATIE and Utah State University.

INAPA, the agency responsible for drinking water supply, was assigned by Law 5994 the mandate for watershed protection and of securing a sustainable water supply. INAPA has not yet carried out any watershed management activities. Another institution involved in watershed management is DGF, which also has responsibility for watershed protection, forestry management and reforestation.

Most institutions have been unsuccessful as a result of their lack of strategic planning, limited leadership, and lack of resources to carry out their obligations. Thus, the diversity of institutions with responsibilities for watershed and water management has not contributed to the improvement of the condition of watershed resources.

INDRHI initiated the decentralization process with the creation of Juntas de Regantes as a result of the implementation of a water management project with USAID support. The participation of NGOs such as the JUNTA de Ocoa, Plan Sierra and the Junta of Regantes of Santiago and Azua—should be taken into consideration by public institutions for future planning and implementation purposes. The Juntas de Regantes of Azua and Santiago are in charge of the administration and maintenance of the irrigation systems, as well as the establishment and collection of water fees. They have reduced the use of water by up to 50 percent and have increased the price of water and the collection of fees. These are good examples that should be promoted and supported by INDRHI and imitated by other institutions.

Much of the legislation is obsolete and does not reflect the reality of a growing population and the increased competition for scarce resources. Water is a scarce resource in the

country, but present policies do not adequately address its scarcity value. For example, irrigation fees are extremely low and are based on the area irrigated rather than the volume of water used. According to INDRHI the fee for irrigation water is between RD$ 60 and RD$ 150 (US$ 4.80 - US$ 12.50) per hectare/year, no matter what volume the farmer consumes. The rate doubles for rice production or if the farmer irrigates more than 10 hectares. There is no connection between the crop grown and the quantity of water required for that crop at a specific time.

This rate structure promotes inefficient use and the waste of irrigation water, although the rate itself is administratively simple. The rate structure also perpetuates the idea among users that water is practically a free resource to which the users have a right. Present fees are insufficient to cover even the costs of operation and maintenance of irrigation systems. In those cases where irrigation districts are run autonomously, however, fees are reported to be higher and collection rates better. Still, the water districts do not collect sufficient funds to cover all operation and maintenance costs, and self-sufficiency should be a goal.

User fees for domestic consumption are higher, but they are also established on a fixed-fee basis. Very few water meters exist in the country. According to INAPA, water fees are set at RD$ 50 (US$ 4.00) per household per month regardless of the volume of water consumed, thereby providing no incentive to conserve water.

The proposed water law that INDRHI will submit to the Congress specifically addresses the issue of water fees for irrigation. The new law proposes that water rates be established annually by the Executive Branch based on a proposal by INDRHI. Under the proposal, the rates will be established to account for the costs of construction, administration, conservation and maintenance, in an apparent effort to recover costs that are currently covered by government subsidies. The proposed law does not determine whether fees will be based on the volume of water used or by the land area, as currently established under law.

The public sector is dominated by relatively weak institutions which often have overlapping jurisdictions and few resources to respond to their mandates. For example, an analysis of the legislation indicates that INDRHI, INAPA, DGF, DIP and the Land and Water Department of SEA have responsibility for the protection and rehabilitation of watersheds. None of these entities have demonstrated a capacity to develop and undertake an integrated approach to watershed management. INAPA only focuses on water quality for human consumption, DGF has been concerned with forests, and the Land and Water Department of SEA has had very limited resources. INDRHI is the institution that has had the most resources, but it wasn't until 1991 that it created a Watershed Management Unit. This unit is still too young to have its performance evaluated, and dam construction and irrigation district management remain as INDRHI's priorities.

During the past, INDRHI and SURENA have carried out training programs for their technical personnel at the graduate level under USAID sponsorship. However, due to low

salaries, most of the trainees are not working in the public sector and the few that remain are dealing with administrative duties.

The President of the DR has felt compelled to create commissions to deal with specific environmental issues as a response to public pressure. One example is the case of the Nizao watershed, where the Government has made a substantial investment in the infrastructure of the Valdesia and Higuey-Aguacate Dams, and the aqueduct for the city of Santo Domingo. Because no watershed management programs were implemented, the Nizao watershed continues to suffer from serious degradation. The Government, in order to establish and implement a watershed management plan, issued a decree creating the Nizao Watershed Management Commission, made up of representatives from each one of the institutions that use watershed resources or have watershed management responsibilities. The decree required the resettlement of farmers living in the upland areas of the Nizao watershed, as well as intervention to protect and rehabilitate the watershed.

This decree represents a significant policy intervention, and it indicates a willingness to address what has appeared to be an intractable problem. However, the implementation of the solution should take into account the need to work with farmers and local development groups to delimit the restricted areas based on scientific studies. A combination of restrictions and better management practices will help to insure that the government can achieve its watershed goals.

The decree also indicates a tendency on the part of the Government to react to critical situations. Since institutions in the water sector are weak, the GODR is forced to respond to the inaction of institutions and their lack of resources by issuing decrees in an effort to squelch protests. If the institutions were viable, decrees such as the one enacted for Nizao would probably not be required.

Creation of commissions with parallel functions to the official institutions contributes to the deterioration of those institutions and reduces leadership and coordination. Financial and technical resources from formal institutions have to be assigned to the commissions, because the commissions themselves do not have those resources. In fact, most of the work of the Nizao commission is done with the support of the watershed management unit at INDRHI.

The proposed water law attempts to address the issue of low institutional resources. The law proposes that public and private firms that use water from a watershed to generate electricity make a monthly payment to INDRHI equal to 2 percent of the value of the electricity generated by water used in the hydroelectric plants. The money collected from this surcharge would be used exclusively to undertake watershed conservation measures.

If this policy is accepted, INDRHI would have resources at its disposal to undertake conservation measures in watersheds throughout the country. The policy has significant merit, especially for conservation activities. The challenge for INDRHI will be to collect the surcharge and to coordinate activities with the various agencies that have a role in watershed protection.

Current policy establishes that government institutions do not have to pay for electric energy. According to CDE, state agencies owe considerable sums of money for electric power. This "free" energy distorts the costs of providing water, sewer and other services, and promotes inefficient power use. CDE can not operate on a commercial basis or develop a program for energy conservation when it must provide a significant portion of its energy free of charge.

CDE's major concern is that it only collects about 50 percent of the bills it sends out and much less than 50 percent of what it generates. Government agencies pay nothing for electricity. According to CDE, the various water authorities owe CDE millions of dollars that it cannot collect.

Recently, INDRHI appears to have taken the lead in coordinating watershed management policy with the participation of public and private institutions. Unfortunately, INDRHI does not have the institutional strength to deal adequately with watershed management. Despite its great interest and desire to accomplish its mandate, INDRHI is seeking to address these shortcomings through institutional arrangements with IICA and FAO, which are providing short-term technical assistance. The FAO assistance is focused on the development of a watershed management plan for the Nizao River.

Policy formulation is often hampered by coordination problems among various organizations with overlapping jurisdictions. The inability to coordinate activities leads to a lack of program implementation and breeds resentment among institutions. For example, in the development of the new water law the GODR created a Water Commission composed of INAPA, CDE, INDRHI, CORAASAN, CAASD and various irrigation districts. INAPA voiced concern that the final draft of the law was submitted to the President without its final review; in fact it was unaware that the law had been submitted. This lack of coordination will most likely lead to greater conflict between INDRHI and organizations such as CDE and INAPA, who have legitimate claims to management roles that INDRHI wants to control.

A weakness of the proposed law is that it does not adequately deal with potable water or make reference to public health laws or institutions charged with controlling the supply of drinking water. The law states only that drinking water should receive the highest priority use. The law establishes INDRHI as the preeminent institution in water, while ignoring the role of other institutions. Poor coordination has led to a relatively incomplete piece of legislation. On the positive side, the law states that INDRHI will charge other institutions for the use of water; but nothing is said regarding the level of fees and how they will be levied.

It is important to mention that there is neither a national strategy for natural resources management nor a national watershed management plan for the country. Consequently, public and private organizations are unable to focus their actions on priority watersheds. Indeed, policies on watershed management have focused on preservation of resources rather than on sustainable management. The preservationist approach of the GODR looks at the protection of the resource base from a biological viewpoint without incorporating a very crucial element: the people living in the watershed.

In summary, the key policies affecting watershed management, water use and water management are the inappropriate water-pricing policies, the fact that Government institutions do not pay for water and electricity use, the low levels of coordination among institutions, the numerous and obsolete laws and regulations, and the absence of a national strategy on natural resources management.

2.1.4 Potential Policy Alternatives

The following recommendations address watershed management, water use and water management policies:

- Design a policy on integrated watershed management under the leadership of INDRHI, and provide it with a solid mandate and adequate resources to carry out the policy. Sustainable management should be a goal, including programs for improved agricultural development and afforestation;

- Develop a national watershed management plan and a strategy for sustainable natural resource management;

- Seek technical assistance in watershed management and natural resources planning;

- Incorporate NGOs with technical capability on watershed management activities;

- Undertake efforts to increase irrigation efficiency through improvements in irrigation infrastructure and on-farm water use;

- Design a mechanism to eliminate the waste of water from leakage losses;

- Develop a coherent energy policy as well as programs to address the issues of deforestation of watersheds due to the use of firewood and charcoal;

- Expand the water law proposal (water code) to include aspects related to the drinking water supply and its management;

- Require all government agencies and industries to pay for their use of electricity. The cost of water delivery should reflect the costs of electricity used for water system operation; and

- Expand the policy to decentralize control of water systems with power to establish water use fees in the hands of autonomous water management bodies and NGOs. The GODR needs to build on successful approaches such as the Juntas of Regantes.

2.1.5 Recommendations for Future Research and Analysis

More information is needed to make further policy recommendations. The following research studies and analyses are recommended:

- Carry out a study to determine the economic value of water in the country in an effort to move water prices closer to economic value;
- Study a more coherent water pricing policy to stimulate more efficient use of water. In the domestic, industrial and irrigation sectors, water fees should be based on the volume of water used and reflect the value of water as a scarce resource, including the cost of protecting water sources;
- Study mechanisms for strengthening the capacity of institutions to respond to watershed management and water resource management problems in the country. The study needs to focus on mechanisms to overcome institutional paralysis and promote coordination among groups;
- Study in more detail the institutional framework in order to reduce overlapping functions, and to update their functions, focusing on a conceptual approach for watershed management and water resources management; and
- Study and promote water saving technologies for irrigation.

2.2 Water Quality

The poor quality of the nation's water resources is a severe constraint to making improvements in public health and on the overall economic development of the country. Most of the country's surface water is contaminated and groundwater supplies are either polluted or subject to contamination. The principal factors affecting water quality in the DR are:

- Lack of treatment of domestic and industrial waste;
- Disposal of raw, solid and liquid waste into rivers, streams and ocean waters;
- Uncontrolled use of fertilizers and pesticides that are washed into rivers and streams;
- Deforestation of watersheds which causes the sedimentation of rivers, streams and water canals and therefore increases overall water turbidity and alters the amount of fresh water inflow, impacting on coral reef formation;
- Injection of untreated sewage directly into aquifers;

- Direct dumping of solid wastes into rivers, streams and coastal areas and waste disposal on inappropriate sites subject to run-off; and

- Percolation of contaminated surface waters from surface dumps that subsequently contaminate groundwater.

The major sources of water pollution in the country are from domestic- and industrial-point discharge into rivers, streams and marine waters. There is virtually no treatment of sewage in the country. According to SESPAS, only 21 percent of the urban population is connected to a sewage system, while 50 percent are estimated to use septic tanks or latrines. The remaining 29 percent have no means of disposing of human waste. In rural areas the number of people without sewage service of any kind is estimated at 71 percent. However, even where people are connected to systems, the sewage is untreated and is discharged directly into water bodies. Other contamination occurs from leaching of contaminants into groundwater from poorly maintained latrines and septic tanks. Where there are no services, raw sewage is carried into waterways from runoff during rain storms.

TABLE 2.6 Major Reported Diseases Dominican Republic, 1991

Reported Diseases	Cases	Percent
Acute Respiratory Diseases	333,748	55.6
Diarrheal Diseases	216,559	36.0
Typhoid Fever	12,066	2.0
Sexually Transmitted Diseases	17,412	2.9
Hepatitis	3,502	0.5
Measles	10,807	1.9
Malaria	733	0.1
Tuberculosis	3,647	0.7
Others	1,497	0.3
Total	599,971	100.00

Source: SESPAS. May 22, 1992. Sanitation Project for the Dominican Republic

The lack of sewage treatment and high level of water contamination, combined with limited drinking water treatment capability, constitute a serious health problem for the DR. The incidence of water borne diseases is very high in the country and diarrhea is a major cause of morbidity among Dominicans. Table 2.6 indicates the incidence of reported disease in the country. Nearly 40 percent of all reported cases result from poor environmental conditions. If one considers that incidence of acute respiratory infection is more prominent among children weakened from diarrheas, the number is even more alarming. In 1986, of the total number of cases of gastroenteritis in the country, 75.2 percent of those cases occurred in children of less

than five years of age (SESPAS, 1992). In fact, gastro-intestinal diseases represent one of the major causes of infant mortality in the country; the infant mortality rate is estimated at between 65 and 100 per thousand (World Bank, 1992a).

As population grows and tourist activities increase, the amount of sewage dumped into Dominican waters will continue to increase. In addition to the health effects on humans, this contamination causes eutrophication of water bodies and the destruction of aquatic life. Freshwater fish populations are threatened, marine habitats altered, and the areas affected by contamination lose their recreational value.

Industries represent another major source of pollution in the country. The most serious industrial pollution problems are concentrated in cities, and are now affecting residential areas. There is no general planning or zoning that separates industrial and residential water users.

The severity of the problem became apparent in 1990 when drought caused a decrease in the volume of water entering the Ozama River. With less water to dilute the pollutants the smell from factory discharges became unbearable and inspired citizens to request government action to address the problem.

According to statistics of the recently established Ecological Commission, emissions of industrial pollutants significantly exceed all international emission standards. The Commission is requiring that all plants submit plans for effluent treatment, and that these be ready to go on-line some time in the very near future. Unfortunately, there is very little data available to measure the overall impact of industrial pollution and the level of natural regeneration of water courses after the emission of pollutants.

Non-point sources of pollution represent a major concern in the DR, but there is little data indicating the severity of the problem. The primary non-point source pollutants are sedimentation from degraded soils, saline water waste from irrigation systems, leaching of pollutants from poorly maintained waste disposal systems and toxins from agrochemical use.

Increased turbidity and sediment loads in rivers and streams lead to more rapid sedimentation of dams, waterways and ports, and, subsequently, to higher maintenance costs and shorter life spans for infrastructure. As levels of turbidity increase, so does the likelihood of increased eutrophication, instability of river banks and alteration of riverside and coastal ecosystems. Turbidity also appears to negatively affect the production of coral along the coasts.

Poor management of irrigation systems in the DR has contributed to increased soil salinity. Estimates indicate that 58 percent of irrigated land in the DR may be affected by salinity. (TR&D, 1992). Increased salinity of irrigation run-off can contaminate freshwater and render water useless for further irrigation or other uses.

Poor farming practices, specifically the overuse of pesticides and the inadequate handling of chemicals for agricultural purposes, lead to water contamination from various types

of residues. Residues can enter water courses from run-off or can leach into aquifers and contaminate water wells. Limited programs to educate farmers in the use of agrochemicals results in situations where, for example, farmers wash their chemical applicators in water courses.

The increasing level of contamination represents an economic cost to the country in terms of increased maintenance of infrastructure, loss of productivity due to human illness, and the loss of appeal of recreation areas. This latter point could have particularly severe economic consequences because of the DR's increasing dependency on tourism. Contamination of areas frequented by tourists or increased incidence of gastro-intestinal diseases among visitors could force tourists to look elsewhere for holiday destinations. The contamination also alters the aesthetic quality of the environment, a quality for which tourists pay a premium. The competition among the Caribbean Islands for tourists is very high, and environmental contamination could easily make the DR less competitive.

The poor quality of the water delivered by INAPA, CAASD, and CORAASAN has increased the number of companies dedicated to provide bottled water.

2.2.1 Policy Framework

Water quality policies in the DR are based on the Health Code of 1956 and on water quality policies promoted by international organizations such as the World Health Organization (WHO), the Pan American Health Organization (PAHO), and the **Comité Coordinador Regional de Adiestramiento a Instituciones de Agua Potable y Saneamiento** (CAPRE - Regional Training Committee for Drinking Water and Sewage Institutions).

The DR has passed various laws to address the issue of water quality. As a result, various institutions have responsibilities for controlling and monitoring the country's water quality. Overall authority for water is defined by Law 6 of 1965. It also assigns responsibilities for watershed management, water quality and management of all groundwater sources in the country. Law 4471 of 1956 created the Health Code and defines responsibility for the control of water quality in the country, including monitoring drinking water quality and industrial discharges, and Law 5852 of 1962 outlines general water use in the country. Several laws have been passed to modify articles of this law (Table 2.3). Laws and decrees addressing watershed protection include:

- Law 5056 of 1954 which protects the headwaters of the Yaque del Sur, Mijo and San Juan Rivers;
- Law 4991 of 1958, which prohibits the disturbance of watersheds of Haina and Duey Rivers;
- Law 632 of 1977, which prohibits tree cutting at the headwaters of rivers;

- Decree 2724 of 1968, which prohibits disturbance of the Catalina River and adjacent areas; and

- Decree 199 of 1992, which prohibits human activities on the Nizao and Yuna River watersheds, to protect Valdesia, Higuey-Aguacate, and Hatillo Dams. The State claims the right to all land on the upper watersheds and the right to resettle populations.

Law 5994 of 1962 defined authority and policy for drinking water and sewage in the country. However, Law 498 of 1973 defined the authority and policy for the supply and quality of drinking water and sewage for the city of Santo Domingo. Four years later, Law 582 of 1977 defined the policy and authority for drinking water and sewage for the city of Santiago.

In 1990 the GODR issued Decree 226 to monitor and control water contamination in the country, especially with regard to industrial wastes. Unfortunately, there are no water-quality standards developed for the country. Any standards applied are generally on an ad hoc basis and are based on those established by WHO. A new health code has been approved by the Congress and it is being reviewed by the Executive Branch.

Policies that address the issue of ocean contamination have not been well developed in the DR. Law 5214 of 1962 prohibits the dumping of substances noxious to fish populations in water courses and assigns implementation to the Department of Fisheries. This legislation is quite general in nature and does not specifically address ocean contamination.

2.2.2 Institutional Framework

Several institutions deal with water use, water quality, and water management. Some of these institutions, such as INDRHI and CDE, were defined in section 2.1. Local and international institutions with major responsibilities for water quality are the following:

International Institutions. **WHO** and **PAHO** provide technical assistance to SESPAS in the application of water quality standards. These organizations also collaborated in the formulation of the new health code, which has been approved by the Congress and is being reviewed by the Executive Branch.

CAPRE, a regional committee, takes technicians from institutions dealing with drinking water and sewage—such as INAPA, CAASD, and CORAASAN—and offers them short-term training on water management, distribution and quality.

Governmental Institutions. Law 4471 of 1956, the Public Health Code, gave responsibility to the **Secretaria de Salud Pública y Asistencia Social** (SESPAS - Secretariat of Public Health and Social Assistance) for any work related to the provision of drinking water and related services such as sewage, industrial use and drainage. The law required that all urban centers be provided with both drinking water and sewage disposal systems. SESPAS was also

required to insure against the contamination of water courses. It plays an important role in monitoring water quality and the sewage disposal programs in fringe urban areas and in small rural communities. SESPAS is a member of the Administration Council of INAPA.

Law 5994 of 1962, created **INAPA** as an autonomous institution and gave it responsibility for the provision of water for domestic and industrial uses and for sewage disposal in both urban and rural areas. INAPA was also charged with pollution control. The role of INAPA was expanded to include responsibility for watershed afforestation by Law 8955 of 1963 in recognition of the need to preserve water sources.

The role of the INAPA began to erode during the seventies. In 1973 Law 498 created the **Corporación de Acueducto y Alcantarillado de Santo Domingo** (CAASD - Corporation of Drinking Water and Sewage of Santo Domingo) giving it responsibility for water supply and sewage disposal in Santo Domingo. An institution with responsibilities similar to CAASD, the **Corporación de Acueducto y Alcantarillado de Santiago** (CORAASAN - Corporation of Drinking Water and Sewage of Santiago), was created by Law 582 of 1977. These two pieces of legislation served to restrict the role of INAPA to smaller urban and rural areas.

INAPA's functions include the design, planning, coordination, construction, supervision, administration, commercialization, operation and maintenance of rural and urban aqueducts for rural and urban areas (except for Santo Domingo and Santiago). CAASD and CORAASAN perform all of these same functions for Santo Domingo and Santiago.

The State Coordination and Auditing Office was created in 1986. This institution is in charge of the construction of aqueducts and infrastructure for water sanitation and for government-built housing.

INDRHI also monitors industry installations to avoid dumping wastes into streams and to suggest solutions for existing problems.

National Commission for Ecological Sanitation was created by Decree 226 of 1990. This commission is in charge of the establishment of pollution standards and advises industries on pollution control and enforces industries to build treatment plants to control discharge of wastes.

The **Navy** in cooperation with INAPA, participates in the maintenance of wind mills installed in the country.

2.2.3 Analysis

The DR has sufficient legislation to deal with the problems of water contamination from both point and non-point sources of pollution in the country. Water quality responsibilities are under control of several institutions with legal authority. The contamination problem arises as a result of an apparent inability to implement existing legislation. None of the public institutions

charged with controlling water quality has the resources to adequately monitor discharges. Overlapping of functions, institutional weakness and a lack of financial resources are the main problems facing those institutions.

SESPAS does carry out some water quality monitoring, but has few resources to adequately respond to the challenge of monitoring the major point sources.

The creation of the National Ecological Sanitation Commission represents a super-imposition of authority over established institutions in an effort to address what was considered an urgent problem, i.e. the failure of constituted agencies to deal with polluted water, especially in the cities of Santo Domingo and Santiago.

The Commission requires that each factory install a treatment plant to ensure that all discharges meet international water waste quality emission standards. The work of the Commission appears to be quite successful and indicates a will to respond to what Dominicans have identified as a serious problem. However, due to the ineffectiveness of the public institutions charged with ensuring water quality, a decree had to be enacted to charge a Commission with the duties. The approach solves an immediate problem but does nothing for the capabilities of public institutions.

Institutions like INAPA, CAASD, and CORAASAN are not economically sustainable under present management policies. All of them face the problem of illegal connections by users of the water distribution system, which reduces efficiency and quality due to low recuperation rates and low water fees. The resources obtained from selling water do not cover the costs of maintaining the drinking water system. INAPA is subsidized by the central Government for 60 percent of its costs. One of these subsidies is INAPA's electricity bill, which, according to CDE, has never been paid.

INAPA is responsible for drinking water quality in the country (excluding the cities of Santo Domingo and Santiago). However, it does not have the financial capacity to monitor water quality and administer all the existing aqueducts. To improve efficiency of water use and quality, INAPA should pass the administration of those small aqueducts to organizations in their respective communities (NGOs).[1] This will allow INAPA to concentrate its efforts on large aqueduct systems, and to charge reasonable prices for water.

The aqueduct systems of Santo Domingo and Santiago, under the administration of CAASD and CORAASAN respectively, also have quality problems. Neither institution can count on sufficient financial resources to monitor and secure good water quality or to adequately maintain the systems.

[1] The DR has had successful experiences with organizations constructing and managing small drinking water systems.

Another factor affecting water quality in the cities of Santo Domingo and Santiago is industrial development without the establishment of appropriate treatment plants for waste discharges. As stated above, the National Ecological Sanitation Commission was created due to institutional inefficiency, lack of coordination and lack of financial resources—among other factors. This Commission has been in charge of advising industries on the design and construction of treatment plants to maintain water quality in the Ozama and Yaque del Norte Rivers.

The Commission also has the responsibility to monitor and enforce water quality standards. The Commission has been working at establishing water treatment plants with most of the industries that discharge waste into the Ozama and Yaque del Norte Rivers. Even though its work is recognized as successful, its functions overlap with other institutions with the same mandate.

The Commission carries out monitoring, charging factories a fee for its analysis. According to the Director of the Commission, the fee is sufficient to cover the costs of travel to the field, laboratory work and the salaries of its technicians. The current fee is RD$ 5,000 per analysis.

Another major source of point pollution is the discharge of human waste from urban sewage systems and private disposal systems (in hotels for example). Ironically, the discharge of untreated or poorly treated water waste systems makes the GODR one of the principal point source polluters in the country. Since the lack of resources inhibits the improvement of water waste systems and since the GODR is unlikely to sanction itself, there is no immediate hope that the problems of raw sewage discharge from municipal systems will improve. Improvements can be made, however, in monitoring private dischargers while efforts are undertaken to improve the performance of government agencies and municipalities.

Although legislation guarantees that Dominicans have the right to quality water, water treatment is seriously deficient in the country. According to INAPA, water quality is acceptable in only a handful of locations across the country, with a high correlation between water quality and tourist areas. This occurs mainly because of the demand for high-quality vacations with services equal to those found in visitors' home countries of Europe and the United States. These economic pressures appear to have resulted in a response from the GODR. However, water treatment is quite deficient in other areas. Water treatment suffers from poor operation and maintenance, lack of resources for providing treatment and an inability to obtain chlorine on a continual basis.

Non-point pollution appears to be more of an intractable problem, especially when considering the poor level of control of point sources. Legislation does prohibit actions that contaminate water, but these are almost impossible to enforce. Education is required at the national level to raise awareness of the dangers of non-point pollution to human health and economic development. Otherwise, even the best legislation will go for naught.

Two new laws have been proposed that deal with the issue of water quality. The new health law will define the role of SESPAS in water quality control and prohibit actions that contaminate, directly or indirectly, water supplies in the country.

This new legislation also addresses the problem of overlapping institutional jurisdictions, but does not achieve a complete clarification of roles. If approved, the new legislation will challenge the existence of the National Ecological Sanitation Commission. The proposed water law provides a much more extensive system of sanctions for violators, including prison terms and high fines.

The proposed new health code does not address the issue of standards, but does attempt to re-establish the preeminent role of SESPAS in monitoring and controlling the contamination of water supplies. The new water law proposed by INDRHI also addresses the issue of water contamination, establishes its role in pollution control, and raises the question of which of these two agencies will take the lead in this area.

2.2.4 Potential Policy Alternatives

The following policy recommendations address water quality issues:

- Establish more realistic fines to limit contamination of water sources. Many of the present fines are obsolete and do not deter polluting activities. Fines and sentences should reflect the value of the damage that would occur from contamination and be sufficiently severe to deter undesirable behavior. Without realistic sanctions, water quality regulation and control may be almost impossible to achieve;

- Consolidate the new water and health laws before their approval to better define institutional roles and responsibilities. Agreement should be reached to insure a cohesive water quality strategy;

- Establish realistic water quality standards for the country and enforce their application. The GODR should analyze the success of the National Commission for Environmental Sanitation to assist in devising a strategy for monitoring and control of industrial wastes;

- Develop a policy stimulating participation of the public and private sectors to successfully provide drinking water treatment, as well as disposal and treatment of human wastes;

- Develop an education policy in schools and through extension programs that addresses the problems of non-point pollution and offers realistic alternatives for all Dominicans. The program should stress the need for integrated watershed management;

- Develop a policy that requires an environmental assessment of all major industrial and hotel projects to insure that all wastes are adequately treated before discharge, either into rivers or the ocean;

- Adopt strict measures to insure the quality of ocean waters, including sanctions for ocean dumping of oil, garbage or other pollutants;

- Prohibit the practice of discharging sewage into underground aquifers; and

- Establish policies to control sewage discharges and improve water quality of inflows into the ocean. Water discharge standards should be developed.

2.2.5 Recommendations for Future Research and Analysis

The following studies are recommended to provide information required for further policy alternatives in water quality:

- Study the feasibility of decentralizing and privatizing drinking water treatment and waste water treatment, assigning more of a monitoring role to the State; and

- Study mechanisms for improving the control of dumping and discharge into coastal waters. Review current policies on ocean dumping, analyze their environmental impact, and propose a new policy under the management of competent institutions.

2.3 Coastal Zone Management and Fisheries

The DR is bordered by the Atlantic Ocean to the North, the Caribbean Sea to the South, and is separated from Puerto Rico to the east by the Mona Pass. The coastal zone extends for 1575 km of extensive geographic and ecological diversity. The coast is characterized by coral reefs, sandy beaches and wetlands connected to inland lake systems.

In the DR the mangrove areas are indispensable for the maintenance of fishing zones and for various species of shrimp in the Samaná Bay area, where the largest mangrove area in the country is found. There are more than 20,000 hectares of mangrove forests in the country (TR&D, 1992). Mangroves are important for food chain support, shore line stabilization and water quality enhancement. The vegetation is threatened by flooding and nearby rice cultivation in the lower Yuna River basin.

The numerous fresh and salt water wetlands are important resources for fisheries. They are potential sources for aquaculture as they are protected from ocean encroachment by natural coastal barriers. Given the level of protection, there is very little exchange of waters in lagoons, making them susceptible to accumulation of contaminants and eutrophication. Many of these lagoons are already suffering from eutrophication because of non-point pollution.

Other important coastal resources in the DR include extensive coral reefs, seagrass beds, dunes and beaches and marine fisheries. Coral reefs are scattered along nearly the entire coastline of the Dominican Republic, with the largest concentrations along the north coast. Providing habitats for numerous species of marine life, these reefs represent a diverse ecological community. In addition, mangroves provide breakwaters that protect bays and estuaries and limit coastal erosion, protecting the beaches that are important for the DR tourism industry.

Coral reefs grow along coastlines in clean waters that are free from sediments and run-off containing pollutants. These reefs are now threatened due to high sediment levels, increasing water pollution and tourists who buy pieces of coral for souvenirs. Also, there have been reports of private hotel interests dynamiting reefs to open up access to boats in areas along the north coast.[1]

Seagrass beds are found throughout the coastal waters of the country. In some areas they are extremely dense, representing approximately 80 to 90 percent of the available substrate (TR&D, 1992). These grasses are extremely productive near shore environments, providing a large quantity of food for grazers such as fish, green turtles, shrimp and crabs. They are also nursery grounds for commercial fish such as snapper and grunt and invertebrates, including lobster.

Seagrasses are sensitive to toxins, high temperatures from thermal discharges and over enrichment. Seagrasses are also threatened from high turbidity and lowered levels of salinity due to freshwater discharges containing high sediment loads.

Beaches and dunes support a large number of plant and animal species. The dunes also support organic matter that create an array of filter feeders, which serve as sources of nutrients for coastal birds. The major distribution of beaches is along the northern coast. These beaches are important attractions for tourists which contribute enormously to the economy of the country. The characteristics of coastal areas and their geographic distributions appear in Table 2.7.

Marine fishing is primarily artisanal and is considered to be of low productivity. This low productivity is a result of the narrow continental shelf and the lack of fishing tradition in the country, including a lack of fishing promotion by public- and private-sector entities. According to INDOTEC statistics, the catch in 1980 was estimated at 26,247 tons compared to 17,147 tons in 1988. Of the 17,147 tons, 14,958 tons were marine species (12,083 tons along the coast and 2,876 tons on the high sea) and 2,188 tons were in interior waters. Twenty percent of domestic consumption of fish is satisfied by imports (World Bank, 1992).

One of the greatest threats to coastal areas is the increasing level of tourism in the country. The Government's attempt to attract tourism has been very successful. The vast majority of tourism activity has occurred in coastal regions and has brought with it essentially

[1] José Morato, Secretariat of Tourism. 1992. Personal Communication.

TABLE 2.7 Coastal Classification of Critical Areas

Geographic Areas	Mangroves Wetlands	Lake and Pond Systems	Seagrass Beds	Coral Reefs
Northwest Pepillo Salcedo to Puerto Plata	Pepillo Salcedo and Icaquitos Bay	Saladilla, Salina, Piedra, Marigo, and Corto Pies Ponds	Monte Cristi Bay Icaquitos Bay	Extensive: Monte Cristi Buren Point, Cape Isabela and Puerto Plata
North Central Puerto Plata to Samana	Arroyo Hondo, Rio Yuna, Rio Barracote, San Lorenzo Bay and La Jina Bay	Laguna Cabarete		Dispersed Coral Areas
Northeast Samana to Saona Island	Laguna Redonda, Laguna de Limon, La Majagua Wetland, Point Macao to Cape Engaño and Nisibon Wetland	Laguna Redonda, Laguna Limon, and Laguna Bavaro		Dispersed Coral Areas
Southeast Saona Island to San Pedro de Macoris	Las Calderas, Soco and Higuamo	Laguna Secucho	Catalinita Bay	Dispersed Coral Extensions
South Central San Pedro de Macoris to Neiba Bay	Palenque, Puerto Viejo and Ocoa River		Calderas Bay, East Bay of Ocoa, Puerto Viejo and Azua Bay	Dispersed Coral Extensions, Andres Bay and Ocoa Bay
Southwest Neiba Bay to Pedernales	Yaque del Sur River, San Luis Point and Bucan Base Point to Laguna Manuel Matos	Lagunas Oviedo, Salada and Manuel Matos		Developed System near Barahona and Extensive Dispersed Areas

Source: Hartshorn et al. 1981. Dominican Republic Environmental Profile.

unregulated construction of hotels and tourist facilities. Over 17,784 rooms dedicated to tourism exist along the coast, 51.5 percent on the southeastern coast and 48.5 percent on the north.

In a study presented at the III National Convention on Tourism in 1990, the Secretary of Tourism reported nine negative impacts of tourism on coastal ecosystems. These included the degradation of mangroves, coral reefs, beaches, coastal waters, and lakes and estuaries. In addition, he cited alteration of populations of fauna and abuse of fertilizers and pesticide runoff into water bodies.

Construction of tourist facilities has completely ignored the dynamism of the coastal ecosystem and these facilities have begun to see the results of this lack of attention in increased flooding, erosion of beaches, loss of aesthetic value, and fluctuation of water supplies. Ironically the level of tourism development threatens those resources that make the DR an important tourist destination. Shortsighted tourism development strategies have a deleterious impact on coastal resources and could ultimately threaten tourism development.

Some of the most important coastal areas in the country have been declared national parks in an effort to achieve some level of protection of coastal resources. Areas of these parks have been protected due to their remoteness and inaccessibility to human encroachment. These parks offer protection of coastal marine fauna such as frigate birds, pelicans, turtles, crabs, flamingoes as well as many other species of animals and plants. However, the national parks are affected by encroaching agriculture, woodcutting for fuel, harvesting of turtle eggs and crabs, and destruction of bird sanctuaries. The role of the parks in protecting biodiversity and coastal resources is discussed in depth in the chapter on biodiversity.

2.3.1 Policy Framework

Table 2.8 lists the major policies affecting coastal zone management and fisheries in the DR, classified according to policy type. Most of the legislation relates to fisheries, and tourism and is sector-oriented. There is no comprehensive coastal resources legislation in the country.

Fishing activities are regulated and administered by SEA's Department of Fisheries, whose functions are defined by Law 8 of 1965. The most important function of the Department of Fisheries is the regulation of fisheries through the application of Fishing Law 5914 of 1962. The legislation provides for general control and administrative measures as well as the protection of fishing areas. The law prohibits dumping of industrial or toxic wastes into waters, controls drag netting in non-permitted areas, and limits modification of coastal vegetation. In addition, the law stipulates measures to promote aquaculture for production of freshwater fish and shrimp.

The control of marine and coastal resources in the country has primarily been attempted by the issuance of decrees. A myriad of decrees has been approved to control the destruction of mangroves and to prevent the extinction of marine species through the control of harvesting and sale. Presidential Decree 2011 of 1980 created the Commission for the Conservation of Marine Flora and Fauna. The Commission has not been active and has not contributed much to coastal resource management. One of the strongest Decrees is 303-87, which declares the protection and rehabilitation of mangroves. The decree is very specific in nature, indicating species as well as particular geographic areas in the country where destruction is prohibited.

Some of the most effective legislation in addressing coastal resources may actually consist of laws establishing the national parks along the coast. If protection of the parks is enforced, important coastal resources will be preserved. More information about the legislation on the creation of parks is available in the chapter on biodiversity.

TABLE 2.8 Policies Related to Coastal Resource Management and Fisheries, by Type,

Type of Policy			
Transnational	Macroeconomic	Sectoral	Specific
– International Treaty to prevent oceanic contamination from hydrocarbons; London, 1954 – International Treaty on fisheries and protection of marine resources; Geneva, 1958 – International Treaty on the Continental Shelf; Geneva, 1958 – International Treaty on the high seas; Geneva, 1958. – International Treaty on the resolution of civil claims arising from contamination of the sea from hydrcarbons, (ammended); Brussels, 1969, London, 1976. – International Treaty on the prevention of oceanic contamination from waste and material dumping; Washington, D.C., 1972. – Treaty for the Protection of the Marine Environment of the Greater Caribbean Region; Cartagena, 1983.	– Fiscal policy – Foreign Exchange – Fiscal Budget	– Water resource Management – Tourism Development	– Law 5914 of July 1962; regulates fisheries assigning the responsibility to the Agricultural Secretariat. – Law 8 of 1965: creates Secretary of State for Agriculture and assigns it a mandate over natural resources management policies, including fisheries. – Law 635 of March 1965; modifies law no. 5914 regarding net size. – Law 573 of April, 1977; declares and exclusive economic zone of 200 miles. – Law 26 of 1979; regulates fisheries and establishes mechanisms to promote fish raising. – Decree 1345, May of 1967; establishes measures to prevent extinction of certain marine species. – Decree 1580 of August of 1967; expands on Decree 1345 – Decree 1434 of November 1975; controls public sale of certain marine species during specific times during the year. – Decree 1728 of March 1976; regulates the extraction of coral in territorial waters. – Decree 976 of June 1979; establishes measures to protect crabs. – Decree 2011 of 1980; creates the Commission for the Conservation of Marine Flora and Fauna to study and establish measures for protection. – Decree 313 of October, 1986; prohibits sales of fish species that are dangerous to human health from May to August due to red tide. – Decree 303–87 of June, 1987; declares a policy of protection and rehabilitation of mangrove forests. – Law 305 of May, 1968; controls construction in coastal areas. – Law 153 of June 1973; establishes incentives for tourism, revoked by Law 11 of 1992 (Tributary Code). and the Department of Tourism Infrastructure in the Central Bank.

Coastal resource management has also been affected by tourism legislation. An example is the coastal resource use conflict, a result of the declaration of Monte Cristi National Park's coastal area as a Tourism Development Zone.

Tourism development is established in Law 153 of 1973, which created incentives for the tourism industry and promoted the hotel construction boom along the coast. Even though this particular incentive law has been repealed, it has had tremendous impacts on the management of coastal resources and will continue to do so as construction projects approved under the law are brought to fruition. The incentive law was repealed through the passage of Law 11 of 1992 that approved the new Tributary Code.

The Secretariat of Tourism, created by Law 84 of 1979, and the Department of Tourism Infrastructure (INFRATUR), established under the Central Bank, are in charge of promoting tourism and monitoring the impact of tourism in the country. A recent agreement between the Secretariat of Tourism and the IDB limits development densities and promotes environmental assessments for new projects.

Law 305 of 1968 was passed to regulate construction along the coast. The legislation prohibits construction within 60 meters of coastal marine and tidal zones. This law has been ineffective because it has not been enforced and because the 60-meter limit represents an arbitrary distance that does not take into account ecological considerations.

Law 573 of 1977 defines the 200-mile territorial sea, the 24-mile exclusive economical zone, and the continental platform. This legislation does not, however, specify the concept of optimal use of marine resources.

Some Resolutions have been passed to approve international agreements; Resolution 542 of August 1973 was passed to prevent the dumping of waste in the sea; Resolution 703 of July 1974, to address accidental dumping waste on high seas; Resolution 108 of December 1974 to approve an international agreement on responsibility for damages caused by oil spills on the sea.

2.3.2 Institutional Framework

Institutions involved in fishery resources are: **Departamento de Recursos Pesqueros** (DRP - Fishery Resources Department); the **Instituto Dominicano de Tecnología Industrial** (INDOTEC - Dominican Institute for Industrial Technology); the Navy; the **Centro de Investigación de Biología Marina** (CIBIMA - Marine Biology Research Center); the **Dirección Nacional de Parques** (DNP - National Park Directorate); the Marine Flora and Fauna Protection Commission; the Commission for the Protection of the Hump Back Whales Sanctuary; the Aquaculture and National Fishery commission; and the Center for the Conservation and Ecodevelopment of the Samana Bay Inc.

DRP is the fishery authority in charge of the implementation of Law 5914 of 1962, which mandates the regulation, control and production of fishery resources in the country,

including sea fishing. Furthermore, the DRP has the legal support of Law 8, which gives to SURENA responsibility for defining and implementing natural resources conservation policies, including:

- Establishing policies for fisheries activities;
- Controlling and regulating fisheries activities;
- Providing technical assistance to fishermen; and
- Conducting research on fisheries resources and artisanal fishing.

The DRP has an Aquaculture Experimental Center in Nigua for species development studies. The GTZ is implementing a fishing research and training project on the Southwestern coast with the participation of fishermen associations; and, with the financial support of the Japanese Government, DRP is implementing a fishing training center in the Samaná Bay.

INDOTEC, a semi-autonomous institution, is an entity of the Central Bank. It was created by a Resolution of the Monetary Board to promote industrial development through technological improvement. INDOTEC initiated its activities in fishery resources in 1978 with financial support from IDB, to carry out a fishery resource sector analysis.

CIBIMA is a semi-autonomous institution created by the **Universidad Autónoma de Santo Domingo** (UASD - Autonomous University of Santo Domingo). CIBIMA is doing research on marine species (the hump back whale is one of the species), mangroves, coastal marine biodiversity, and coral reefs. This institution is receiving financial support from the World Wildlife Fund.

DNP has responsibility for coastal resource management and for protection within national parks boundary. This institution is described in the biodiversity section.

The **Navy** provides enforcement activities and support to the Fishery Resources Department in its implementation of sea fishing regulations. The Navy monitors shores and beaches to prevent illegal marine fishing activities, and exercises national sovereignty on territorial seas.

The **Marine Flora and Fauna Protection Commission** was created by Decree 5011 (10-4-1980) for the conservation and protection of marine flora and fauna in the country.

The **Commission for the Protection of the Hump Back Whales Sanctuary** was created by Decree 319 (10-1986).

The **Aquaculture and National Fishery Commission** was created by Decree 1824 (1-23-1984)

The Center for the Conservation and Ecodevelopment of the Samana Bay Inc. (CEBSE, INC) is working on wetlands management in the Samana Bay.

2.3.3 Analysis

The DR has never had an integrated coastal management policy. Present policy is characterized by:

- No legislation that encompasses all coastal resources or that views coastal resources as an integrated whole. Consequently, too many institutions participate in coastal zone management;
- Fishing laws that are coercive rather than supportive in promoting the industry; and
- A lack of understanding of the function of coastal ecosystems and the impacts that unrestrained development could have on those resources.

The coastal resources sector mirrors other resource sectors in that there exists a proliferation of institutions that have at least some small part to play in resource management.

These institutions do not coordinate their activities and often do not concern themselves with issues that do not address their discrete mandate. Since there is no comprehensive legislation, attempts to control and regulate coastal resources have occurred through presidential decrees that create commissions to solve problems which are within the mandates of existing institutions.

Neither the creation of commissions nor the expansion of institutional roles necessarily translates into the allocation of additional resources or to attempts to provide technical training to technicians, allowing them to better carry out their jobs. Often new commissions will have a mandate but are given little authority to carry out their regulatory roles. The result is an unfocussed coastal resource policy and little implementation of the laws, with the consequence of further coastal resources deterioration.

The 1962 fishing law, for example, is highly regulatory in nature in terms of protecting fishing areas, the resources upon which fish depend, and regulating the size of catches. Unfortunately, it does not offer stimulus to the fishing industry, except for aquaculture. Currently, there is no policy to promote fisheries in the country. This lack of support, coupled with the progressive deterioration of coastal resources upon which fish depend, will limit development of coastal fisheries in the economy. Success in fisheries, however, has been achieved in the production of freshwater shrimp.

There is no integrated policy for the management of coastal resources, just as there is no integrated policy for natural resources management in general. Part of this problem arises from the sparse knowledge regarding the structure and function of coastal ecosystems among technicians and professionals in general.

Any policy that attempts to promote integrated coastal resources management must take into account the need for increasing the level of professional competence in the country. For example, Law 305 prohibits construction within 60 meters of the water front and establishes the 60 meters between water front and buildings as the property of the State open to public use. In terms of construction, the 60 meters represents an arbitrary number that may make sense in terms of preserving access to public beach lands, but does not address ecological issues. Sixty meters may be more than enough or may fall far short of protecting fragile lands, depending on the characteristics of a specific area.

Resources are also scarce for monitoring both oil spills and the dumping of waste in coastal waters. The Navy has only two boats to patrol the country's 200-mile economic zone. As a result, the dumping of pollutants can occur with impunity. The DR is signatory to international treaties to control ocean contamination from hydrocarbons, but this international commitment has not contributed to improved surveillance.

The repeal of the law providing incentives for tourism will provide the halt needed to establish some order in the tourism industry. With the repeal, it may be easier to establish some environmental controls over the hotel industry to insure that coastal resources are managed effectively. Establishing controls may be difficult due to the political influence and economic power of the Hotel and Restaurant Trade Association, which resists controls on tourism.

An IDB agreement with the Secretariat of Tourism represents an important step toward the management and protection of coastal resources in the country. The agreement requires that all tourism projects be subject to an environmental assessment prior to their approval, and that each assessment follow established norms. In addition, the agreement calls for land regulation to control the density of tourist units and the type of construction.

This agreement is being implemented, but a major limitation to its successful implementation may be the lack of technical personnel trained in conducting environmental assessments. Another major problem is the fact that the Secretariat of Tourism appears less interested in environmental standards than in simply increasing the number of hotels and their room capacity.

Attention must also be given to the deterioration of watersheds, which increases the amount of sediments that flow into rivers and eventually reach the oceans. These sediments affect the aesthetic quality of waters along the coast and negatively affect the health of coral reefs. Watershed destruction also affects the yearly flow of water in rivers. Reduction and even elimination of flow in some rivers can have extremely negative effects on coastal resources which depend on freshwater outflows to regulate environmental conditions necessary for their productivity. Changes in the hydrological system from upstream activities can have very serious impacts on coastal resources. Lack of attention to watershed management can therefore seriously threaten coastal resources.

Lack of attention to issues surrounding water quality can also have serious consequences for coastal resources. Direct dumping of sewage into the ocean and the increased levels of pollutants coming from non-point sources threaten the viability of marine life and destroy the aesthetic quality of the coasts. Unless the GODR can implement policies to control the level of water pollution flowing into coastal areas, coastal resources will remain threatened.

2.3.4 Potential Policy Alternatives

Important policy alternatives for coastal zone management and fisheries include:

- Establish and implement a coastal resource management policy for the country that addresses the needs of the ecosystem and the long-term development goals of the country;

- Establish one institution to manage the global coastal policy and ensure that there is a coordination mechanism established between the lead coastal institution and leading institutions in the water resources, forestry and tourism areas;

- Create a policy to legitimize by law the requirement that all major construction projects be subjected to an environmental assessment and that mitigating actions be planned prior to approval;

- Undertake a plan to consolidate all laws and decrees that deal with coastal resources and design comprehensive coastal resources legislation; and

- Design a policy to promote education concerning coastal resources to increase the technical capacity of government workers and to educate the public, especially the hotel and restaurant sector, on the ecological and economic importance of coastal areas.

2.3.5 Recommendations for Future Research and Analysis

The following studies are recommended on coastal zone management and fisheries:

- Investigate the potential for fisheries in the country and determine a package of incentives and controls to promote a sustainable fisheries and aquaculture industry;

- Define a research agenda that will prioritize actions needed to address coastal resource problems and stimulate recovery; and

- Analyze discharges of hotels and restaurants along the coast and create a plan that will eliminate the direct discharge of wastes into coastal waters.

3. FORESTRY

Past administrative and legal actions concerning Dominican forests indicate that these resources are managed primarily for conservation and/or preservation purposes. Thirty-eight percent of forests areas are consigned to the category of "National Parks." The remaining forests were under no formal management plan (Russo, et al., 1989).

Overall, protective legislation has been weakened by the fact that the **Dirección General Forestal** (DGF - Forestry General Directorate) is located under the Secretariat of State of the Armed Forces. The perception that this results in weak supervision and implementation has given rise to an antagonistic attitude of the farmers and the general public towards the forest.

In fact, while the GODR, through its Executive and Legislative Branches, has been concerned with forest protection since 1884, there still exists a steady degradation of the forest resource base. Demand for charcoal and household firewood, as well as industrial fuelwood, has increased to critical levels in recent years (Potter, et al., 1987; Knudson, et al., 1988).

Around two-thirds of the Dominican population depends on firewood and charcoal for its energy needs (Benson, 1984). Unlike manufactured wood products, firewood and charcoal are entirely supplied by native forests. Furthermore, levels of production have exceeded natural regeneration, especially within the dry forests, creating a deficit which translates into a net loss of forested land over time.

According to the **Comisión Nacional de Política Energética** (COENER - National Commission on Energy Policy), a national wood energy survey showed that the total consumption of solid wood for energy was around 4,172,700 cubic meters for 1985 with a total of 728,400 families in the country using either charcoal or firewood (IEPD, 1991). Likewise, FAO estimated a total consumption of solid wood for charcoal and firewood of four million cubic meters for 1987 (Christiansen, 1987). These estimates indicate that there is strong pressure for illegal cutting of native forests, and hence, for deforestation in the country. Table 3.1 presents the COENER data on family charcoal and firewood use.

Furthermore, annual expenditures on imports of wood products have steadily increased from US$34 million in 1975 to US$61 million in 1986. The country spent about US$55 million per year during this period of time. Conversely, due to the legal system and the implementation mechanism existing so far, small farmers seem to place a negative value (utility) to tree growing.

The negative attitude of farmers toward trees was apparent in the Integrated Rural Development Project of Sabaneta-Los Gajitos, funded by the Agency for International Cooperation of Spain in 1987 (Fadón, 1991). The project found that small farmers in the region accepted conservation and management plans rather easily in regard to annual crop and conservation practices. However, farmers have "a negative attitude toward forest trees and could not understand all the benefits associated with trees." The author points out that farmers

actually make an effort to limit natural regeneration.

The importance of wood in the lives of most Dominicans is underestimated; and the use, management, and supply of this resource is a crucial political problem. Due to the great variety of properties and uses of many native species, and the market problems involved with fossil and mineral fuels, it will be difficult to find suitable alternatives in the short and medium term, especially for the rural areas of the country. Charcoal and firewood, combined with the role that forests play in watershed protection, affect 86 percent of all the energy produced in the country (IDB-DR0119, 1992).

TABLE 3.1 Number of Families that Used Firewood and Charcoal for Cooking in the DR in 1986

Region/Type	Firewood	Charcoal	Total
Whole Country	358,900	369,500	728,400
Urban	33,400	226,900	260,300
Rural	325,500	142,600	468,100
Santo Domingo	14,400	94,900	109,300
Urban	3,000	71,300	74,300
Rural	11,400	23,600	35,000
Cibao Region	189,400	129,800	319,200
Urban	13,400	73,400	86,800
Rural	176,000	56,400	232,400
Southwest	71,000	45,800	116,800
Urban	12,900	31,700	44,600
Rural	58,100	14,100	72,200
Southeast	84,100	99,000	183,100
Urban	4,100	50,500	54,600
Rural	80,000	48,500	128,500

Source: IEPD. 1991. Población y Energía en la Republica Dominicana (1990-2000)

Thus, the issues of deforestation, reforestation, forest management and wood uses are closely related and must be addressed directly by decision-makers in the DR, together with an appropriate policy and institutional framework that allows for conservation and development of the resource. Of interest here is the need to understand present situation of Dominican forest resources.

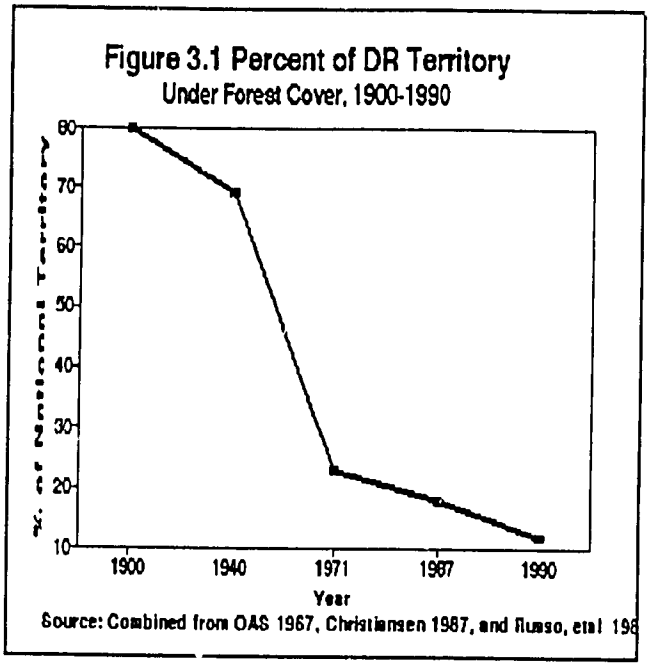
To date, there have been four major formal examinations of the DR's forestry sector:

- The forest inventory conducted by the Organization of American States (OAS) in 1967;
- The FAO forest inventory of 1973;
- The overall environmental study of the country conducted by CRIES in 1980; and
- The forest inventory for the Baoruco and Sabana de San Juan regions conducted by Ramm, C.W., in 1985.

Even accounting, for deforestation and forest regeneration efforts, the data are contradictory. Nevertheless, what does emerge is a picture of consistent deforestation over time.

The OAS study was based on aerial photographs taken in 1958. The area under forest cover was estimated at 557,000 hectares. The FAO study of 1971, aimed at identifying the economic potential of forests, specifically that of pine forests. According to FAO, there were 1.1 million hectares of forest land in the country, which represented 23 percent of the national territory. Human intervention was considered to be very heavy in at least 65 percent of these areas.

FAO also conducted a re-evaluation of the status of the forests in 1987 which is presented in the *Tropical Forest Action Plan* (CONATEF, 1991). The update estimates the area under forest cover at 871,000 hectares, of which 72 percent had some kind of human intervention. This forest area represents 18.3 percent of the national territory.



Thus, parallel to the steadily increasing demand for wood products for energy from the dry forests—and sawtimber from the broadleaf and pine forests—that has been a steady deterioration of the forest resource base itself (Figure 3.1). FAO estimated that by 1987 pine forest cover had decreased by 28 percent from 1971 estimates. Likewise, broadleaf forest areas decreased by 17 percent during the same time period. In sum, forest cover in the country went from an estimated 23 percent of national territory in 1971 to about 18 percent by 1987 (Christiansen, 1987). The **Departamento de Inventario de Recursos Naturales** (DIRENA[1] - Natural Resource Inventory Department) has also estimated the proportion of the country still under forest cover using aerial photographs taken in 1984 as well as field visits. Accordingly, pine forests plus broadleaf forests represented about 12.2 percent of national territory in 1985. These data suggest that in a 14-year period, from 1971 to 1985, an estimated 225,600 hectares of forests disappeared, which represents an annual loss of 16,114 hectares.

Resource degradation is coupled with soil erosion occurring within the deforested areas. According to the DR Environmental Profile, soil losses vary from 507 ton/ha/year in Ocoa watershed to 95 ton/ha/year in Chacuey watershed (Hartshorn, et al., 1981).

Deforestation represents another crucial factor for the forestry sector. Deforestation and the inappropriate use of forest resources over time have resulted in important losses to the

[1] Natural Resource Inventory Department GIS.

natural capital endowment of the country. The list of consequences brought about by such a degradation process can be summarized as follows:

- Destruction of fauna and flora habitat together with a reduction of biodiversity, since forest areas host most of the biological natural resources on the island of Hispaniola; this despite the fact that most forest land (6,448 km^2) has been confined to national parks and other protected areas;

- Alarming rates of soil erosion, which significantly diminishes the productive capacity of the soil, provokes sedimentation of rivers and dams, and hence creates an unstable water supply for human consumption, irrigation and hydropower generation;

- Deforestation also puts more pressure on rural peasants in two ways:

  - Farmers have to spend more time and effort to finding and collecting wood material for cooking, construction, artisanal activities, and other uses; and
  - Deforestation accelerates the process of slash and burn agriculture as soil degradation occurs more rapidly and farmers have to move from one plot to another;

- The country experiences a general decrease in welfare.

3.1 Policy Framework

Transnational, macroeconomic, sectoral, and specific policies affect the forest sector in the DR. Table 3.2 presents a list of selected major policies currently affecting the use and exploitation of forests in the DR.

International policies are crucial to the forestry sector. There has been an increasing awareness of sustainable use of natural resources throughout the world during the last ten years. The United Nations Conference on Environment and Development held in Brazil last year highlighted concerns on the environment and sustainability. Natural resources issues have also been included in the agendas of international donor organizations. The Forestry Action Plan was drafted due to the influence of international institutions. Projects funded by USAID—such as NARMA—have influenced forestry policy, and IDB is including natural resource policies in its conditionalities.

Macroeconomic policies have an effect on forestry in the DR. Important to forestry are the Government's monetary, fiscal and trade policies. Among monetary policies, the most important are foreign exchange, foreign debt and credit policies. Fiscal policy is also important, specifically income tax and budgetary policies. Trade policy affects the cost of imported timber

TABLE 3.2 Selected Policies Affecting the Forestry Sector of The Dominican Republic

Transnational	Macroeconomic	Sectorial	Specific
- Forestry Action Plan (PAF) - USAID's policy on Environment - UN Declaration of 1972 Principle 4 - World Conservation Strategy-1980 - Brundtland Report-1987	- Monetary Foreign - Exchange rate - Trade-Import Tariff - Fiscal-Budget - Monetary-Credit - Law 211-1967 on wood imports - New Tax Code (Law 11-1992)	- Education Law 295-1985 - Law 112-1987 - Law 8-1965	- Law 1783, 1948. Colonization Law. - Law 5856, 1962. Most Important Forest Law. Deals with forest conservation, education, research, protection (fire, diseases and insects), wood preservation. Requires licenses for cutting of any tree and for transportation and marketing of forest products. Creates DGF, and a Forest Fund. - Law 8, 1965. Creates SURENA as part of SEA and puts DGF under its control. - Adm. Measure. 1966. Shuts down all sawmills in the country. - Law 206, 1967. Transfer DGF to SEFA. Attributes to the Armed Forces and National Police the surveillance, conservation, restoration, and protection of forestry activities in the country. - Law 211, 1967. Establishes tariffs for imported wood to compensate sawmill owners for the losses due to Law 206-1967. - Law 78, 1971. Creates DNP under the Presidency. However, DGF keeps responsibility for national parks protection while SURENA is still charged with wildlife surveys and conservation units proposal development. - Law 292 and 360, 1972. Sells up to 125 hectares of public lands to those who possess them provided the land is being used for cattle ranching. - Law 5879, 1974. Agrarian Reform Law. Creates the IAD to promote agrarian reform in public lands and private lands acquired for this purpose. - Law 627, 1977. Allows the Government to buy areas for protection of mountainous areas. - Law 632, 1977. Expanded the prohibition of the cutting of trees around the headwaters of rivers and creeks. - Law 532, 1979. Law for the Promotion of Agriculture and Livestock. Creates fiscal and credit incentives and price intervention mechanisms to favor agriculture and cattle ranching activities. - Law 705, 1982. Shuts down all sawmills that were opened since 1967. Requires the approval of management plants to grant planted tree cutting licenses. Create CONATEF to reform forest legislation. - Decree 258, 1985. Approves a National Forest Management Plan required by Law 705. - Law 290, 1985. Establish a fiscal incentives program for reforestation. - Law 291, 1985. Transforms CONATEF into the main government agency for forestry policy with some execution power. - Resolution 658, 1987. Attributes to the Director of DGF the role of President of CONATEF. - Decree 260-92. Government will pay RD$0.60 per planted tree and RD$0.30 for maintenance every six months during the first year.

Source: World Bank report No. 10614-DO; Russo (1987); and Medina (1987)

and energy and the price of export products. A detailed description of these policies is provided in Chapter 5 under Sustainable Agriculture.

The most important sectoral policy is education. The DR's educational system operates mainly within a traditional framework that does not incorporate environmental aspects in the curricula. Even though forest legislation calls for educational programs that consider natural resources, the legislation has failed to establish adequate implementation mechanisms.

Legal instruments concerning the forestry sector can be traced back to 1884 when worries about the expansion of the sugar cane industry brought about Decree 2295, which forced farmers to consider forest conservation on their lands. FAO has estimated that more than 120 laws, presidential decrees, rules, and other legal instruments delineating forest policy in the DR have been promulgated (FAO, 1987). Most efforts, though, have been directed toward conservation and/or preservation of forest resources. Nevertheless, incentives have also been considered within the forest legislation, although supervision and implementation mechanisms have not been clear.

Since 1884, legal instruments have been used to try to limit the devastating effects of deforestation on the country's forest resource base. First a law was passed to assure forest conservation on a small portion of farmers' lands (Decree 2295-1884). Then several pieces of legislation were enacted to increase regulation of forest activities in the country, such as:

- The establishment of forest wardens in 1907;
- The creation of a forest service in 1919 (Law 365);
- The establishment of the forest reserve system in 1920 (Law 586); and
- A set of laws to protect public forests (Laws 944-1928, 641-1934, and 1688-1948).

Even though these laws were aimed at protecting resources, they allowed and even supported exploitation of vast areas as long as these areas (less than 200 hectares). were put back into forest or agriculture.

Later, during Trujillo's dictatorship, several laws were passed to monopolize the exploitation of forest resources for Trujillo and his friends; this is reflected in Law 29-1938, Law 227-1940 and Law 208-1943. These laws were used to forbid general forest exploitation, while allowing Government use of these resources.

The most important piece of legislation regulating the forest resources is the Law 5856 of 1962 on Forest and Fruit Trees Conservation. This is a rather complex piece of legislation and one that merits a detailed study. Table 3.3 presents a summary of topics included in this law.

In the institutional and administrative areas, Law 5856 concentrates all aspects relative to conservation, management and exploitation of forest resources in the hands of a specialized

TABLE 3.3 Topics Included in Law 5856 of 1962 on Forest Conservation[1]

Titles	Section	Article No.
General Dispositions	One	1 through 9
Administration of the Forest Fund and Research & Education	I. Administration	10 through 17
	II. Fund	18 through 22
	III. Forest Research and Education	23, 24, & 25
Conservation of Forest Resources	I. Forest Fires	26 through 34
	II. Pasture, Slash and Burn Practices	35 through 40
	III. Diseases and Insects	41, 42, & 43
	IV. Protected Zones	44 through 47
	V. National Reserves & Protected Zones	48 through 53
	VI. National Parks[2]	54 through 63
	VII. Wood Preservation & Extraction & Elaboration of Forest Products	64 through 71
Restoration and Development of Forest Resources	I. Reforestation	72 through 78
	II. Special Provisions for Coffee, and Cocoa Plantations and Other Fruit Trees and Palm Trees[3]	79 through 85
Forest Commercial Exploitation	I. General Rules	86 through 105
	II. Guidance for Harvesting Wood Trees	106 through 114
	III. Ordinary Harvesting	115 through 122
	IV. Suspension, Cancellations and Renovations	123 through 126
Transportation and Commercialization of Forest Products	I. Transportation and Confiscation of Wood	127 through 135
	II. Commercialization of Forest Products	136, 137, & 138
	III. Commercialization of State Forest	139 through 146
Infractions & Sanctions	One	147 through 159
General Dispositions	One	160 through 164

[1] Adapted from Russo, et al., 1989.
[2] Managed by the DNP through Law 67 of 1974.
[3] Managed by SEA through Law 206 of 1967.

authority (SEA), later modified by Decree 8086 of 1962, which created DGF. The Law established the need for forest management plans for the cutting, transport and commercialization of forest products. It also created a forestry fund to be used in conservation activities. Furthermore, the law promoted forest research and education.

Technically, Law 5856 requires that all use of forest resources in the country be preceded by a management plan which must be prepared by a trained professional. In this regard, the law includes articles on forest fires, conservation, pasture, insects and diseases, protected areas and national reserves, national parks, reforestation, and provisions for fruit trees.

Law 5856 differed from the previous legislation in that for the first time forest resources of the country were looked at from a productive and usefulness viewpoint. Finally, this law established a "national public record" of forestry property. Basically, it allowed farmers to acquire resource rights on their forest plantations without requiring land titles. Recognizing the need to pay more attention to protective areas and national parks, chapter four of law 5856 is devoted to national parks.

In 1967, Law 206 transferred the DGF to the Armed Forces, which provided military support for the custody of forest resources. Decree 3777 of 1969 banned the cutting of live trees in the country without a permit from the DGF.

In order to apply a more scientific approach towards the conservation of Dominican forest resources, the **Comisión Nacional Técnica Forestal** (CONATEF - National Technical Commission on Forestry) was created through Law 705 of 1982. The commission was charged with the supervision of all forestry activities in the DR. CONATEF was latter strengthened through Resolution 658 of 1986. This Resolution required the formulation of a National Forestry Plan, which was formulated latter in 1985 (Olson, 1984). Law 705 also closed down all sawmill operations once again. The most recent legal instrument used is the Decree 199-1992, which declared approximately 444 km^2 of the Nizao and Yuna watersheds as protected areas.

The participation of the private sector in Dominican forestry was accelerated through Law 290 of 1985. This law allows for reforestation projects for sawtimber, pulp, energy and any other industrial exploitation process. The incentives to promote private participation were modified through Law 55-1988 which increased up to 100 percent the tax exemptions for reinvestment in an agroforestry industry. Some of the institutions that benefited from the incentive law are: CONIFOR (Consortium for Forestry Investments), E. León Jiménez, and Brugal, among others.

The incentive law and its amendments allowed for development and mortgage banks to invest up to 50 percent of their subscribed capital and up to 100 percent of profits in forestry projects they developed themselves or through third parties. However, this law did not have the intended effects on the sector due to a lack of interpretation and supervision on the government side, and abuses on the private side.

Other specific forest legislation (Decrees 1432 and 1758 of 1980), declared portions of land in San José de las Matas as public domains to be used by Plan Sierra, a private development institution. Likewise, Decree 417-1989 declared several scientific reserves of "Ebano Verde" (*Magnolia pallescens*) which were assigned to the Progressio Foundation for management.

Parallel to Law 290, Law 291 was issued in 1985, modifying Laws 211 of 1967 and Law 705 of 1985, and authorizing sawmill operations in the country. Both Law 290 and Law 291 strengthened CONATEF as they widened its range of supervision activities and clarified the

respective roles that CONATEF and DGF should play in implementing them. Recently, Law 290 was eliminated by the new tax code: Law 11 of June 1992.

In August 1992, Decree 260-92 was signed to provide an incentive to plant trees. The Decree specifies that the Government will pay farmers RD$0.60 for each tree they plant in designated watersheds and river basins. The Government will provide the trees in addition to fertilizers, and will pay RD$0.30 per tree every six months for maintenance during the first year.

Decree 25-1987 approved the zoning of charcoal and firewood material production regions with the objective of organizing the production of these materials. The zoning was accompanied by a strong control policy on forest products coming out of regions other than the ones specified in Decree 25.

3.2 Institutional Framework

The institutional framework surrounding the forestry sector in developing countries often hinders forest policy implementation. An adequate framework should have three distinct and well-balanced elements: 1) policy making; 2) implementation; and 3) research and development (Munasinghe, 1988). Too often, however, the three elements are mixed together, and when they are delegated to different institutions, there is no coordination of efforts. In the case of the DR, the weakest areas are those of policy analysis and formulation and inter-institutional coordination. The forestry sector has been influenced by international donor organizations as well as local institutions. Table 3.4 lists these institutions by policy type.

FAO has provided assistance to the sector since 1971 when the organization conducted a forest inventory and general evaluation. The most recent effort by FAO is the Tropical Forestry Action Plan published in 1991, which outlines programs and actions within the forestry sector. The plan presents five operational programs and five support programs involving an estimated area of 550,000 hectares and total investment of US$131 million. One difficulty with the plan is that it counts on resources from Law 290 on forestry incentives for the local resources; however, Law 290 has been eliminated through Law 11 of 1992. FAO is also involved in conducting several studies of the Nizao watershed, and is assisting INDRHI in watershed management planning.

USAID has also supported the sector actively. First, under SEA,through the NARMA project from 1981 to 1987. NARMA trained professionals in natural resources. USAID also started a project in cooperation with COENER to promote feasibility analyses of energy farms. The energy farm project ended due to institutional inability to supervise the activity. FIRENA is a USAID funded project with the Junta of Ocoa that includes forestry activities.

One international organization actively engaged in forestry development is the German development agency GTZ. Basically, this organization focuses on social forestry projects. It is also working in a dry forest management project in the southwest region of the country and

TABLE 3.4 Institutions Involved in Forestry Policies, by Type of Policies

Transnational	Macroeconomic	Sectorial	Specific
- US Agency for International Development (USAID) - The Word Bank - Inter American Development Bank (IDB) - U.N. Development Program (PNUD) - Spain International Cooperation Agency - U.N. Food and Agriculture Organization (FAO) - Japan International Cooperation Agency (JICA) - European Economic Community (EEC) - World Food Program - U.S. Forest Service - Kellog Foundation - Ford Foundation - German-GTZ - German-DED - U.N. Environmental Program - CATIE	- The Central Bank - BAGRICOLA - Technical Ministry of Presidency - National Budget Office - National Planning Office	- Natural Resource Subsecretariat - National Park Directorate (DNP) - National Institute of Hydraulic Resource (INDRHI) - Dominican Electrical Company (CDE) - National University Pedro Henriquez Ureña (UNPHU) - Superior Institute of Agriculture (ISA) - Technological Institute (INTEC) - National Energy Commission (COENER) - Mining Direction - INDENOR - INDESUR	- General Forestry Directorate (DGF) - Forestry National Technical Commission (CONATEF) - ENDA-CARIBE - PRONATURA - PROGRESSIO - Grupo Habitat - Plan Sierra - Plan Cordillera - Floresta - Ocoa Development Association(Junta) - Barceló-Proforesta - Brugal-Proforesta - Los Arbolitos - ARBODOM - FEDOMASEC - Ecological Association of Santiago

implementing a nim tree program with the Loyola Polytechnical Institute. Another German organization involved in the sector is the German Social-Technical Cooperation Service (DED). Several projects on natural resources are expected to be funded through LOME IV.

IDB has had some influence throughout the history of the sector. For the period 1992-1995 the bank has scheduled several projects on watershed management such as the Conservation and Management of Bao Watershed and the Forest Management Project for the Mao watershed.

Environmental education is taught at few graduate level programs. The UNPHU has a one-year post-graduate course on forestry. Likewise, INTEC has a one-year program on environmental education; and the UASD is just starting another program on environmental education. CEDPE also has a program on forestry. ISA, created and supervises one of the few legal commercial forests in the country; it also has a forest science curriculum. ISA has been involved in a number of research efforts on dry forest management during the last ten years, and manages a dry forest in the northeastern part of the country.

The most important institutions concerning the forestry sector are located within the Government. There are eight institutions within this group that interact in forestry activities in the country: the DGF, SURENA, CONATEF, DNP, INDRHI, CDE, IAD, the Secretariat of Foreign Affairs, and the Agricultural Bank. Below, a brief discussion on each of these institutions is included.

The most important institution in forestry is DGF, created in 1962 by Law 5856. The DGF was initially placed under the SEA and then in 1967, through Law 206, it became a dependency of the Armed Forces. Up to 1982 (when CONATEF was created) the DGF was the major institution responsible for the implementation of the Forestry Law 5856 of 1962. Presently, its tasks include, among others:

- Management of public forest lands;
- Law enforcement on illegal tree cutting and commercialization of forest products;
- Forest resources inventories;
- Forest research;
- Reforestation;
- Forest education; and
- Management of the forestry fund.

The **Subsecretaría de Estado de Recursos Naturales** (SURENA - Subsecretariat of Natural Resources) was created in 1965 as part of SEA and initially had the responsibility of controlling DGF. Currently, it has two departments which have major overlapping or complementary responsibilities in the forestry sector. The Department of Natural Resources Inventory conducts studies on the potential of the renewable resource base in the country, including forest resources. The Wildlife Department is responsible for the protection and management of wildlife as well as for conducting studies and inventories of wildlife. It also develops proposals for the creation of new conservation units that later will be managed by DNP and DGF. The functions of the Wildlife Department overlap with some of the DGF and DNP functions.

The **Dirección Nacional de Parques** (DNP - National Parks Directorate) which was created by Law 67 of 1974. DNP is an agency of the Administrative Secretariat of the Presidency. According to the law, DNP is the maximum authority administering national parks and other protected areas in the country. It is charged with the development, management, and care of recreational, historical, natural and indigenous areas located within national parks and other protected areas. This institution has overlapping functions with DGF and SURENA.

The most important institution in charge of forestry policy in the country is CONATEF, which was created in 1982 as an advisory commission to the President on forest policy issues. Its tasks were expanded in 1986 through a Regulation which considers DGF its executing agency (although, it has executing responsibilities of its own). Its functions include:

- Formulating national forest policies;
- Overseeing the preservation and development of existing forest resources; and
- Coordinating and supervising public and private forest management plans and reforestation projects.

CONATEF members include public and private institutions as well as distinguished national personalities. CONATEF has an Executive Director with a staff to implement its programs.

Another public organization related to forestry is the **Instituto Nacional de Recursos Hidráulico** (INDRHI - National Institute of Hydraulic Resources), which is responsible for water use for irrigation and electricity. INDRHI was created in 1965 and it also has the task of administering the use and protection of watersheds, including erosion control. This institution is described in a greater detail in the watershed management chapter. There is a recent inter-institutional agreement between DGF and INDRHI for the conservation and management of Nizao's watershed.

The **Corporación Dominicana de Electricidad** (CDE - Dominican Electrical Corporation) was created in 1955 to provide for the production, transmission and distribution of electricity. CDE has had increasing influence on watershed management and protection activities during the last decade. This is in response to heavy sedimentation problems within the hydropower reservoir network.

Two public institutions impacting on the forestry sector are the **Instituto Agrario Dominicano** (IAD - Dominican Agrarian Institute) and the **Banco Agrícola** (BAGRICOLA - Agricultural Bank). IAD was created in 1974 to administer the agrarian reform programs. Current agrarian legislation considers deforestation as an "improvement" necessary for the recognition of property rights. On the other hand, BAGRICOLA is the institution responsible for providing credit for crop and livestock production, regardless of land capability. The bank has promoted the conversion of fragile forest lands even within protected areas by facilitating credits to small farmers to cultivate these areas. Such practices are being corrected by the Bank authorities.[1] BAGRICOLA manages the **Fondo Especial para el Desarrollo Agropecuario** (FEDA - Special Fund for Agricultural Development) which was created through Law 367 of 1972. The FEDA considered forest projects for long-term financing programs; however, its influence in the sector was limited due to lack of resources.

Several NGOs also have influence over the forestry sector. **Plan Sierra**, and the **Progressio Foundation** manage forest lands with the approval of DGF. Furthermore, the GODR is in the process of obtaining a loan of 15 million dollars from IDB for management of the Mao watershed. This project will be implemented by Plan Sierra. Progressio, on the other hand, manages the protective reserve of Ebano Verde (*Magnolia pallenscens*) through an agreement with DNP. These examples of private organizations managing forest resources are a good indication of the potential for private sector management of fragile resources and forest resources in general.

Several private sector organizations have traditionally incorporated reforestation programs into their agenda. Institutions such as **Falconbridge**, **Rosario Dominicana**, **Central Romana**, and **Casa Vicini**, among others, have undertaken voluntary reforestation efforts in the country. These efforts, however, are of limited influence in the sector.

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[1] Pedro Bretón, Agricultural Bank's General Manager. Personal Communication.

The country's reforestation strategy changed drastically with the opening of private nurseries. Two institutions are particularly important: Los Arbolitos and ARBODOM. Before these companies entered the market, production of forest plants was provided by DGF, and severe shortages of plants were the rule rather than the exception. The strengthening of private nurseries companies is needed to meet the demand if a massive reforestation effort is to be undertaken.

3.3 Analysis

Starting with macroeconomic policies, two important polices affecting forestry are the foreign exchange and the foreign debt polices. Exchange rate policies which make imported products more expensive affect the use of native wood materials. If combined with a forest production policy, such exchange rate policies could help make domestic forest products more competitive. Considering the overall effects such exchange rate policies might have on the country's welfare, they must be analyzed in a broader content. The previous fixed exchange rate had a direct positive impact on national forests as it made imported wood for furniture and construction cheaper, as well as imported energy. This made the use of local wood slightly less attractive, and the cost of firewood relatively more expensive. However, this fixed exchange rate policy distorted the allocation of resources in the economy. The present policy is to have a market-determined exchange rate, even though the black market is about five percent higher than the official exchange rate. This market-determined exchange rate has made the use of local wood and firewood more attractive.

The DR has a foreign debt of over four billion dollars. Some of this debt qualifies for forgiveness and for swaps. Some debt-for-nature swaps have been realized in the DR, but their effects are limited to a few small projects. It is important to study ways to make debt swaps more open to public scrutiny to allow for discussion over the advantages and disadvantages, as well as impacts and alternative implementation avenues and administrative practices.

Even though clear measures have been taken to protect forest resources over time, the deforestation process has continued, reaching critical levels in the last ten years. Moreover, the different legal and official efforts (i.e. laws and decrees) undertaken so far, do not seem to be the product of a coherent scientific strategy to manage forest resources under a sustainable production regime. Rather, these efforts appear to be isolated actions that respond to specific groups' pressures and/or to various political compromises. In fact, there seems to be a general belief that conservation and development activities can not coexist within the forestry sector. Such a concept is supported by the present institutional framework which lacks the appropriate level of coordination within the government institutions and lacks active private sector participation.

A central element of the problem is that forest resources have been looked at using a traditional framework analysis. Within this view, resources are a static stock of trees which may have environmental value but which are too costly for the present generation to conserve. However, in reality, forest resources are both crucial for dynamic ecosystems and offer

economic benefits to present and future generations if managed under a sustainable production regime.

Forests are classified as resources only as long as they can be used for human benefits. In that sense, resources are important for the kind of uses people can find for them within a given time horizon. Forest resources can be conserved only if the present generation learns how to benefit from them without diminishing their potential use to future generations. The objective ought to be to maximize the social welfare obtained from these resources. Under this objective, one would look at the stream of benefits over time as opposed to the one-time (now) situation. To recognize the benefits offered by forest resources, however, the analysis has to include not only tangible benefits such as stumpage fees and timber sales, but also intangible benefits such as watershed and environmental protection.

In the new view of productive ecosystems, forest resources interact with other resources to:

- Protect and, in a sense, produce water for human uses, including irrigation and electricity;
- Prevent or considerably reduce soil erosion caused by wind and rainfall;
- Protect wildlife and biodiversity within ecosystems;
- Produce wood material needed to meet the demand for charcoal, firewood and sawtimber; and
- Produce non-traditional pharmaceutical and industrial products.

The new paradigm under which forest resources must be analyzed focuses on the advantages of the agro-forestry system in both economic and social terms. The challenge is to convince people to use the resources, and to make people understand the benefits of using these resources in a sustainable way. The question to ask is: How can people coexist with the environment in a mutually beneficial association?

In order to move towards this new concept of productive ecosystems in terms of resource use, it is necessary to have appropriate policies and an adequate institutional framework. An adequate forest policy framework, as mentioned previously, should have three distinct and well-balanced elements: 1) Policy Making, 2) Implementation; and 3) Research and Development. In the case of the DR, problems exist at all stages.

The degree of complexity in the forestry sector is illustrated in section 3.1 (Policy Framework) by the number of articles in Law 5856 of 1962 concerning the conservation, management, and development of forest resources. The policy framework surrounding the forestry sector tends to favor the resolution of problems on a discretional interpretation of the laws and regulations. It also promotes the need for special permits for nearly all forestry activities. Forest legislation, coupled with the existing supervision and implementing mechanisms, has prevented the development of an efficient market for logs, charcoal, and

firewood. This situation has not created incentives for private sector involvement in reforestation.

The forestry sector has also been subject to discrimination from other sectors of the national economy. There is still a notion, which has been reinforced by legislation, that forests are "idle" lands that do not offer economic incentives equal to agricultural and other types of land uses. IAD, which implements agrarian laws, has a history of expropriating forest lands to distribute among farmers for agricultural uses.

The DGF is the organization charged with implementing forestry activities in the country. The DGF mandate has been reduced to some extent through several presidential decrees strengthening CONATEF's functions. Likewise, budget limitations have prevented the DGF from expanding its operations and reforestation programs. The DGF is in the final stage of establishing three nurseries[1] with a total capacity of 60-million plants per year, to be used in reforestation activities.

Even though there is a specialized institution for forest policy identification and formulation, the process of policy making is still weak. CONATEF must be strengthened with forest policy analysts who can study and/or put forward forest policy proposals more efficiently. Since its inception, CONATEF has devoted much of its efforts to the analysis of specific forest management plans. This task hardly fulfills the need for facilitating forest policy reforms and identifying specific areas of study in the forest policy field. Since the government's relationship to forestry resources is based on the problem of controlling the harvesting and commercialization activities of these resources, the situation is usually limited to whether a particular project should or not be approve. These decisions are based on financial analyses that affect small areas rather than economic analyses affecting the resource base as a whole. Incidently, no comprehensive study has been undertaken to estimate the social costs and benefits of the present forestry policy.[2]

Resource ownership is another crucial factor for management programs to be operational. Land, as a primary resource, must play an important role in a sustainable production scenario. However, determining property rights in the DR is not always a clear and straightforward affair. Although an official classification exists with unique definitions for private and public ownership, the operational system is not so organized. Often, state ownership is defined as common property; hence, it is there for any one to use. This is the case particularly where public forest land is scattered through a region, making the use of forest wardens rather expensive. The GODR often gives property titles to farmers living and operating on public lands if they can prove occupancy for a 20-year period of time and also as part of the land reform policy.

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[1] Cnel. Candelier, Director of DGF, Personal Communication

[2] A initial attempt was made in Laureano, 1991.

Certainly, there is some confusion between land tenure and land ownership which has encouraged farmers to cultivate (with short-rotation crops) forest lands in high elevations and critical watersheds. Public ownership is very important to pine forests, which are considered the most important type of forest in the short and medium term. Most of the pine forests are either managed by the DGF or by the national parks authorities.

The existing land tenure and property rights strategies are also a serious constraint to the development of the sector. An important portion of forest resources is located on public lands which are regarded by the farmers as common property. Due to the high exclusion costs within these lands, it is very difficult to avoid illegal extraction of wood material and slash and burn practices. In private forest areas, on the other hand, the problem is that property rights are clearly defined, but there are no resource rights. This situation contributes to the antagonistic attitude towards the forest.

There is a need to establish property rights within forest lands, especially those located outside of fragile areas. It is also necessary to create an operational system which can slow down exclusion costs (cost of rangers, fencing, etc.).

Major local and international banks have difficulty in taking reforestation projects seriously. To finance tree plantation without assurance of cutting rights at the end of the rotation contradicts common economic sense. Unfortunately, several ecological and conservation groups may actually foster this notion by creating a romantic aura around reforestation activities. Statements portraying a criminal as anyone who cuts a tree, still find their way into official advertisement campaigns on reforestation.

Policy implementation is also a problem in the DR. Since it is difficult to formulate national policies for forestry, the implementation process follows the mandates of isolated forest Laws. Furthermore, the implementation task, corresponding to DGF, is performed with limited technical criteria. In the long run, a police-like policy of control would harm rather than improve the resource base. Such a policy would help to antagonize the attitude of people towards forest resources and thus would exclude any possibility of resource development and even resource conservation. In fact, the forest resource base has significantly deteriorated during the last twenty years (Potter et al., 1987; Knudson et al., 1988; Laureano, 1991).

Another policy problem is the isolation in which planning is done for irrigation, soil conservation, and the servicing of potable water and hydroelectricity. The contribution of forests to each one of these activities does not reach the planning table. Likewise, no incentives are given to the landowners of forested lands from whose property water flows for irrigation, domestic and electricity uses. The abstract policy of administering natural resources as unrelated, independent components clearly reflects a general unawareness that the environment is the total sum of all natural resources that interact in many concrete and dynamic ways.

Research and development constitute the weakest area of forest policy in the DR. There are no specialized public or private organizations that study forest policies and their effects on

resource use, conservation and development in the country. This institutional limitation allows for forest policy proposals to move directly from design to approval without passing any feasibility test.

The present institutional framework acts as a constraint to the conservation and development of the forestry sector for several reasons:

a) The Government institutions related to the sector do not have clearly defined lines of action and functions that complement each other. Rather, they often have overlapping and contradicting functions. The levels of coordination among DGF, CONATEF, DNP, and SURENA are minimal;

b) The technical staffs within the government institutions lack the professional expertise needed to confront the situation. Existing salary policies contribute to the problem;

c) Government institutions see each other as competitors even though they are part of the same system. Often resources are used to confront each other;

d) Private intervention through NGOs is still limited and oriented toward the execution of small projects;

e) One limitation to strengthening the institutional framework surrounding the forestry sector is inter-institutional conflicts among: (i) governmental organizations; and (ii) NGOs and governmental organizations;

f) Although actual differences are much smaller than perceived differences, inter-institutional communication is poor and often misleading;

g) There seems to be a general lack of awareness of the importance of forest resources to the economic and social development of the country. Institutions have failed to identify the linkages between forest resources and macroeconomic policy;

h) Lack of awareness at both technical and decision-maker levels favors the action/reaction system of policy formulation and implementation. Decision makers are often forced to choose from a set of poor alternatives (a no-win situation). Even when good alternatives are presented, they often lack the necessary analytical tools to support their approval;

i) The lack of formality in the decision-making processes of the country also presents a limitation. Institutions respond to a particular incumbent, rather than to established objectives, strategies and programs. This "personalization" of the

institutional framework, is a problem that affects the whole Dominican society; and

j) The Army does not have a cadre of trained forest professionals within its corps, even though it has been implementing forest policy in the country for nearly 25 years.

Therefore, substantial reforms are needed in the area of policy making, implementation and research in the DR. The reforms should be oriented toward making the system more dynamic and eliminating some of the bureaucratic problems associated with forest policy implementation. A good start would be to study the new Forest Code that was recently proposed to the Congress. The new Code would replace old disorganized legislation and could help set the stage for a more comprehensive forest policy process in the country.

In the last nine years, significant efforts have been made towards improving this overall situation. Given this new effort, it is necessary to analyze the institutional framework surrounding the sector. Crucial to the concepts of "wise" and "sustainable" management of forest resources is an understanding of institutional positions regarding forest policies. Furthermore, it is necessary to understand institutional differences, and group differences, regarding possible development paths and policy scenarios for the sector.

Another important aspect of the forestry sector is its institutional framework. As explained earlier, there are too many governmental organizations which overlap, complement, and sometimes contradict each other, in their basic functions regarding the use, administration, conservation and preservation of the country's forest resources.

Understanding institutional and group positions on forest policy may bring more light to the situation of how policy affects institutions and vice versa. Particularly important is to find out the attitudes of the different institutions regarding the present forest policy, an alternative production policy and an energy substitution policy. It would also be important to know how the institutions rank each other with regard to their importance in forest policy formulation.

In this regard, the results of a survey-interview study conducted during 1991 and covering eighteen relevant institutions for the DR forestry sector are presented here.[1] The questionnaire used in the study covered the present forestry national policy and two alternative scenarios. The objective was to identify institutional and group perceptions on how different national forestry policies may affect the country's forest resources as well as the country itself.

The survey-interview was administered to eighteen Dominican institutions relevant to the forestry sector. The study divided institutions into five groups:

[1] For further information on the attitude analysis consult Laureano, 1991.

- Governmental agencies;
- Donor agencies;
- Environmental/ecological societies;
- Non-governmental organizations; and
- Private firms.[1]

Twenty nine questions were used in the questionnaire to determine institutional attitudes towards forest policy. Key findings include the following:

- Most participating institutions (88 percent) believe that slash and burn agriculture constitutes a very important cause of deforestation in the DR; and 65 percent of all institutions think that the harvesting of wood material for charcoal and firewood, as well as for furniture uses, is a very important contributors to deforestation;

- Eighty-eight percent of the institutions believe that the problem of deforestation can be solved by establishing enough production areas in the country;

- One important issue included in the analysis was how the institutions rank themselves regarding to the role they play in formulating forestry policies in the country. NGOs and CONATEF were ranked at the top of the list. This result illustrates the influence NGOs are having on forestry;

- Most institutions (88 percent) either disagree or strongly disagree with the proposition that the best way to conserve forest resources is by forbidding the cutting of live trees in the entire country. Even institutions within the government group disagree with the proposition. Thus, an implicit utilization of resources is thought to be necessary for sustainable conservation activities;

- All institutions either disagree or strongly disagree with the proposition that the best way to conserve or preserve forest resources is through the use of the Armed Forces. This consensus suggests that an institutional reform is thought to be crucial for the development of the sector, since policy implementation is under the Armed Forces control (i.e. DGF);

- After considering all questions relating to the present forest policy, the results showed that NGOs have the strongest negative attitude toward the present forest policy with all of their responses in the strong negative and negative ranges. In addition, 92 percent of the government institutions have either a negative or strong negative attitude toward the present policy. This finding suggests a

[1]The Attitude Survey was conducted by Efrain J. Laureano Pérez, in 1991.

conflict of interest between the central Government which promotes the policy and the different institutions charged with applying and reforming that policy; and

- Most institutions, including the government group, believe that a production policy is likely to have a positive effect on the sustainability of the resource base. Donors have the strongest position on this issue. However, almost all the institutions either agree or strongly agree that a production-area policy should focus on improving the standards of living of small farmers as well as self-sufficiency in the production of the wood material. They (71 percent) also believe that such a production policy should be directed toward utilizing extensive production farms. Furthermore, 65 percent think that Government subsidies are needed for such a production policy to yield positive results.

In order to develop the sector in a sustainable manner, national private capital is thought to be important. It seems also that an association between small farmers and the forest is crucial. Under a production policy regime, however, there is no consensus on what level of influence the Government should have with respect to property and resource rights and supervision.

On the other hand, most institutions have a negative attitude toward the undertaking of an energy substitution policy in the country. This attitude is partially reinforced by the inability of the Government to meet present levels of consumption for imported energy materials. However, any movement toward the substitution of charcoal and firewood seems to be more acceptable if done at the city level.

3.4 Potential Policy Alternatives

The present policy and institutional framework have proven to be inefficient in overcoming forest resource problems in the DR. Alternatives to the existing settings must be studied and analyzed for the sector to move from its present stagnation. Particularly, it would be beneficial to study those alternative policies oriented towards making the system more efficient and/or promoting new settings which can consider forest conservation and forest-sector development in an integrated framework. The following are a few alternative policies to consider:

- Categorize and regionalize the timber concession permit system. Permits could be regionalized by forest district according to the number of trees involved and/or the size of the intended operation. This would speed up the process and reduce the cost to users;

- Allow other agencies, beside DGF, to use the Forestry Fund. Most forests are under protected areas, which are managed by the DNP;

- Establish a set of policies for each one of the following categories:

    - Forest areas and forest projects;
    - Agroforestry projects;
    - Forestry protection projects; and
    - Reforestation projects with multiple-purpose trees;

- Clarify reforestation objectives for each institution. DGF could concentrate its efforts in areas defined as potentially commercial forests, while DNP could concentrate its efforts in areas identified as protected forests;

- Reinforce the policy of allowing NGOs to manage forest areas in the country. This should become an established explicit policy;

- Orient forest policy towards the sustainable management of the forest resource base rather than towards forest resource preservation;

- Increase NGO participation in protected area management through the use of debt-for-nature swaps; and

- Promote public forums for forest policy discussions. Such forums could analyze documents such as: Proposal for a Forestry Code (CONATEF, 1991; and the Forestry Action Plan (CONATEF, 1991). The public forums would also be valuable for discussing a general forest policy framework.

3.5 Recommendations for Future Research and Analysis

Research studies are needed before making major decisions for the sector. Information concerning the forest resource base is poor and in most cases over 20 years old. Specifically, the following studies are considered important:

- Study alternatives to design a national comprehensive natural resource management policy. Such a policy would include a national land use management plan;

- Study the establishment of a comprehensive forest management incentive package, including:

    - Flexible long-term credit programs
    - Stumpage fee management programs
    - Tax incentives programs
    - Supervision and follow-up programs
    - Revised wood products import tax policies;

- Study the likely effects of a national policy on energy farms in the short and medium term;

- Study the comparative advantages of institutional program alternatives, including the following:

    - A re-arranging of actions and functions of DGF, DNP, SURENA, INDRHI and CONATEF to increase efficiency within the existing framework;
    - The role of an increased influence of NGOs in managing forest areas; and
    - Salary and benefits alternatives for public servants to attract highly qualified professionals; and

- Study ways to establish a research program on forest policy and forest management in the country. Areas of research could include:

    - Adaptability studies for introduced foreign species before they are planted on a large scale in the country;
    - Basic research on native species behavior;
    - Definition of areas suitable for each type of forest according to capability; and
    - Forest restoration possibilities in degraded soils, deforested areas, and in areas severely altered by over-extraction.

4. WILDLANDS AND BIODIVERSITY

Since the release of the Brundtland Report by the World Commission on Environment and Development, the idea that development must protect the structure and functions of ecosystems has been recognized and partially implemented (IUCN/UNEP/WWF, 1991). The aim of this development is to improve the quality of life for human populations while conserving essential ecological processes and life-support systems. The adequate formulation and execution of the development and conservation of wildlands and biodiversity policies, strategies, and programs are intersectoral (IUCN/UNEP/WWF, 1980s, Peña-Franjul and Geisler, 1992). In this integrated approach, the resource-base and its interrelations must be considered in their socioeconomic and cultural context (Ridell, 1981; Sachs, 1984).

The application of an integrated approach to the development and conservation of biodiversity and wildlands is especially important for countries with small, mixed economies where development is based on growth without consideration of the natural environment. This generates disharmony in biophysical, socioeconomic and cultural realms. In countries such as the DR, where the use of ecological capital is weakening, the possibility for sustainability will depend on how the resource base is managed. All of this will affect the welfare of the population and the maintenance of the socio-political system.

There is no doubt that development must be resource-based. Correcting natural resource mismanagement with wise management is a productive and justifiable goal. Resources must be utilized so that they can be simultaneously maintained while also attending to the basic human needs and aspirations of the Dominican population. The question is how to operationalize development and conservation of wildlands and biodiversity in an institutional environment where physical constraints and socioeconomic instabilities are important causes of environmental degradation and natural resource depletion (Peña-Franjul, 1991). The new approach recognizes the processes and vulnerabilities of nature. There is no possibility for unlimited growth. Non-renewable resources are finite in their supply. Natural resource management for conservation and development also raises ethical considerations in relation to a more equitable share of the nation's resources. This is not a matter of choice. It is a precondition for sustainable development.

Organizational factors related to the character of the administrative agencies and institutions—such as the lack of efficient allocation of financial, organizational and intellectual resources—are significant forces that work against the objectives and goals of wildlands and biodiversity policies. Environmental degradation and resource depletion in the DR often occur not only because there is a lack of public awareness of the multiple values of these resources, but also because of the incapacity of the decision-making mechanism that is necessary to properly maintain and implement existing conservation and development policies.

Wildlands and biodiversity, properly managed, can offer many benefits to a great number of people. They can also have a significant impact on the government budgetary process

(CEDOPEX Statistics, 1992). Conservation and development can be made more economically and socially cost effective by utilizing resource-use accounting, tax revenues, public and private sector investments and other measures. In general, the value of wildlands and biodiversity includes:

- The reduction of soil erosion and sedimentation of water ways;
- A source of raw material for construction, firewood and charcoal;
- A source of flora and fauna species for domestic consumption;
- A way of absorbing carbon dioxide to halt global warming; and,
- A source of many ecological, educational, and research benefits.

The financial benefits of wildlands and biodiversity are more clearly perceived in the recreation and ecotourism subsector. Ecotourism has proved to be a way of using these resources with potentially profitable opportunities for conservation and development. A better understanding of the values and benefits to the national, regional, and local economics will reduce the perception that conservation of biological resources hinders economic growth.

The issues in wildlands and biodiversity preservation are protection of endangered species, biodiversity, park and reserve management, and ecotourism.

4.1 Protection of Endangered Species and Biodiversity

Wildlands and their biological potential constitute the natural heritage of the nation. The DR, in spite of being a small country, has a diverse ecosystem with many species. This country is comprised of nine different life-zones ranging from subtropical thorn woodland to subtropical montane wet forest (Table 4.1). The subtropical moist forest, the subtropical wet forest, and the subtropical dry forest represent 80 percent of the potential forest cover of the nation.

These life zones include a wide variety of ecosystems and habitats rich in wild and domesticated species of flora and fauna. The diversity of indigenous and exotic species enhance the value of the national natural heritage. The country harbors more than 5,400 species of vascular plants representing essential genetic materials and evolutionary processes. The richness of non-vascular plants has not been properly assessed quantitatively. The herbarium of the national botanical collection has over 65,000 specimens. Most of those plants exist in a wild state.

The natural variability of the vertebrate fauna is better known. The country harbors 70 species of fluvial fishes, 60 species of amphibians, 141 species of reptiles, 254 species of birds, and 33 species of coastal and territorial mammals. The invertebrate fauna are poorly known, but they are estimated to be highly diverse.

The coastal and marine invertebrates are commercially exploited. Stony and black coral, sea shells, sea mosses, large crabs, conch, shrimp, lobsters and large marine gastropods (Strombus) are harvested to fulfill human needs and export demand (CEDOPEX Statistics, 1992). Much of the fauna utilization has been treated with total disregard for the natural resource system. The present tendency will significantly modify ecosystems and habitats. The losses will contribute to the reduction of flora and fauna species, and to the increase of extinction rates for remaining species.

TABLE 4.1 Life Zones, Dominican Republic, 1981

Life Zone	Area (has)	%
Subtropical Thorn Woodland	100,000	2.1
Subtropical Dry Forest	918,200	20.3
Subtropical Moist Forest	2,213,900	45 7
Subtropical Wet Forest	683,400	14.1
Subtropical Rain Forest	5,600	0.1
Subtropical Lower Montane Moist Forest	348,000	7.2
Subtropical Lower Montane Wet Forest	357,700	7.4
Subtropical Lower Montane Rain Forest	36,000	0.7
Subtropical Montane Wet Forest	30,000	0.6
Other Areas	88,000	1.8
Total	4,844,200	100.0

Source: Hartshorn, Gary, et.al. 1981. *Dominican Republic, Country Environmental Profile, a Field Study*. Santo Domingo: USAID.

Until 1960 much of the country was covered by vegetation, including hundreds of tree species. However, in the last 40 years, much of the vegetation has been cut with poor use of the timber resources. The deforestation rate is 16,114 hectares per year (FAO, 1971; 1987). The impact of deforestation should be measured not only in terms of the reduction of tree cover, but also by resource depletion in hydrological basins, the loss of species habitats, and genetic erosion. At the present time, 89 species and/or subspecies of vertebrates are reported to be threatened, of which 15 species are considered endangered (SEA/DED, 1990). Habitat destruction is the major cause of extinction in the DR. Habitat insularization, hunting, introduction of exotic species, and environmental pollution are other factors affecting wildland and biodiversity.

The country's enormous variety of plants, birds, reptiles, insects and other invertebrates is largely contained within a national network of protected areas. Presently, more than 11 percent of the country's territory is under certain categories of protection. Table 4.2 summarizes the protected areas.

Other protected areas include river heads and dam reservoirs, archeological sites, urban parks, ruins and monuments. The amount of land under those designations is greater than

700,000 hectares. Their proper management should ensure that wildlands and biodiversity are protected, developed and utilized correctly and efficiently.

The next section describes the major policies affecting wildlands and biodiversity. The relevant institutions are then described, followed by an analysis identifying the critical policies and institutions affecting wildlands and biodiversity in the DR.

4.1.1 Policy Framework

The environment in which decisions are made concerning the development and conservation of wildlands and biodiversity cannot be realistically understood without integrating the external and internal economic and technical forces that influence the country's decision-making environment. In this sector, there is a growing constellation of partners who focus on achieving successful conservation of imperiled species and ecosystems. There are several joint ventures, motivated by global natural resource policies, that are helping the nation to abandon those self-destructive practices.

Table 4.3 lists the policies that affect endangered species, biodiversity, wildlands and ecotourism. This section mentions only those related to endangered species and biodiversity, while section 4.2.1 lists the policies affecting wildlands and ecotourism.

TABLE 4.2 Protected Areas, by Type
Dominican Republic, 1992

Designations/Name of Area	IUCN Mgt. Category	Area (has.)	Year Noti-fied
National Parks	II		
Cabo Francés Viejo	II	125	1974
Del Este	II	42,000	1975
Isla Cabritos	II	2,400	1974
Jaragua	II	137,400	1983
Armando Bermúdez	II	76,600	1956
José del Carmen Ramírez	II	73,784	1958
La Caleta Submarine	II	1,010	1986
Litoral Norte de Puerto Plata	II	75	1971
Litoral Sur of Santo Domingo	II	1,075	1968
Los Haitises	II	20,800	1976
Monte Cristi	II	53,000	1983
Sierra de Bahoruco	II	80,000	1986
Scientific Reserves			
Ebano Verde	IV	2,310	1989
Laguna de Rincón	IV	4,780	1983
Lagunas Limón y Redonda	IV	10,100	1983
Loma Isabel de Torres	IV	2,200	1983
Valle Nuevo	IV	40,900	1983
Villa Elisa	IV	15	1976
Quita Espuela	IV	7,250	1992
Bird Sanctuary			
Cayos Siete Hermanos	IV	0	1987
Cetacean Sanctuary			
Humpback Whale of Silver Bank	IV	374,000	1986
Scenic Route			
El Acetillar—Cabo Rojo	IV	41,000	1986

Adapted from: IUCN. 1992. *Protected Areas of the World*, Vol. 4.

Table 4.3 Policies Related to Wildland and Biodiversity Management, by Type, 1992

Type of policy		
Transnational	Sectoral	Specific
-international Convention on Trading of Endangered -Latin American Flora and Fauna Protection Convention -Lome IV -USAID Environmental Policy -UN Environmental Policy -The World Bank Environmental policy -IDB Environmental Policy	-Education Policy -Agricultural Policy -Tourism Policy -Agrarian Reform	Law 85, Feb. 4, 1931. Hunting Law. Reforms by Laws 34, 640, 1609 Law 1216Jan.13,1929. Gun Regulation. Reforms by Law 70 & 36. Law 5914July 7, 1962. Fishing Law. Reforms by Law 635, Feb.3, 1965 Law 1268, Oct.12, 1946. Domesticated Animal Protection Law 4598, Dec.11,1956. Pigeon hunting regulation Law 456,Oct. 20, 1976. Create National Botanical Garden. Law 114, Jan.3, 1975 Created National Decree 2675. Jan. 11, 1981. Created Marine Flora & fauna Conservation Comision Decree 1823,Feb.23,1983. Aquatic Live species importation. Decree 1824, Feb. 23, 1983. Created aquaculture Development Commision Decree 3278, Jan.26, 1978. Created National wildlife Council. Decree 550, June 17,1982. Closing season regulation. Decree 301, Dec. 11, 1978. Natural Resorces Inter-institutional coordination Res. No. 64, June 20, 1989.Regulates Vegetation export. Decree 55, Feb. 26, 1992. Closing season for ten years Decree 5011, Oct. 4, 1980. Comision for the protection of Flora and Fauna Decree 319, Oct. 12 Created the Comision Santuario Ballena Jorobadas Decree 407, Nov. 14, 1986, Created National Museoum of Natural Historic Decee 155, 1987, created the Environmental National Comision Law 67, Nov.5,1974. Created National Park Directorate Law 1410,April 4, 1947. Created a National Park, Puerto de la Comun, Jarabacoa. Law 3841, May 5, 1954. Rio Bao Watershed protection. Law 4389, Feb. 16,1956. Created Armando Bermudez National Park. Law 5056, Dec.24, 1954. Created Jose del Carmen Ramirez National Park. Law 4991, Sept.9,1958. Haina and Duey watershed protection. Law 5579,July 18, 1961. Alto de la Bandera, Constanza Protected Area. Law 5697,Dec. 8, 1961. Diego de Ocampo, Protected Area. Law 470, Sept.2, 1964. Protects several mountain tops. Law 244, Jan.10 1968. Created Los Haitises National Park. Law 409,May 26, 1976. Created Los Haitises National Park. Law 654, April 25, 1974. Created Cabo Frances Viejo National Park. Law 664, April 25, 1974. Created Isla cabrito National Park. Law 95, Mar.17, 1971. Created Litoral Norte, Puerto Plata. National Park. Law 305, May 23, 1968. Created Santo Domingo Litoral Sur National Park Law 249, Feb.25, 1985. Created La Caleta Sub-Marine National Park. Law 206,Nov.1, 1967. Gave authorization to National Police and the military for conservation, restauration of forestal vegetation. Law 5697, Dic. 8,1961.Loma Diegode Ocampo. Law 627, May 1977. protection of Mountain Areas.

Table 4.3 Continued.

Type of policy		
Transnational	Sectoral	Specific
		Law 520, 1969. Create National Monument Caves of haitises.
		Decree 1311.Sept.9, 1975. Created Del Este National Park.
		Decree 1315.Aug.11, 1983.Created Montecristi, Jaragua, Sierra del Bahoruco and Natural Cientific Reserves: Izabel de Torres, Valle Nuevo, Laguna Laguna limon. Reforms by Decrees: Reforms by Decree 155, 156,157 of 1986
		Decree 417 of Oct. 27, 1989. Created Ebano Verde Natural Scientific Reserve
		Decree 159, Feb.26, 1986. Created Aceitillar – Cabo Rojo Scenic Rute
		Decree 305, April 30, 1968. Prohibit Construction betwen high tide and low tide.
		Decree 199, June 20, 1992. Nizao, Mahoma and Mahomita watershed. protection. Special Manegement Areas, Nizao and Mahomita confluence.
		Decree 2724, Aug. 12. 1968. Rio Catalina, sosua, watershed protection.
		Decree 138, March, 1991. Loma El Curro, Azua.
		Decree 82, March 6, 1992. created Quita Espuela Scientific Reserve
		Decree 303, 1987. Protection of the mangroves of Barrocote, San Lorenzo,La Jina
		Law 295, Aug.28, 1985. Introduces in school curriculum Natural Resources Conservation.
		Law 112, Dic. 10, 1987. Obligatory Forestry Service.
		Res.488 . High School Students intership in social work.

The main transnational policies are:

- The Convention on International Trade of Endangered Species (CITES), which regulates the trading of endangered species among signatory members;
- The Declaration of the United Nations Conference on the Human Environment (1972). Principle 4: "Man has a special responsibility to safeguard and wisely manage the heritage of wildlife and its habitat which are now gravely imperilled by a combination of adverse factors;"
- The World Conservation Strategies (1980);
- Report of the World Commission on the Environment and Development (1987). This is a strategy for sustainable living, stressing that sustainable development needs be met in the present without compromising the ability of future generations to meet their own needs;
- The Earth Summit declaration (1992);
- The Pan-American Union Convention for the Protection of Nature and the Preservation of Wildlife on the Western Hemisphere (1942);
- The U.S. Agency for International Development Environmental Policy;
- The Inter-American Development Bank Environmental Policy; and,
- The World Bank Environmental Policy.

There are many other global and regional policies, including the Cartagena Protocol, the Convention of Wetlands (RAMSAR), and the Conference of Plenipotentiaries Concerning Specially Protected Areas and Wildlife in the Wider Caribbean Region. There are other regional agreements related to marine and coastal environments to which the DR's signatures are pending.

At the sectoral level the most critical policies are those in education and agriculture. Education is deficient, suffering outreach limitations. Education policy includes increasing the population's awareness about wildlife. The Education Secretariat is coordinating efforts with other institutions to train teachers on environmental subjects. Agricultural policy, on the other hand, is centered on increasing production with little regard for the preservation of endangered species and biodiversity.

In the DR, there are extensive sets of laws, decrees, agreements, and treaties regarding some aspects of wildlands and biodiversity development, conservation, and relevant agencies. The considerable body of legislation directed at biological resources and specific environmental

problems is now administered by several institutions. There is no comprehensive national environmental policy; instead, a wide range of particular policies exist which sometimes assign similar responsibilities to more than one institution.

The most important specific laws in this area are the Hunting Law of 1931 and the Fishing Law of 1962. In addition, there is Law 8 of 1965. By the provisions of this law, SEA can regulate the import of exotic animals and ornamental plant materials.

Other important laws affecting national wildlife are those concerning protected areas. More than 11 percent of the national territory is under protection. More than 84 percent of threatened species have their habitats in protected areas. Because of the poor management of these areas the number of species moving from the threatened to endangered category is increasing. The laws and decrees designating the protected areas are listed in Table 4.3.

4.1.2 Institutional Framework

There are several institutions that share responsibility in managing wildlife and biodiversity. The leading institution is the **Departamento de Vida Silvestre** (DVS-Wildlife Department) of SEA. Its main objective is to promote, develop, and conserve flora and fauna, and study the ecological processes that are critical to maintaining their existence. The DVS is well-staffed for resource inventories and custodial activities, but it is ill-staffed for considering the natural variability of ecosystem structures and processes that properly managed interventions may require. By Dominican standards, the DVS is the best-staffed government agency in this sector. It has 25 professionals in addition to 48 wildlife wardens and administrative personnel. There is also a large number of volunteer wildlife wardens.

CEDOPEX, the Plant Protection Department, and the Livestock Directorate are all responsible for the registration of import and export of fauna and flora species and their products. Their task is only to perform registration duties. Advisability of species trade is not taken into consideration.

The **Departamento de Recursos Pesqueros** (DRP - Fishery Resource Department) of SEA is mainly responsible for aquatic resource management. The major emphasis in aquatic resource management has been in harvesting potential. Coral reefs, seagrass beds, mangrove habitats, wetlands, and coastlines and terrestrial ecosystems are important to aquatic wildlife but are not a major concern to the DRP. It focuses mostly on production, and it seems to be on a collision course with the DRP and other institutions.

The DRP, by law and decree, controls the use of stony coral, sea fans, black coral, sea shells, oysters, large crabs, conch, shrimp, lobsters, manatees, sea turtles and other species of economic importance as well as fishing techniques. However, the legal mandates involved have not been strictly enforced or effectively administered. There are interdepartmental conflicts with DRP in the management of manatees, sea turtles, and sea birds.

The **Jardín Botánico Nacional** (JBN - National Botanical Garden) was created by Law 456 of 1976. Its major goals are to preserve the national flora and to promote botanical studies of flowering plants, non-vascular plants, ferns, orchids, and species of highly restricted distribution.

The JBN has conducted a flower inventory of **Ebano Verde Reserve** in coordination with Fundación Para el Mejoramiento Humano (PROGRESSIO), an NGO responsible for the administration of this reserve. JBN has also conducted a flower inventory of Del Este National Park in cooperation with DNP. Another activity conducted by the Botanical Garden is the technical assistance for the creation of the Botanical Garden of Jánico, in Santiago. In addition, it has provided technical assistance to different universities for students' theses and some private institutions such as medical laboratories.

JBN provides medical plants samples to the Cancer Institute of Washington for research in the field. The Botanical Department has six specialists with advanced training. The study of flora for the DVS is also made by the JBN. However, it lacks specialized personnel due to low salaries.

The **Dirección Nacional de Parques** (DNP - National Parks Directorate) manages protected natural areas, urban parkas and man-made ecosystems. It is described in more detail in section 4.2.2.

The **Parque Zoológico Nacional** (ZOODOM - National Zoological Park) was created in 1975 by Law 14 as a dependency of the Administrative Secretary of the Presidency. The main focus of ZOODOM activities continues to be education and research, including breeding endangered species in captivity and conducting inventories of their natural habitats. Technical and financial assistance were provided by the Secretariat of State for Education, Fine Arts, and Culture, the OAS, and the WWF (Peña Franjul, 1976).

Presently the ZOODOM is conducting research on the fauna of the Antilles, including reproduction habits, growth rates, and feeding habits. ZOODOM is also carrying out an important environmental education task, working with 200 students per month. These students must do 60 hours of social work to graduate from high school (Secretaría de Estado de Educación, Bellas Artes y Cultos—SEEBAC—Resolution 488). ZOODOM also has an agreement with SEEBAC for training teachers on environmental education in the entire country. Teachers from the Southwest and Southeast have already been trained. At present, teachers of the Eastern portion of the country are undertaking environmental education training. There are some working agreements between ZOODOM and the National Museum of Natural History. ZOODOM is under the financial administration of The National University Pedro Henríquez Ureña (UNPHU).

The **Museo Nacional de Historia Natural** (MNHN - National Museum of Natural History), is a branch of the Administrative Secretariat of the Presidency. Its major goal is to conduct basic research, especially on birds, mollusks, and crocodiles (USAID, 1981).

Presently, the Museum is practically closed to the public mostly due to scarce resources. Budgetary constraints do not allow MNHN to maintain standard administrative structures and operational procedures. The MNHN staff is underpaid. The monthly salary of a biologist is lower than the salary of a park warden.

The **Centro de Investigación y Mejoramiento de la Producción Animal** (CIMPA - Center for Research and Improvement of Animal Production), a non-profit organization, has also been involved in biodiversity conservation activities. CIMPA has worked with native wild pigs to breed them with other species. These pigs are endangered. CIMPA also works with donkeys and native cows.

Hemispheric and regional concerns about wildlands and biodiversity have catalyzed additional support and capital investment to local public institutions and NGOs. PRONATURA is a coalition of private organizations that manages a donation of the Conservation Trust of Puerto Rico obtained through a debt-for-nature swap in 1990. PRONATURA has provided funding for specific projects for the Isla Cabritos National Park, Arroyo Parra watershed, Ebano Verde Natural Scientific Reserve and the Diego de Ocampo Peak. PRONATURA is a joint venture with The Nature Conservancy providing extra budgetary funds for public and private institutions that work in the wildland and biodiversity sectors.

There is also some significant management-sharing arrangements between the National Parks Directorate and the Jaragua Group, PROGRESSIO, and the Quita Espuela Foundation to promote conservation of biological resources in protected areas through private sector initiatives. These and other institutions involved in wildlands and biodiversity are listed in Table 4.4.

4.1.3 Analysis

Reviews of the historical evolution of natural resource use policies clearly indicate a strong relation between global, regional, and national policies. External influence seems to be motivated by the change in policies of international financial organizations that insist that natural resource conservation measures be addressed in loan proposals (Carpenter, 1980; Putney, 1980). Such modifications of financial policies come from pressures exerted by the environmental groups of major shareholding countries who have finally realized that the granting of international loans and aid for major development projects without environmental considerations creates diseconomies that are major obstacles to development. International, regional and bilateral financial institutions are now requesting some kind of environmental profile as part of the requirements for financing large-scale development projects. The modified Foreign Assistance Act (1978) gives USAID clear authority to carry out studies for this purpose.

In the DR, knowledge and understanding of the importance of those global and regional policies are weak, but there is advancement on conservation measures and the emergence of ecological awareness. The DR has shown a desire to be integrated into regional and global resource management initiatives to preserve the world's natural heritage.

TABLE 4.4 Institutions Involved in Wildland and Biodiversity Policies, by Type, DR, 1992

Type of Policy		
Transnational	Sectoral	Specific
Secretariat of Foreign Affairs	Secretariat of the Presidency	Wildlife Department
USAID	SEA	Fishery Department
World Bank	CEDOPEX	National Parks Directorate
UNEP	National Technical	General Forestry Directorate
IDB	Forestry Commission	Museum of Natural History
OAS	Dominican Army and Navy	National Zoological Park
		National Botanical Garden
		Marine Biologic Research Center
		Pedro Henriquez Urena University
		PROGRESSIO
		Fundacion Quita Espuela
		Grupo Jaragua
		ISA
		SOECI
		FEDOMASEC
		CEBSE
		Plan Sierra

In spite of the environmental awareness and ecological concerns of the Dominican population, the country does not have comprehensive legislation to protect wildlife and biodiversity. The most important regulatory instrument derives from the Convention of International Trade in Endangered Species (CITES). This convention provides guidelines for the commercial traffic of wildlife species among signatory nations. Controlling plants and animal trafficking is mostly a matter of concern in developed nations. The DR does not have an effective institutional infrastructure to control the exportation of endangered species or the smuggling of plants and animals. There are several vulnerable species, such as the Hispaniola parrot (*Amazona ventralis*), that are openly marketed.

Biodiversity is facing legal, institutional, socioeconomic, conceptual and technical constraints that impinge its management for conservation and development. Laws are single-targeted, partially implemented or simply disregarded by the authorities. The legal basis for wildlife management is the Hunting Law, dating from 1931, and the Fishing Law of 1962. Those laws by themselves are not conservation laws. It is now apparent that both laws are obsolete. Modern wildlife and biodiversity conservation requires a form of protection that was not envisioned 60 years ago. Those laws are supplemented by decrees issued by the President to regulate hunting and fishing. The real problem consists in translating those legal mandates into actions. Protecting species such as the white-crown pigeon (*Columba leucocephala*), which is hunted all over the nation, has been very difficult. The Wildlife Department elaborated a comprehensive Fauna Law proposal in 1979, but it has been unsuccessful at promoting its acceptance and approval by the Congress and the Office of the President.

The Fishing Law—and various other decrees, agreements, and treaties regarding aspects of aquatic resource management—provide a better framework for marine biodiversity management activities. They give authority to the DRP for partial management of the aquatic wildlife. However, the DVS, DRP, and DNP compete for jurisdiction over certain resources, species and habitats.

There are problems in the present administrative structure. The management agencies are ill-equipped to implement laws in an effective way to fulfill their responsibilities as trustees of the nation's biological heritage. Responsible management is a requisite for conservation and development. The administrative structure of the wildlands and biodiversity sectors is still underbudgeted, understaffed and under-equipped to effectively manage the DR's biological resource endowment. Inadequate public funding and a shortage of qualified personnel and equipment at the national, regional and local levels hinder better natural resources management. Current actions are not sufficient to guarantee the long-term conservation objectives of the present policies. Many legally protected areas do not have formal budget allocations.

A comprehensive wildlife and biodiversity law is urgently needed to regulate trade in exotic plants and animals. There are insufficient regulations for the commercialization of fauna and flora, especially the expatriation of flora samples. Regulations should incorporate global, regional, and national initiatives. Management goals should be followed by proper procedural steps to achieve those goals, and budgetary allocations should be provided for public understanding of restricted measures and policy implementation. The CITES criteria are helpful guidelines for the needed law.

Research is needed to develop standards by which development and conservation should be judged. Without accurate and authoritative information, conservation and protection of wildlands and biodiversity may never be a reality. Conservation on a small island is a very complex issue. The research agenda requires an unprecedented collaboration between public and private sectors, both inside and outside the country to balance biophysical, socioeconomic, and cultural environments. Budgetary constraints are restricting the research agenda of the public sector. Lack of funding and well-trained personnel are hindering private sector research.

The major institutional problems are related to the agencies themselves. The Fishery Resource Department (DRP) and the Wildlife Department (DVS) evolved from the Hunting and Fishing Directorate in 1978 by Resolution of the Secretary of State for Agriculture. The DRP focuses on the fishing law; thus, it is not concerned with biodiversity. On the other hand, the DVS focuses on preservation. It has recruited, trained, and equipped a young cadre of biologists to work on natural habitat inventories to preserve and maintain biodiversity on a culturally diversified and biologically complex island.

Both departments have presence at the national, regional, provincial and municipal levels. Structurally speaking, they are well equipped for carrying out integrated management programs of biological resources, but both departments are facing extraordinary pressure from inside SEA. SEA's major priority is to increase agricultural production. Agricultural activities are responsible to some extent for the depletion of the forest and wetland habitats, reservoir and reef siltation, and for the pollution of streams with certain chemicals. From those perspectives, agricultural policies are a significant part of the problem. Most agronomists have a persistent misconception about wildlife and biodiversity.

The DVS has conducted and developed some important habitat studies, special biotopes, and technical reports on the DR's biodiversity, as well as many inventory studies that have facilitated the creation of new protected areas. Funds for these studies are extra-budgetary, coming from DED/WWF and USAID.

The Wildlife Department cannot accomplish many of its functions in any significant manner. The major law in this area is obsolete and regulatory decrees are not supported by scientific data or up-to-date information. DVS activities and objectives are important, but the National Planning Office so far has failed to give them priority among national objectives.

There are other intra-institutional conflicts dealing with animal sanitation, vertebrate pest control and plant protection. Those conflicts are exacerbated by limited coordination among implementing institutions. These can be easily solved by a direct pragmatist approach. The Secretariat of Agriculture has the authority to integrate and coordinate multiple aspects of wildlife and biodiversity management within the SEA. Agricultural policies are gradually embracing the sustainable development ideology.

The inter-institutional conflicts of DVS and DRP are mainly with the DNP. Policies and actions are sometimes carried out with total disregard for each other. There are also some overlapping institutional jurisdictions. In some cases, these agencies have developed cooperation agreements on specific issues—including resource inventories—profiting from the academic and research resources that exist in the country. Theoretically, there are no conflicts. Both institutions concern themselves with wildlands and biodiversity protection. Cooperation between institutions and with other NGOs is usually done. Conservation and development conceptually allow a wide array of institutional participation. Good management of wildlife and biodiversity can provide a wide variety of environmental and economic services. The DVS may wish to have

wildland to manage; but that desire can only be possible by modifying the present legal basis of this resource management.

There are many problems affecting institutions sharing responsibilities for wildlife and biodiversity management. The most critical seems to be inadequate budgetary allocation and human resources. Low salaries and lack of incentives are rapidly draining the highly qualified staff from those institutions. MNHN, JBN, ZOODOM, and universities are in critical financial condition, reducing their possible contributions to natural resource management.

The country's universities are rapidly advancing to develop educational and training programs in natural resource management. UNPHU, INTEC and UASD have graduate programs in forestry, environmental education, and ecology, respectively. UASD has been working jointly with New York City College under a grant from a special USAID program for university collaboration. UNPHU has a strong relation with Cornell University, and is developing a masters degree program in natural resource management. There is significant participation of university professors in workshops for natural resource management. This has been organized by the Consortium of Caribbean Universities for Natural Resource Management.

In summary, wildlife and biodiversity management is a very complex issue. The survival of ecosystems depends on interrelationships. Conservation is a way of thinking, but it needs better inventory of habitats and species, clear definitions of carrying capacity, and the monitoring of changes. The DR's institutions must change their work styles to unify departments that share responsibilities, which in the past have been isolated. Conservation does not exclude people and their activities from the benefits. It should encourage the population to participate in wildlife and biodiversity and look at the relation to the national economy. There is a need to maintain a balance between ecological concerns and economic growth.

4.1.4 Potential Policy Alternatives

Alternative policies to improve protection of endangered species and biodiversity include:

- Approve the Fauna Law proposal for managing wildlife commerce, as well as hunting, export, protection and recovery of endangered species;
- Define the institutional responsibilities between DVS and the DRP, with respect to the protection of marine fauna;
- Establish a clear inter-institutional boundary between DNP, DGF, DRP, and DVS over the functions in wildlife and wildlands management;
- Locate the DVS under a more suitable administrative structure. The SEA has clear production policies, while DVS's goals are more concerned with wildlife, species research, and protection;

- Define CITES Appendix 3;

- Establish wildlife commerce legislation;

- Develop an inter-institutional educational program at the technical level and decision-making level to create awareness of the value of wildlife. Education is an effective tool to influence policy makers. NGOs could play an important role in the strategy;

- Direct extra-budgetary revenues to wildlife- and biodiversity-defined priorities; and

- Improve personnel management capability.

4.1.5 Recommendations for Future Research and Analysis

Some studies are needed to increase basic knowledge about the behavior of endangered species and the island's biodiversity to better target policy alternatives. The following are recommended:

- Conduct studies on the biodiversity of the DR's protected areas;

- Conduct an inventory of flora and fauna in critical areas of the country to protect valuable endangered species and their habitats;

- Study the economic and social values of specific wildlife species. These studies are important for implementing sustainable management projects that can be integrated into communities. These projects will benefit both wildlife and human beings;

- Study alternatives to increase the financial sustainability of the Botanical Garden and other similar institutions;

- Intensify studies and inventories of national wildlife. Knowledge of distribution, animal behavior, and economic and ecological values is the base for a practical and accurate wildlife-planning policy; and

- Study ways to develop a vertebrate pest control program.

4.2 Wildlands and Ecotourism

The national parks and equivalent protected categories play a vital role in national development. There are many economic spin-offs related to protected areas. The areas are central to wildlife conservation and watershed protection. Parks, reserves and sanctuaries provide

habitat protection for more than 84 percent of threatened species. The protected area system includes a large portion of the upper watersheds of many rivers and streams. The establishment of the Armando Bermúdez National Park (1951) and José del Carmen Ramírez National Park (1956) were motivated by watershed protection objectives. Likewise, the creation of a protected area in the Nizao-Jiguey-Aguacate upper watersheds (Decree 199-92) set aside an area for similar objectives.

The economic contribution of those protected areas is highly significant, especially when they are considered in regional and national contexts. Protected areas are of considerable value to the economy. They sustain ecosystems, habitats and species, and the regulation of physical, chemical and biotic processes essential to human life support systems (Beacon, Deane and Putney, 1988).

There are eight wildland management categories established by Law 67. However, in practice they are limited to national parks, scenic routes, scientific reserves and fauna sanctuaries (Table 4.2). The management concept comes from insular ecology theories. Most protected areas have been managed as "islands for protection" without knowledge of biota needs and uses for productive economic ends.

Substantial progress is being made in protected lands. Existing lands provide adequate habitats for the survival of viable populations of endangered species and native population. The area under protection has grown considerably since the establishment of the Armando Bermúdez National Park (1951). Protected areas represent more than twelve percent of the National Territory, of which less than nine percent is managed by the DNP (Peña-Franjul, et al, 1991).

4.2.1 Policy Framework

Wildland policy has always been influenced by international guidance. The first national park, Armando Bermudez, was created in 1956 by Law 4389. The creation of this protected area was a response to a sequence of events that started in 1942 when the DR joined the Latin American Flora, Fauna and Scenic Beauty Protection Convention. Soon after, the Jose del Carmen Ramirez National Park was created in December of 1958. For many years, these two parks were the only elements constituting a wildland management policy. The laws creating these two parks are contradictory, classifying the parks as "forestry reserves" and "national parks" at the same time.

DNP was created in 1974 by Law 67 with the responsibility of managing all natural protected areas. After this institution was established, another group of laws was enacted creating the following natural protected areas: Isla Cabritos, Del Este, Litoral Norte and Puerto Plata National Parks, and Villa Elisa Scientific Reserve. Another long period elapsed before other areas were created in 1983. A list of the existing laws is found in Table 4.3.

Most of the laws creating reserves and national parks did not clearly specify their boundaries. At present, the Haitises National Park boundary is a point of conflict between the

DNP and people cultivating land, mainly in the "buffer zone." Other parks with unclear boundaries are Jaragua, Sierra de Bahoruco, and Monte Cristi National Parks. At present, most of the protected areas are created by Presidential decrees.

4.2.2 Institutional Framework

The leading institutions in wildland management are the **Dirección Nacional de Parques** (DNP - National Park Directorate), DGF, DVS, and the Fisheries Resources Department. Other institutions play a secondary role in wildland management. The national wildland policies are established by congress, the Presidency, and the Secretariat of International Affairs. The Educational and research are conducted by several institutions, including public and private universities. The universities work with traditional biological science education, and no openings, with the exception of some graduate programs, have been made in the curriculum to meet the present professional needs.

DNP was created in 1974 by law 67. It is administratively within the Administrative Secretariat of the Presidency and its main goal is to conserve, protect and develop recreational areas. These areas are historic, natural, and indigenous. The natural areas include national parks, scientific reserves and botanical gardens. The emphasis of the institutional policies of DNP changes from time to time. During a given period of time it concentrates on the management of one natural area and during another time the focus is on urban areas.

The staff of DNP is insufficient. Only two people have special training in wildlands management. DNP has eight different departments: Planning, National Parks, Legal, Public Relations, Administration, Urban Parks, Training, Research, and Historic Sites. DNP has minimal equipment to support its tasks. Infrastructure is minimal and so is the presence of personnel.

DNP receives foreign assistance from World Fund for Nature, the Spanish International Agency for Cooperation, USAID, The Nature Conservancy, Latin American Network of Protected Area, and PRONATURA. Some of these institutions assist DNP with funds for projects and some provide technical assistance.

DNP is consolidating the existing protected areas, increasing management capabilities, developing park interpretation infrastructures and increasing the number of park wardens. This has been done with extra-budgetary revenues and coordination with other agencies. The undertaking of some of these tasks has been possible due to financial and technical assistance from The Nature Conservancy, USAID, WWF, AECI, IUCN, Jaragua Group, PRONATURA, PROGRESSIO, and others. Despite extraordinary efforts in the protected-area sector, the threats to ecosystems, habitats and endangered species continue, as many of these areas lack adequate protection.

The private sector is helping DNP with the management process in protected areas. PROGRESSIO is a national NGO managing the Ebano Verde Scientific Reserve. Grupo Jaragua

cooperates with research in the Jaragua National Park, and the Ecological Society of Barahona (SOEBA) is in charge of the environmental education campaign in Jaragua and Sierra de Bahoruco National Parks. Quita Espuela is managed by the Fundación Quita Espuela. These NGOs have signed agreements with the DNP to manage these areas.

4.2.3 Analysis

After eighteen years, the management of protected areas in the DR has not improved greatly. The only significant advancement has been the creation by law or decree of the national parks and scientific reserves. However, wildlands legislation is ambiguous. Most of the national parks and reserves are partially located on private property and their boundaries are unclear. The laws creating national parks and reserves do not establish how to obtain private land. Several conflicts have been caused due to this factor. Conflicts include the case of Del Este National Park, where an owner continues to use a beach house for years, despite the law that made it park territory long ago, even before the house was privately owned.

Another example is the Ebano Verde Scientific Reserve, where land owners attempted to build houses on reserve land. Sixty percent of the area in Ebano Verde belongs to private owners. Protected areas are created in territories that include private land (Table 4.2). Forty percent of the territory in all the parks and reserves are private lands. Sierra de Bahoruco National Park was the subject of national debate because the law is unclear on boundary limitations. The situation is even worse in the Haitises National Park, where boundary limitations have contributed to human conflict. Small farmers living in the buffer zone of this park have been literally forced to leave the area. Some farmers have had activities inside the imaginary park boundary, but no clear boundary limitation was ever really established. The consequences of this fact are that people living around the protected areas consider the parks as enemies; they intentionally destroy or over-use the natural resources in these areas. People living around the protected areas are poor and illiterate, and DNP and the Government should explore other ways to work with this population. Sustainable development using the communities as actors in the process is the way people are trained worldwide to deal with the management of protected areas.

It is important to point out that the private land owners in national parks and scientific reserves want the Government to buy these lands, but DNP doesn't have the resources to do so.

Law 67, which created the DNP, gave a broad mandate to this institution. Control of the Santo Domingo urban park is an operation drawing greatest pressure on DNP from the Government. Most of the efforts and budget are placed in the urban park system to maintain good conditions to the detriment of the natural protected areas. Urban parks should be the responsibility of municipalities. DNP controls historic sites which should be under the Patrimonio Cultural Office. In addition, DNP has the legal administrative control of 23 natural protected areas constituting more than 12.8 percent of the national territory. Thus, DNP has to deal with a broad mandate and it doesn't have sufficient resources to do an adequate job. DNP's director is a member of more than twelve national commissions involving natural and

cultural resources. He spends more than 90 percent of his time participating in the meetings of these commissions.

The natural protected areas are constantly threatened by human activities due to insufficient and inadequate policies related to national parks and reserves management. DNP does not have the budget to develop these areas. Fifty percent of its budget is spent on salaries and the remaining part on urban parks. The number of park rangers protecting the 23 areas (6218.60 km^2) is 170. There are 383 km^2 per park ranger when it should be 10 km^2 per park ranger. This amount of territory does not include the Marine and History National Park. The marine parks are unprotected by DNP, and only the Navy has control over them. The protection function, which is the first in any natural area management plan, practically does not exist.

There is no differential management among protected categories. There are several reasons for this:

- The restricted protection categories in the law;
- The lack of a comprehensive protected areas system;
- The lack of management plans for individual protected areas; and,
- Inadequate funding and regional human resources.

Education on parks and community outreach have increased park management capability. This has been possible through debt-for-nature swaps and extra-budgetary funding from The Nature Conservancy, WWF, AECI, and local NGO's. Universities such as Cornell and UNPHU have developed a research agenda for buffer zone management.

The most important operational problems involved in the administration of protected areas are:

- Land acquisition—the need to purchase land retained by holders within park boundaries;
- Undefined park boundary demarcations;
- Few park wardens, trained and equipped;
- Lack of an environmental outreach program with local and regional school teachers for nearby community involvement;
- Lack of basic patrol functions;
- Lack of a long-term funding source; and

- Lack of monitoring and management systems.

Since 1976, when DNP first began to operate, the budget has been an obstacle to its development, causing problems in the hiring of specialists, training of personnel, and the overall development of the protected areas. The low salaries at DNP provide little incentive for people with technical skills.

The protected areas category is another problem facing wildlands administration. There are 13 national parks created by law. Of these areas only eight belong to the category of national parks: Armando Bermúdez, José Del Carmen Ramírez, Jaragua, Sierra de Bahoruco, Haitises, Del Este, Isla Cabrito and Monte Cristi. The remaining areas should be renamed to adjust their categories. For example, the Litoral Norte of Puerto Plata National Park and the Litoral Sur National Park in Santo Domingo are areas that do not have the natural conditions to be a national park. The Laguna de Limon and Laguna del Rincón scientific reserves need to be renamed and classified in a category that can be managed together with the surrounding communities. These lagoons are a source of food and jobs for many people living in these communities. Good management will require better understanding of the ecosystems, habitats and species found within the natural areas and the surrounding population.

The development of ecotourism activities with total disregard for proper administration will result in severe environmental damage, social dislocation, and unrealistic expectations. Recreational use by Dominicans is increasingly becoming too expensive in several protected areas. The cost of renting a boat in Bayahibe or Sabana de la Mar to visit the East Park and Los Haitises is too high to allow for a true appreciation of nature. Most Dominicans are unfamiliar with the national parks system. The ecotourism activities are more oriented to development than to protection. There is a need to view the parks as part of ecosystems in larger regions, and to combine protection functions with ecotourism. Ecotourism is very limited. There is a lack of appropriate infrastructure for its development, and a general lack of experience with ecotourism operations.

The national wildlands laws are vague as to which institution is responsible for the management of specific protected areas. The way in which protected areas are created has been changed, and today most of these areas are created by decrees.

The number of excursions and tourists visiting the national parks is larger than what is registered. DNP does not have direct control over the number of people visiting the national parks. Ecoturisa, a private institution, has had control and exclusive management of ecotourism activities in the natural protected areas. Presently, however, tourists in the parks do not receive information on the natural resources, and as a result, the park's objective of serving as a means of environmental education is entirely unmet.

The lack of management strategy in the natural protected areas has its implications. Valle Nuevo is by law a scientific reserve, which means it cannot be visited by tourists. Yet a group of 35 people did visit the area in 1991. Management should prohibit visitors in

scientific reserves; otherwise, the reserves should be renamed and classified under another category that does permit tourists.

4.2.4 Potential Policy Alternatives

Policies to improve wildlands management and ecotourism in the DR would include:

- Developing a model national park to demonstrate that a well managed, protected natural area can be economically self-sufficient;
- Defining roles for DNP and the Secretariat of Tourism in promoting ecotourism;
- Formulating an action plan for natural resources management. The institutions working with natural resources must find a more suitable and efficient way to manage these resources;
- Expanding Isla Cabritos National Park. The lake should be included in the expansion of park areas due to its inefficient management of crocodiles and other protected species; and
- Expanding Del Este National Park. The Catuano Canal between the mainland and Saona Island needs to be included in the park areas for better protection of white crown pigeons and other species.

4.2.5 Recommendations for Future Research and Analysis

Studies needed to improve the analysis of policy alternatives for wildlands management and ecotourism include:

- Conducting studies to develop a definitive wildlands protection system for the DR. It is impossible to continue creating areas without a clearly defined strategy;
- Studying budgetary possibilities to create, within the DNP, an environmental education unit which includes a component dealing with ecotourism;
- Analyzing alternatives for private sector participation in natural protected areas management. The administration of Ebano Verde Scientific Reserve by PROGRESSIO is a good example to study; and
- Studying the possibility of using debt-for-nature swaps to acquire privately held land in protected areas.

5. SUSTAINABLE AGRICULTURE

The term *sustainable agriculture* is associated with farming practices that maintain or enhance soil productivity, economic viability, genetic diversity, relative resistance to pests, and protection of water resources. However, in the context of this report, sustainable agriculture is also associated with the appropriate use of land at the highest productivity level possible without degrading it. That is, the ability of the agricultural system to comply with the evolution of human needs without degrading the natural resources, and better yet, to improve the natural resource base. The best way to protect land is through conservation in national parks. However, land must also feed and provide resources for a growing population.

Thus, one must examine not only soil conservation, but also land capabilities. Maximizing land use while maintaining its productivity will increase income, thus contributing to the reduction of population pressures on 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 biodiversity are also integral parts of sustainable agriculture. However, given their importance, they have been treated in previous chapters. The issues to be treated here, 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—informal, de facto practices. This study treats both kinds of policies according to their impact on natural resources. Under the theme of sustainable agriculture, de facto policies predominate over formal ones. This is because in sustainable agriculture there are more dynamic policies that change continuously, such as macroeconomic policies.

5.1 Land Utilization and Soil Fertility

Land use capability pertains to the most intensive, sustainable, and continuous ways land can be used continuously without degradation. This capability can then be compared with actual land use to determine whether a particular piece of land is being underused or overused, the latter leading most often to degradation. Both situations occur in the DR. Overuse causes direct degradation. Underuse, while ostensibly contributing to land conservation, also favors overall deterioration. Low use of high capability soils also contributes to a decline in the income of the entire population. In such circumstances, small farmers may become squatters and be forced to deforest available land and/or 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 the DR. 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 (Stallings, 1957, p. 427).

TABLE 5.1 Land Classes, Dominican Republic, 1981

Land Class	Area (Has.)	%	Observations
Suited for cultivation			
I	53,700	1.1	Excellent for cultivation
II	235,000	4.9	Very good for cultivation
III	312,200	6.6	Good for cultivation
IV	363,900	7.7	Limited or marginal for cultivation
SUB-TOTAL	964,800	20.3	
Not Suited for Cultivation			
V	607,100	12.7	Pasture, no erosion hazard
VI	561,100	11.8	Pasture, erosion hazard
VII	2,516,100	52.7	Forest
VIII	120,200	2.5	Wildlands
SUB-TOTAL	3,804,500	79.7	
TOTAL[1]	4,769,300	100.0	

[1] Does not include 58,800 Has. in water bodies, islands and unclassified areas.

Source: Hartshorn, Gary, et.al. 1981. The Dominican Republic, and Environmental Profile. Field Study. Santo Domingo: USAID.

Table 5.1 provides a breakdown of land classes in the DR. It indicates that only 20 percent (964,800 hectares) of the land in the DR is suitable for cultivation, and 80 percent (3.8 million hectares) is not.

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 and the data integrated with soil classes to determine homogeneous areas for cultivation purposes. The DR has a soil classification system that incorporates these factors. This classification system divides the country into Resource Production Units (RPU). Each RPU is relatively homogeneous for production purposes. The country has a total of 46 different RPUs. Table 5.2 lists the characteristics of the main 37 RPUs.

Present land use in the DR generally does not correspond well to land capability classes (Table 5.3). Annual crops and sugar cane occupy 1.3 million hectares, while land in Classes I to IV only cover an area of 964,800 hectares. This indicates overuse of areas not suited for

Table 5.2 Description of Major Resource Production Units (RPU), DR, 1992

RPU	Area (Ha)	Remarks	Agricultural Potential	Limiting Factors
1	50,600	Highly Productive	Moderately High	60% Clayey, 20% Slope, Shallo
2	562,300	Forest	None	None
3	226,300	Pasture	Low Subsistence	None
4	100,800	Generally Productive Rice, Coconuts, pasture	Moderately High	Clayey, Flooding
5	170,400	Unproductive	Very Low	Rock; Slopes; Shallow
6	16,700	Good for Cotton	Moderately High	Clay; Slope; Shallow
7	113,000	Sugarcane, Pasture	Moderate to Moderately High	Wet; Acid; Slope
8	62,000	Sugarcane, Rice, Cocconuts, Cocoa	Moderately High to High and Unsuited	Wet; Some Sandy
9	139,100	Valueless	Very Low	None
10	24,600	Limited Potential	Unsuited	Wet; Acid
11	49,500	Sugarcane Now, but Better for Pasture	Moderate	Slope; Shallow
12	139,800	Sugar, Pasture, Steep Slope Farming by Poor	Moderately High	Clay; Shallow; Slope
13	101,600	Suited for Perennials	Low	Slope; Shallow
14	157,900	Best for Watershed	Very Low	Slope; Shallow
15	44,900	Floods	Moderately High to High	Flooding
16	73,600	Periodic Flooding	Moderately High to Moderate	Wet; Saline
17	110,300	Most Productive in Dominican Republic	High	Clay
18	27,700	Present Use Optimum	Moderate to High	Wet; Slope; Shallow
19	24,700	Sugar (rain) but Best for Pasture	Moderately High & Low	Wet; Slope; Shallow
20	40,000	Pasture; Sugar (rain); Subsistence	Moderate to High	Slope; Clay
21	14,800	Intensive Production, Valley Rice and Sugar	Moderately High to High	Drainage
22	31,100	Best for Pasture; some Sugrar	Moderate to Moderately High & Low	Acid; Slope; Wet; Shallow
23	69,800	Little Potential	Very Low	Rock
24	280,000	No Potential	Very Low	Rock
25	182,800	Has Most of Major Irrigated Crops	Low to Moderately w/Irrigation	Droughty; Coarse;
26	2,900	Vegetables	Moderately High to High	Drainage
27	189,000	Some Poor Farming	Low to Very Low	Slope; Shallow
28	30,800	Saline; Needs Irrigation	Moderately to Moderately High	Droughty; Saline
29	113,300	Little Value	Low	Slope; Dry
30	129,200	Bad	Low	Slope; Dry
31	58,600	Highly Variable, Needs Irrig.	Moderately Low	Slope; Dry; Shallow
32	55,300	Good Perennial; Annuals Without Irrigation	Moderately Low	Slope; Dry; Shallow
33	37,400	Lack of Rain Through-out Year; Seasonally Variable	Moderate to Moderately High	Clay; Slope, Dry
34	23,300	Intensive Agriculture	Moderate to Moderately High	Clay; Slope
35	140,900	Variable Rain	Moderate	Dry; Slope
36	97,500	Naturally Unproductive	Low to Moderate w/Irrigation	Dry; Slope
37	40,600	Highly mixed	Moderately High & Low	Wet; Slope; Shallow

Source: DR Enviromental Profile, 1981, and Dpt. of Natural Resource Inventory SEA, 1992.

intensive farming. On the other hand, Table 5.4 presents a detail of land use by land capability class in 1992. It shows under-utilization of land classes I to IV and over-utilization of land classes V to VII.

The DR Environmental Profile of 1981 indicated that soils in the DR are mostly poor with low productivity levels. This is due to topography, the parental material of soils, or both (Hartshorn, et. al, 1981, p. 53).

The physical and chemical properties of soils required for sustainable agriculture depend on soil topography, soil characteristics, and climatic factors. Soil degradation or depletion 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 agrochemicals.

Soil management in a hot humid climate such as the DR's is a very difficult task. Many physical, chemical, and biological activities occur very rapidly. Thus, land use and soil management are key elements in maintaining the productivity of soils. In the DR, inadequate land use and soil management have been the greatest contributors to soil degradation.

TABLE 5.3 Patterns of Land Use, 1992

Description	Hectares
CROPS	1,717,600
Annual	930,200
Permanent	380,000
Sugarcane	407,400
LIVESTOCK	1,362,800
Improved pastures*	545,120
Natural pastures	817,680
FORESTLAND	1,383,200
Pine	319,800
Broadleaf	257,900
Dry forest	805,500
MANGROVES	23,400
BUSH	276,100
NON-AGRICULTURAL LANDS[1]	68,200
TOTAL	4,831,300

From: Actual Land Use, Department of Natural Resource Inventory; Ministry of Agriculture/CRIES-GIS, Michigan State University, 1992, Santo Domingo, D.R.

NOTES: The non-agricultural lands include: developed lands, wetlands, mine, and degraded lands. Improved and natural pastures are estimated according to data offered by PRODELESTE. They found that improved pastures represent about 55% of the pastures in their target region, East section of the country and Monte Plata. However, the percentage is less for the whole country because of the non-improved pasture in the South. It has to be said that the information could not be obtained neither in the Livestock Directorate or in the Ministry of Agriculture.

Land has been mis-used both through inappropriate crops for the type of soil and slopes and inappropriate cropping patterns and practices for the soil and slope conditions. This problem is observed in areas with steep slopes (field beans in San José de Ocoa area), in flatter lands with soil problems (pineapple and other crops in Villa Altagracia, Cevicos, Cotuí, and Yamasá), and in more fertile lands (Moca, Salcedo) that are being eroded and depleted due to inadequate management.

TABLE 5.4 Actual Land Use per Land Class (Has.), DR, 1992

Land Capab. Class	Crops*	Rice	Sugar cane	Coffee and Cocoa	Coco-nut	Pasture	Broad-leaf Forest	Pine Forest	Dry Forest	Man-groves	Bush	Non-Agric.
I	34,800	900		4,100		3,700	200		300		200	800
II	94,000	61,300	51,900	22,800	300	63,000	9,200	4,800	31,100	1,900	10,700	7,400
III	84,800	34,100	113,000	7,000	1,900	57,000	8,800	1,200	60,500	1,100	13,200	8,000
IV	72,600	53,900	39,500	3,600	7,400	83,800	9,200	1,400	64,500	2,200	54,100	17,500
V	117,300	53,100	142,000	32,300	11,100	256,000	13,900	6,700	92,100	1,800	26,600	22,500
VI	55,300	12,500	32,400	40,000	5,000	134,100	13,300	9,500	132,700	600	21,200	1,300
VII	255,300	14,800	26,900	167,200	22,900	727,300	195,700	280,000	388,700	1,500	142,300	3,600
VIII	14,700	4,800	1,800	8,400	11,900	37,900	7,600	16,200	35,600	14,300	7,800	7,100
TOTAL	728,800	235,400	407,500	285,400	60,500	1,362,800	257,900	319,800	805,500	23,400	276,100	68,200

Source: Natural Resources Inventory Department. CRIES, Land Use by Capability. Santo Domingo: SEA.

* Annual crops excluding rice.

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

- Lack of knowledge about the damage that is being done;
- Population pressure upon the limited land base of the DR;
- Highly skewed land distribution, forcing small farmers to plant tillage-intensive crops on hillsides;
- Inadequate extension services to educate these farmers about appropriate crop and cultivation practices for different soil types and topography;
- Lack of national land use planning and legislation;
- Agricultural land conversion to wetland and vice versa; and
- Land tenure problems.[1]

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

Thirty-eight percent of the DR's rural population is illiterate, compared to 14.4 percent in urban areas.[2] A study conducted in the Bao River watershed found that 85.5 percent of heads of households were illiterate.[3] The low levels of education and technical assistance explain some of the soil degradation and erosion observed in the DR.

The output of the agricultural sector has been in constant decline since 1984. This decline has been due mostly to a reduction in agricultural production. Output from livestock has increased, mainly due to substantial gains in poultry production. The reduction in agricultural output has been mainly due to a drastic decline in sugar production to 12.9 million quintals, half the production of 1984 (SEA, Plan Operativo 1992, Cuadro 4). Production of other crops has also declined, including rice, beans, coffee, and cocoa. The decline of international prices has probably been the main cause for the production drop in sugar, coffee and cocoa, while national policies have contributed to a drop in output of other crops.

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[1] Due to its importance, land tenure issues are discussed in another section.

[2] Secretaría de Estado de Educación, Bellas Artes y Cultos - SEEBAC - 1990. *Hacia Una Acción Intensiva de la Alfabetización en 1990-1994.* Santo Domingo. pp. 12-13.

[3] SEA, Departamento de Tierras y Aguas. 1979. *Plan de Manejo de la Cuenca del Río Bao.* Santo Domingo.

TABLE 5.5 Area Planted in Major Crops, 1983/1992 (Thousand Tareas)[1]

Crop	Year								
	1984	1985	1986	1987	1988	1989	1990	1991	1992[2]
Rice	1,931.9	1,679.5	1,621.0	1,784.1	1,764.2	1,800.8	1,504.3	1,724.1	1,830.4
Maize	907.6	730.4	492.1	452.2	593.6	601.7	433.9	536.4	691.3
Sorghum	250.2	234.8	260.4	246.5	247.5	249.3	131.5	136.7*	100.0
Sugarcane*	248.0#	292.6	255.0	238.9	183.6	215.3	205.6	N.D.	N.D.
Tobacco	341.0	455.6	223.6	212.5	N.D.	N.D.	N.D.	291.0	138.3
Coffee	2,250.0	2,428.0	2,428.0	1,582.58*	2,428.4*	2,428.4*	N.D.	2,400.0	555.1*
Cocoa	1,866.2	1,866.2	N. D.	2,848.9*	N.D.	N.D.	N.D.	1,936.6	287.4*
Peanut	997.6	930.9	279.3	183.7	162.1	218.8	50.4	98.9	115.9
Field bean	1,002.6	901.3	698.7	920.9	1,007.0	835.5	632.5	583.1	730.0
Pigeon peas	198.7	437.7	169.3	261.1	421.1	401.5	510.9	850.0*	859.3
Cassava	327.5	392.4	259.2	372.4	389.7	401.5	286.2	399.5	504.7
Sweet potato	111.8	117.4	87.3	143.3	104.6	99.3	98.5	142.3	188.4
Yautía	89.6	88.7	52.7	87.8	149.2	106.8	60.7	74.7	114.6
Banana	148.4*	7.9*	578.5*	85.1	1,120.6	101.0*	104.7*	108.9*	256.4*
Processing Tomato	103.2*	63.8	74.4	91.5*	135.4	162.8*	107.9*	80.5*	65.9
Plantain*	542.5	459.9	5,432.9	451.9	5,198.2	567.5*	501.6*	563.3*	629.9*

Source: Ministry of Agriculture, Planning Department, Operational Agricultural Plan 1990.

NOTES: [1] One Hectare is Equal to 15.9 Dominican Tareas.
[2] Harvested Area.
Sugarcane area is in Tarea Inglesa (752.5 m²).

Declining agricultural output is an indication of land underutilization. Soils are being degraded, but not at such a rate that low production could be blamed on low soil productivity. The decline is due mostly to land underutilization (Table 5.5). The country's irrigation potential is not being effectively utilized. Irrigated rice is very water-use intensive. If some of the areas planted with rice were switched to other crops, overall productivity would increase as more land would be given to producing higher yields. In addition, land previously under irrigation has been abandoned, as is the case of some areas in Azua.

While output of other crops has been increasing (such as bananas, yuca, oil palm, pineapple and others), the increase has not compensated for the large decline in sugar production. This overall decline in agricultural production contributes to pressures put on a growing landless farm labor force migrating to the cities or to farm fragile lands. The lack of extension and other services exacerbates this problem.

Two additional aspects of land use rarely considered in the DR are complementarity and efficiency—that is, the role of forests and protected watersheds in allowing dry-season irrigation when yields are highest. Efficient land use 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 the DR are low productivity in the agricultural and livestock sector, severe erosion, and land used below its capability.

5.1.1 Policy Framework

Many policies contribute to the present state of land use and soil fertility in the DR. Some are external in nature (transnational), but most are internal. Only the major policies affecting land use are mentioned here.

Table 5.6 summarizes the policies affecting land use and soil fertility issues. The analysis section synthesizes the major policies affecting land use in the DR. The policies have been organized into transnational, macroeconomic, sectoral, and specific categories.

Transnational and regional policies extend beyond the territorial frontier. Important to the DR are the Caribbean Basin Initiative and the Lome Convention. These agreements provide the DR with special treatment and access to U.S. and European markets. The North American Free Trade Agreement (NAFTA) proposed for the U.S., Canada, and Mexico—in addition to other integration efforts in the Caribbean region, Central America and South America—will also affect international trade in the DR.

Other major international influences on land use are the financing policies of international organizations. The IMF, the World Bank, and IDB, for example, have imposed policy conditionalities on the disbursement of funds. Examples are the economic restructuring program, the revision of tax laws and the reduction in the spread of import tariffs. These financing policies have impacted the country's macroeconomic policies. The Brady Plan and the Enterprise for the Americas Initiative (EAI) of the U.S. are policies that provide the country with an opportunity to reduce its debt and/or to exchange debts for investments in natural resource activities.

The World Conservation Union (IUCN) and The Nature Conservancy (TNC) have contributed to the designation of protected areas (a very specific use of land for conservation purposes) through land purchase. Other transnational policies that have affected land use in the DR are the U.S. sugar quota, farm subsidies in industrialized nations and the International Coffee Agreement. The U.S. sugar quota has distorted the sugar market, distorting the average price the DR would receive for its sugar in an open market. Agricultural subsidies in industrialized nations have also distorted the international price of major commodities, and the ICA maintained artificial coffee prices for many years.

Table 5.6 Policies Related to Land Use and Soil Fertility, by Type, DR, 1992.

Type of Policy			
Transnational	Macroeconomic	Sectoral	Specific
– Lome IV	– Monetary – Money Supply	– Price Policy	– Law 398 of 9–12–72. Regulation to Expanding Sugarcane Area of Prod'n
– Donor's conditionality	– Monetary – Foreign Exchange	– Development Policy	– Law 911 of 8–11–78. Unique Tax on export sugar and its by–products
– Caribbean Basin Initiative	– Monetary – Credit	– Population Policy	– Decree 1057 of 6–27–75. Limiting sugarcane land expansion.
– Enterprise for the Americas Initiative	– Fiscal – Budget Deficit	– Education Policy	– Law 1410 of 4–30–47. declared public domain "El Puerto de la Comun de Jarabacoa."
– Plan Brady	– Trade – Export Promotion Policy	– Tourism Policy	– Law 3107 of 1951. International agreement to protect Nature (1948) creation national park "Armando Bermudez"
– Sugar quotas	– Fiscal– Tax Code	– Extension	– Law 3841 of 5–13–54. establishing regulations to protect the Bao River watershed.
– Subsidies in other countries	– Trade–Import Tariff	– Law 69 of 1979 on Export Promotion	– Law 4389 of 16–2–56. Established a Forest Reserve.
– International Coffee Agreement	– Trade– Import Controls	– Law 532 of 12–12–69 Agricultural Livestock Promotion	– Law 5056 of 1954. Creates a forest reserve to preserved river watersheds.
		– Law 8 of 1965. SEA structure.	– Law 4991 of 9–3–58. Declared restricted aerea between rivers Haina and Duey
			– Law 5579 of 7–18–61. Declared restricted area between "Alto de Bandera" mountain in Constanza and La Vega.
			– Law 5697 of 12–8–61. Declared restricted area part of Diego de Ocampo mountain
			– Law 470 of 11–2–64. Declared restricted area in the mountains.
			– Law 244 of 10–1–68. Created Forest Reserve on the name of "Zona Vedada Los Haitises"
			– Law 654 of 4–25–74. Created a restricted area or national park "Cabo Frances Viejo"
			– Law 661 of 25–04–74. Declared National Park "Isla Cabrito del Lago Enriquillo"
			– Law 67 of 11–5–74. Created National Park Directorate.
			– Law 409 of 4–16–76. Declared National Park "Los Haitises".
			– Law 627 (1977). Declared national interest the mountain areas.
			– Decrete 6845 of 9–25–50. Established 16 national forests.
			– Decree No. 199–92 of 6–20–92 declared areas "vedadas" in the Nizao watershed.
			– Law 632 or 1977. Forbides tree cutting in a 0.5 Kms. radius of head waters

Macroeconomic policies are directed at the economy in general and are classified into monetary, fiscal, and trade categories. The DR has recently adopted major changes in its macroeconomic policy framework. The objective of the reforms has been to stabilize an economy that had reached inflation levels of 100 percent. This objective has been achieved at the expense of economic growth. The country's GDP decreased 5.2 percent in 1990 and 0.5 percent in 1991. The key elements of the economic program were designed to:[1]

- Eliminate the fiscal deficit;
- Establish a unified, market-determined exchange rate;
- Tighten monetary policy, liberate interest rates and eliminate other restrictions affecting the financial system; and
- Initiate reforms to the trade regime, the tax system, the civil service, and the rules and regulations governing foreign investment.

The Government has made various fiscal, labor, trade, and monetary reforms. The Government deficit was reduced from 5.9 percent of GDP in 1989 to a surplus of 0.1 percent in 1991. Fiscal policies are often used to correct the difference between private and social costs or economic externalities. However, this has not been considered in designing the DR's fiscal policies. The main objective of fiscal reform was to eliminate exemptions and privileges, and to provide equal treatment for all sectors.

The new tax code was the other major modification of the fiscal policy. The major components that affect the natural resources were the elimination of the incentive laws for forestry and agroindustry.

Major monetary reforms include modification of the interest rate ceiling with the purpose of eliminating negative real interest rates and the tightening of the money supply to reduce inflationary pressures. A tight money supply reduces credit availability to higher risk activities such as agriculture. The monetary board eliminated all interest rate ceilings and floors on all deposits and loans in January 1991. Real rates were low due to a very high inflation, but they have increased sharply in 1992 due to an accelerated reduction in the inflation rate and a slow reduction in nominal interest rates. The annual inflation rate has been near zero during the first half of 1992, while the passive interest rate was between 24 and 34 percent in July 1992.

The Government liberalized the foreign exchange market, allowing market forces to determine prices. However, the Government has had a target of about RD$12.50 per US$1.00, which it achieves through market interventions. The package of measures adopted—mainly tight money supply and the shift in interest rates in addition to an external force created by low

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[1] The World Bank, May 1992. *Dominican Republic, Updating Economic Memorandum: The Challenge of Sustainability*. Report No. 10614-DO. pp.2-3.

interest rates in the international markets, mainly in the U.S.—have contributed to high accumulations of foreign reserves in the Central Bank.

There is also a trend to liberalize international trade. Import tariffs were revised from a range of zero to more than 300 percent to a range of 5 to 35 percent, with only a few exceptions.[1] In addition, imports are now valued for purposes of taxation at CIF instead of FOB prices, applying a market-guided exchange rate rather than fixed rates as before. A temporary levy (*Recargo Cambiario*) was imposed on all imports, which will be phased out gradually in three years. The new import tariff was enacted by decree, and Congress' approval is pending. The Tax Code eliminated the temporary levy (*Recargo Cambiario*) for agricultural inputs and some foods.

The new Tax Code (Law 11 and its Regulations) eliminated the tax incentives of Law 69 of November 1979 on Export Incentives. The only incentive left in this law is a provision to suspend the import tariff on inputs utilized in the production of goods to be re-exported. This incentive is really a correction of an undue tax.

Imports of some agricultural products are still controlled. Only BAGRICOLA can import rice. Some products such as beans are only imported by INESPRE, while others, such as edible oils, need a permit from SEA and INESPRE. This policy provides a support price for producers.

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 include price, research, extension, and agricultural development.

Prices of some agricultural goods previously controlled by the Government are now determined by market forces, except for certain key commodities such as rice and beans, which are protected through import restrictions.

The research policy has been very flexible, with both the public and private sectors conducting research. Various specialized institutions conduct public sector research, which is complemented by research in private institutions. Traditionally, agricultural research has not focused on sustainable agricultural production. It is only recently that the **Fundación de Desarrollo Agrícola** (FDA - Agricultural Development Foundation) has started to raise concerns on sustainable agricultural production in the research institutions it is funding.

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[1] Precious and semi-precious stones, diamonds, other jewelry items, most firearms, and several types of motor vehicles became subject to import duties ranging from 60 to 80 percent. Petroleum, petroleum products medicines, raw materials for the production of medicines, imports of intermediate goods for processing in the Free Zones, equipment for CDE, and agricultural inputs and machinery were exonerated from import duties, except for agro-chemicals, which pay 10 percent.

Extension is provided by the Government and the private sector. The Government provides extension services through its regional and local offices and through specialized crop promotion departments, such as Rice Foment, Coffee Production, and the Livestock General Directorate, as well as specialized projects with international support such as PRODELESTE (GODR-FAO) and DRI-Cibao (GODR-CEE). In the private sector, services are provided by individuals and small firms that provide technical assistance to farmers who can afford it, and by NGOs that provide services to its affiliates or project participants. Examples include JAD and Plan Sierra.

The Government's population policy is very broad. Families are encouraged to plan the size of their families and abortion is against the law. The Government depends heavily on NGOs to provide services on family planning and birth-control methods.

The infrastructure construction policy has been of mixed benefit during the present Government. This administration has dedicated a significant amount of resources to the construction of dams, mostly with local funds. This, in addition to a direct intervention in tourism infrastructure and housing construction, was the basis of a demand-driven development model that was excessive for the production response capacity of the country.

Tourism policy has been very aggressive, providing incentives for investments, improvements in the airport and infrastructure development. The development of this sector has contributed to significant growth in the economy, generating needed employment and increasing the demand for agricultural products.

Law 532 of December 1969 provides incentives for investment in agricultural production. Some of the incentives (Articles 56 and 57), however, were eliminated by Law 11 (Tax Code) of 1992.

The land use and soil fertility policies are directed at using land for a particular purpose. In the DR, the specific land use policies are the laws creating the national parks and reserves, and some laws and decrees that define the land area under sugar cultivation. Table 5.6 lists these laws and regulations.

5.1.2 Institutional Framework

Many public, private, and international institutions analyze, design, influence, and administer natural resource-related policies and their impact on sustainable agriculture in the DR. In this study, the institutions are identified according to the policies described above—i.e., transnational, macro, sectoral, and specific policies. Table 5.7 summarizes these institutions within each category.

The Secretariat of Foreign Affairs is the DR's official diplomatic channel for dealing with foreign affairs, including foreign governments and international institutions. It participates in negotiating policies that affect the use of natural resources in the DR.

TABLE 5.7 Institutions Involved in Land Use and Soil Conservation Policies by Type of Policy, DR, 1992

Transnational	Macroeconomic	Sectoral	Specific
USAID	The Central Bank	SEA	SEA-Department of Land and Water
IFM	The Banking System	Secretariat of Public Works	SEA-Department of Research
The World Bank	Secretariat of Finance	Secretariat of Education	SEA-Department of Crop Production
IDB	Technical Ministry of the Presidency	Natural Resources Undersecretariat	SEA-Department of Natural Resource Inventory
International Coffee Organization	National Budget Office	Secretariat of Public Health and Social Assistance	SEA-Department of Agricultural Extension
World Meteorological Organization	National Planning Office	General Directorate of Cadastre	Dominican Farmers and Large Livestock Producer Association
U.N. Environmental Program		National Statistic Office	Associations of Agronomists
FAO		General Livestock Directorate	Landowners and Farmers Association
Secretariat of Foreign Affairs		Dominican Agrarian Institute	Ocoa Development Board
JICA		INDRHI	General Forestry Directorate
UNDP		National Coffee Commission	Patronato Nacional de Ganaderos
World Food Program		Agricultural Development Foundation	Proyecto de Desarrollo Lechero del Este (PRODELESTE)
European Economic Community (EEC)		Price Stabilization National Institute	Southern Development Institute (INDESUR)
Spain Agency for International Cooperation		Dominican Agribusiness Board	Northwestern Development Institute (INENOR)
		State Sugar Council	ENDA-CARIBE
		National Technical Forestry Commission (CONATEF)	Federación Dominicana de Asociaciones Ecológicas
			Plan Sierra

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 GODR.

The 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 foreign exchange rate, revision of the interest rate, reduction of the budget deficit, elimination of price controls, and trade liberalization. The World Bank and the IDB have also played important roles in these policies by imposing the same kinds of conditionalities.

The UNDP and the FAO have financed development projects in agriculture and natural resource management. The World Meteorological Organization has provided technical assistance and cooperation in agrometeorology, and the World Food Program has provided food donations.

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

The Central Bank formulates monetary policies implemented through the banking system. The Secretariat of Finance designs and implements the fiscal policy in coordination with the Technical Secretariat of the Presidency. The Secretariat of Industry and Commerce is in charge of trade policy.

The Secretariat of Education designs and implements the education policies, while the National Population Council is responsible for the country's population policy.

The Secretariat of Agriculture (SEA) is responsible for the agricultural sector policies, and the Secretariat of Public Works for the construction of rural roads.

The **Consejo Nacional de Agricultura** (CNA - National Agricultural Council) is a policy advisory board under SEA. This Council is made up of public officials and private individuals. Its function is to advise the Secretary of Agriculture on national agricultural and natural resource policy. The Agricultural Policy Studies Unit (UEPA) prepares studies on agricultural policy analysis for presentation and discussion at the Council.

At the advisory level, SEA maintains a Legal Department and an Audit Department. The Technical Under-Secretariat for Agricultural Sector Planning is another key element in policy analysis of agriculture-related issues. It is the technical arm of SEA in charge of agricultural-sector planning, and it is often used by the Secretary to analyze key policy issues in coordination with UEPA. This Sub-Secretariat has four departments: Planning, Statistics and Data Processing, Agricultural Economics, and External Resources. 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.

Three other units that deal with land use and productivity are the Undersecretariat for Research, Extension and Training, the Undersecretariat for Production, and the General Livestock Directorate. The first is in charge of agricultural research, the second of agricultural production, and the third of livestock production. SEA is organized into eight regions to provide services to farmers. Regions are divided in Zones and zones into Sub-zones.

SEA conducts agricultural research in four research centers, one laboratory (Duquesa) and one institute (Instituto del Tabaco - INTABACO - Tobacco Institute). The four centers are: **Centro Sur de Desarrollo Agropecuario** (CESDA - Southern Center of Agricultural

Development), **Centro de Investigaciones Arroceras** (CEDIA - Rice Research Center), **Centro de Investigaciones Aplicadas a Zonas Aridas** (CIAZA - Applied Research Center for Arid Zones), and **Centro Nacional de Desarrollo Tecnológico de Cacao** (CENDETECA - National Center of Cocoa Technology Development).

These government research centers are complemented by research done by private institutions. These include the **Instituto Superior de Agricultura** (ISA - Superior Institute for Agriculture), with the **Centro Norte de Desarrollo Agropecuario** (CENDA - North Center for Agricultural Development), **Instituto Politécnico Loyola** (Loyola Technical Institute), **Universidad Autónoma de Santo Domingo** (Autonomous University of Santo Domingo), and **Universidad Nacional Pedro Henriquez Ureña** (UNPHU - National University Pedro Henriquez Ureña. The **Fundación de Desarrollo Agropecuaria** (FDA - Agricultural Development Foundation) is a private institution playing an important role in financing research activities in private and public institutions.

The Under-Secretariat for Natural Resources has the objective of developing techniques for the conservation, development, and rational use of the country's natural resources. It also transfers these findings to the regions through the regional structure of SEA. This sub-secretariat has three departments that deal with land use: the Natural Resources Inventory Department, the Land and Water Department, and the Environmental Education Department.

The **Centro Regional de Estudios de Alternativas Rurales** (CREAR - Regional Center for the Study of Rural Alternatives) is located in Rio Limpio, near the southwest border with Haiti. This center receives international aid for training small farmers on sustainable biological agriculture. The **Centro de Agricultura Sostenible y Tecnología Apropiada** (CASTA - Center for Sustainable Agriculture and Appropriate Technology) is located in Villa Altagracia where students receive practical training in sustainable agriculture. Environment and Development (ENDA-CARIBE), headquartered in Santo Domingo, is an NGO implementing agroforestry practices in Zambrana, Cotuí.

Plan Sierra is an non-profit organization located in San José de las Matas in the northern portion of the Central Mountain Range. Plan Sierra is studying traditional hillside farming systems to gain understanding to improve their physical-biological efficiency. The organization is also evaluating some agroforestry systems and training farmers on the use of these practices.

Asociación para el Desarrollo de San Jose de Ocoa (JUNTA - Development Association for San José de Ocoa) is located in the southern section of the Central Mountain Range. The JUNTA has been sponsoring natural resource conservation practices since the 1970's. The JUNTA is implementing a project funded by USAID with the participation of the GODR. This project is the **Fondo de Inversión en Recursos Naturales** (FIRENA - Investment Fund for Natural Resources). Under this project, hillside farmers receive technical assistance, economic support, and training for the implementation and management of small-scale irrigation community projects for cropping their lands efficiently. An innovation of this project is the

system of land sharing established in each unit to ensure that every community member can farm a piece of land even if some individuals are landless. It is a form of voluntary agrarian reform. A requirement to receive benefits from FIRENA is the willingness to share land. Another compromise of farmers within the project is to plant forests in land not suitable for crop production. In addition, farmers organizations have to pay the costs of irrigation equipment in the long term.

The institutions listed in Table 5.7 under specific polices are all public and private organizations responsible for policy implementation.

5.1.3 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 on 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.

The DR has benefitted from the CBI concessions, which have allowed the country to access U.S. markets without reciprocity compliance. This has stimulated the development of certain agroindustrial export companies, and the growth of the manufacturing sector in industrial-free port facilities. This in turn has contributed to the generation of employment, which reduces population pressure to farm fragile lands. The country is also receiving some of the benefits of the Lomé Convention, which facilitates the DR's participation in European markets with the same effects as above.

On the negative side, however, the DR has had to compete with subsidized agriculture in industrialized nations. These subsidies have increased world production above the levels it would reach under a situation of no subsidy. Lower world production would increase the international price of agricultural goods, stimulating more production in countries with natural comparative advantages. One way of neutralizing the effect of these subsidies is through an import tariff on the imports of these goods. The income from this tariff could be used to subsidize the population below the poverty line, which in the DR reaches 61 percent in rural areas (CIEA, 1990). Some countries (Chile, El Salvador, Honduras) have designed a price band mechanism that includes a variable levy on imports according to fluctuations in the international market.

The DR has had excessive effective protection for some crops (rice and red beans) and very low protection or penalties for others (coffee and tomatoes). The UEPA has estimated

nominal and effective protection coefficients for rice, corn, beans, garlic, red onions, and chickens covering the period from 1986 to 1989. The World Bank has also made estimates of protection coefficients for a few products up to 1991. Effective protection for corn, red beans, and rice was estimated at 171.9, 199.2, and 73.1, respectively, for 1991, at the official exchange rate.[1] However, the same report estimates negative effective protection coefficients for coffee and tomato. This is due to the milieu of tariffs and exchange rates that prevailed in 1991. These estimates do not identify the sources of distortion. They are also limited in the number of commodities included, and they must be updated for 1992.

Excessive protection is also a distortion when it is above the subsidies of industrialized nations. An excessive protection stimulates a misallocation of resources and it penalizes the poorest members of society. This is a case in which a correction in an economic distortion contributes to improvement in the natural resource base.

The country's foreign debt doubled from $2.2 billion in 1981 to $4.4 billion in 1992 (World Bank, 1992a, p. 74). This was done during a period of poor economic management that resulted in high inflation rates in 1990, a sharp devaluation of the Dominican peso, and a lack of dollars to import the required inputs to keep the economy running. This forced the Government to negotiate with the international community, which induced macroeconomic reforms conducive to stabilizing the economy. Inflation was reduced to near zero, at the cost of a recession.

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

The impact of the new import tariff and trade regime on land use is not clear at this moment. It is necessary to conduct an analysis for each product to determine the nominal and effective protection coefficients for each product and to identify the source of distortion, which may be in either the input or output market, or both. While the import tariffs have been modified in an attempt to reduce the spread and reduce the distortions, the application of the tariff is not consistent. Merchandise values are assigned arbitrarily by customs officials, and there are differences in the interpretation of the definition of certain imported commodities. For example, a producers' association imported irrigation equipment, which does not require an added exchange levy (*Recargo Cambiario*) according to the law. However, customs officials valued the components separately, charging a different tariff for each part. In addition, imports of agricultural products are controlled, which results in an even greater effect on prices. Another source of distortion is a fuel surcharge, which affects each product according to its level of energy use.

[1] The World Bank, 1992a.

The new Tax Code (Law 11 of 1992) will have a negative impact on investment in the agricultural sector. This code eliminated Law 409 on agro-industrial promotion, some incentives of Law 69 on export promotion, Law 652 of 1974 that allowed deductions for investments in development banks, the provisions of Law 292 that allowed deductions for investments in development banks, and the investment incentives of Law 532 of 1969 on agriculture and livestock promotion. This will contribute to lower investment levels in the agricultural sector, with the consequence of losses in employment in rural areas, inducing the population to farm fragile lands.

The economic thinking behind this new Code is to provide equal conditions for all sectors so that the country's limited resources are invested in activities yielding the highest returns. This will theoretically provide a better allocation of scarce resources, achieving a greater level of economic growth. However, most of the markets are not perfect in the DR and there are market failures in the use of natural resources. Thus, higher private returns do not translate into higher social returns. Corrections are needed to stimulate higher levels of investment in sectors that will yield greater benefits to the economy as a whole. The DR still has an agrarian problem with 40 percent of the population living in rural areas, with very low incomes and low levels of government services. This contributes to low productivity.

Considerable private investment has been made in infrastructure for non-traditional crops such as pineapples, citrus, African palm, vegetables and other fruits. This compensates for some of the losses in sugar, coffee and other crops. These investments were stimulated by Law 409 on agro-industrial promotion, but this law has been limited by the new Tax Code. Thus, this compensation trend cannot continue without a replacement set of incentives. An alternative is needed.

This leads to the government's investment policy, which is highly concentrated in the urban areas. This is another reason to justify incentives and subsidies for the agricultural sector. The private sector could provide the needed income in rural areas to partially compensate for the lack of assistance in government budgetary allocations.

The major monetary policies affecting the natural resource base in the DR 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 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 informal sector.[1]

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.

[1] There was a difference of five percent between the two markets in July 1992.

In an effort to control inflation and stabilize 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. This also gives banks the opportunity to adjust loan terms to more recent conditions, increasing their returns.

SEA has estimated that BAGRICOLA will provide 26 percent of the credit needs in agriculture in 1992 (*Plan Operativo* 1992, p. 53). 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 citrus and palm oil. These investments are needed to prune trees, replace nutrients, adopt conservation measures, control the spread of pests, 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.

On the other hand, the present scarcity of credit provides an excellent opportunity to enforce conservation measures and improve land use patterns. However, some credit practices have been detrimental to natural resource conservation. One example is loans provided by the BAGRICOLA in the past to plant yautia in the Haitises National Park, which, by definition, should not be farmed. Credit could be used also to enforce conservation practices and better land use. Each disbursement can be tied to certain technological practices. An example of this was the NARMA Project, for which BAGRICOLA provided conservation credit in Ocoa.

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.

The GODR has adopted a policy to stabilize the foreign exchange rate. This has been achieved through market intervention in addition to all the other economic reforms. One of the measures adopted by the Central Bank has been to demonetize the economy, and one of the mechanisms used in this process has been to accept deposits from the public at high interest rates. This also contributes to capital flows into the country, given the low interest rates in the U.S. and other industrialized nations. As inflation came under control, interest rates started to drop, but they have stopped at a very high level (passive 16-28 percent and active 18 to 32 percent). This is due to a large amount of bank reserves retained by the Central Bank, and to the Central Bank's participation in the market, paying high rates. The Central Bank probably resists changing this position due to its fear that the capital flow will reverse its course. High

interest rates in real terms are another added cost to agricultural investment and economic growth. This, in turn, has a detrimental effect on natural resources as pressure to farm fragile lands increases.

Other modifications of the monetary policy include the elimination of selective reserve requirements, the unification of interest rates and the elimination of specialized credit funds. In addition, the GODR is in the process of modifying the banking system to reduce financial institutions to only two kinds: multi-service banks and savings and loan banks. In addition, FIDE, INFRATUR, and BNV would be combined into a development bank with no specialization. These measures will also limit the availability of resources to agriculture, with detrimental effects on natural resources.

The Government's new fiscal policy, oriented towards reducing the budget deficit, includes a policy of low salaries. This measure contributes to the further loss of 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, and subsidizes investments in soil conservation. This further contributes to a lack of institutional development that permeates throughout the entire government. Institutions lack adequate resources to provide the services they were designed to provide and to implement the regulations and procedures mandated by the present legislation.

This lack of institutional development is reflected in the inactivity of the **Consejo Nacional de Agricultura** (CNA - National Agricultural Council), and the minimal impact UEPA has had on policy reform. UEPA has produced excellent policy analysis studies for discussion in the CNA; however, CNA has not met for some time, and the impact of the studies is minimal. JAD has played an important role in being a voice representing the private agricultural sector to promote discussion of key policies that affect the sector, such as the new tariff, the new tax code and the new labor code. However, a voice has a greater impact when a good analysis presents the costs and benefits, the winners and losers of the policy, and quantifies these impacts.

In the past, the DR's trade policy has 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. Staples were imported with overvalued currency and without duties. This reduced the farm gate 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. However, certain food imports are still exempt from import duties while some inputs are not. (*Plan Operativo* 1992, p. 48).

Stable prices eliminate one source of risk in agriculture, contributing to better land use patterns and investment in soil conservation measures. The present Government's pricing policy is to let local market forces determine prices. However, controls on imports have contributed to increasing farm gate prices, mainly in the case of rice. This excessive protection distorts efficient allocation of resources. Rice is a key example. Rice uses a lot of water, consumes half the credit available from BAGRICOLA, and consumes many of the resources of IAD. In addition, technical assistance from SEA is concentrated in rice production.

The water utilized for rice production could be used to irrigate a larger area to increase total output from agriculture. Credit resources from BAGRICOLA could also support other agricultural activities in which the country is more competitive, and the scarce GODR budget could be used to provide extension services for other crops. This is an example in which good economic policy is also a good environmental policy.

Education has been deficient in rural areas. There are few teachers and in some cases no schools at all. Many of the teachers lack adequate training. A rural population with low levels of education has very little knowledge of the impact of inappropriate practices on soil fertility. In addition, school curricula do not cover agricultural or environmental subjects even though Law 295 of 1985 establishes the inclusion of environmental education in school curricula. 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 Dominicans listen to the radio. A 1987 study indicated that rural dwellers who listened to an environmental education program provided by the Environmental Education Department of SEA developed a greater concern for natural resource conservation and soil erosion control (Valdez, Luisa, 1987).

Research activities have been very limited due to inadequate funding. 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. The Government research centers have been operating with insufficient budgets. A proposed solution to the Government's research limitations was the creation of the **Instituto de Investigaciones Agropecuarias** (IDIA Institute for Agricultural Research). Unfortunately this institute has not operated, and only exists on paper. Another attempt to solve this problem was the creation of the FDA, which finances agricultural research projects. However, FDA does not have enough resources to cover all the research requirements of the country. In addition, traditional research institutions are lacking basic infrastructure and personnel to take advantage of FDA resources. According to FDA, the organization was able to fund few research projects because of budget constraints and the lack of good proposals from both the public and private institutions.

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

an export fee to finance the research since individual farmers would not contribute voluntarily. This would require a law establishing research funding levels, and allowing farmers to have access to research results.

The present extension policy is too diffused for the limited resources of SEA, and it does not integrate soil conservation with crop production. SEA has eight regional offices with 550 extension offices throughout the country, but the extension service lacks the logistical support and the staff to provide adequate coverage. SEA needs to redefine its policy to concentrate in a few activities and train its personnel in soil conservation and soil management procedures. The Land and Water Department of SEA was organized to offer additional extension service on soil conservation. This Department, in fact, has five regional units that used to offer such assistance at the watershed level. There have been successes, however, in the last year, the department has not been able to accomplish its tasks due to a lack of resources after international funding ended.

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 recipe. 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 conservation 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 in yields and the deterioration of soils due to poor management. Irrigated areas have been the victim of salinization due to poor water management practices. One example is what happened to soils in Azua.

A major issue pertaining to land use and soil fertility is the conflict of use. When a piece of land is used for a purpose other than the one specified by its capability it is known as a conflict of use. This means that actual use does not match the potential use determined by the land's agroecological capability.

Data in Table 5.4 show that in the DR farmers are growing annual crops in soil Classes V, VI, VII, and VIII, soil suitable for pasture, forest, and wildlands according to the land class production capability description. In addition, rice is being planted in land defined as Class VII and VIII. This situation implies that soil loss due to erosion should be very high considering that annual crops and rice do not offer necessary soil cover, which is needed for reducing the rainfall impact and for reducing erosion hazards.

On the other hand, both natural and improved pastures are found in soil Classes II, III, IV that are defined as agricultural lands. This implies that there is a conflict of use; pastures are produced in land suitable for crop production. In addition, it is noted that crops such as coffee and cocoa, sugarcane, and coconut are planted in Class VIII soils, which are suitable for

wildlife. However, coffee is being planted on hillsides to provide a vegetative cover and reduce erosion.

Traditionally, many rural dwellers and landless laborers have cropped on the slopes of mountain ranges, using slash-and-burn practices. This type of agriculture, however, is decreasing due to a reduction in State and public domain (*comunera*) lands that can be used for farming purposes.

In the long run, hillside agriculture might not be economically profitable even when using soil conservation practices. These practices are expensive and do not assure high yields or an increase in soil fertility; thus, farmers can barely survive with this type of agriculture. This is the case of some projects being implemented in the country which have not been evaluated yet. However, the situation is different in some areas with semi-temperate micro-climates used in intensive and high-input agriculture, generally without conservation measures. Mostly vegetables and other cash crops are planted in these areas. This the case in Constanza, some parts of San Jose de Ocoa, Rancho Arriba, Padre las Casas, San José de las Matas, and the Haitises, among others. Some of these areas might be better used for cropping some non-traditional fruit trees such as nuts and other products.

Likewise, soils in the valleys are not being used according to the land capability classification or do not receive any conservation treatment. Farmers have believed that plain soils do not require management practices. Consequently, these soils are misused (e.g. soils used for cropping rice). These soils are also affected by salinization due to mismanagement of irrigation water.

Soil conservation practices have been used in the DR since the 1970s. Traditionally, these practices have been adapted from those used by the USDA Soil Conservation Service. In the 1980s, a research activity was started as a component of the NARMA Project. Results are incomplete because this activity has not received resources to continue. A recent unpublished study on the data collected in the Ocoa runoff plot shows that crop yield increased and soil loss decreased (Table 5.8). An economic analysis of the data collected shows that conservation practices such as live barriers and hillside ditches are not economically feasible because the net present value discounted at 15 percent is negative. This is lower than the interest rate applied to BAGRICOLA loans.[1]

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. Only specific projects, such as the ones implemented by FUDECO and the Development Association of Ocoa, subsidize soil conservation practices in the DR. This practice needs to be expanded.

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[1] Hernández, Abel, 1992, p. 23.

TABLE 5.8 Soil Loss with and without Conservation Practices and Crop Yield (mt/ha/yr)

Years	Soil Loss W/out Cons. Practices	Yield W/out Conservation			Soil Loss W/Cons. Practices	Yield With Conservation		
		Peanut	Field Bean	Pigeon Pea		Peanut	Field Bean	Pigeon Pea
1985	17.250	0.889	0.578	2.185[a]	37.117	0.777	0.711	1.963[a]
1986	100.393	0.994	0.427[a]	2.056	44.809	0.667	0.494[a]	2.222
1987	86.175	1.000	0.578	2.185[a]	43.514	1.278	0.669	1.963[a]
1988	67.940[a]	1.444	0.500	0.889	41.813	0.778	0.520	1.889
1989	67.940[a]	1.069c	0.051[b]	3.611[b]	41.813	0.875[a]	0.076[b]	1.780

Source: SEA-Department of Land and Water. 1988. "Conservation Plots." San Jose de Ocoa.

From: Hernández, Abel. 1992. "Institutional and Economic Analysis of Soil and Water Use Conservation Practices in the Dominican Republic," unpublished. Prepared for the World Bank.

Notes: a) Average of the first three years.
b) Data no-use in the regression because of the magnitude.
c) Average of non-collected data.

Present production practices are eroding the soils. This can be seen in large agroindustrial projects such as pineapple production in Villa Altagracia or in traditional farms of yuca in Moca. This is due to a lack of land use planning, inadequate extension service, and the lack of a system of incentives and penalties to induce sustainable agricultural practices.

In summary, the major policy issues affecting land use and soil fertility in the DR are the macroeconomic policies that limit investment and credit for agriculture, the agricultural research and extension policies, lack of a soil law or land use planning, lack of a soil conservation policy, and low budget and lack of institutional capacity.

5.1.4 Potential Policy Alternatives

The following policy alternatives are recommended to improve land utilization and soil fertility in the DR:

- Reactivate the National Agricultural Council to incorporate participation of the public and private sectors in the discussion of agricultural policy;
- Design a comprehensive agricultural policy that eliminates distortions, provides stability, and fosters investments in the agricultural sector;
- Review credit policies to make access easier for agricultural investment; and
- Define a credit policy for hillside crop production.

5.1.5 Recommendations For Future Research And Analysis

The following studies are needed to define other policies that will improve land utilization and soil fertility:

- Analyze ways to stimulate investments in the agricultural sector to compensate for the losses in sugar and other crops and to compensate for the vacuum created by the elimination of Law 409;
- Conduct further analyses to determine distortions in the economy using simple methodologies such as the Policy Analysis Matrix (PAM);
- Study alternative ways to finance the agricultural research needs of the country. Research is the way to expand potential future production;
- Study ways to make the extension service more effective;
- Study the financing system for agriculture to determine alternatives for increasing credit availability for agricultural production;
- Study the potential for establishing an environmental fund with an EAI account in the fund;
- Study ways to invest more resources in rural education;
- Study ways to design a soil amendment project that subsidizes farmers who adopt the recommended practices;
- Study ways to improve public administration at SEA with fewer and better trained personnel and adequate resources to establish a soil conservation service with well trained technicians;
- Study the possibility of establishing a price band mechanism for rice, corn and other commodities suitable for this kind of policy; and
- Study ways to make the Land and Water Department more effective in performing its goals, reducing inefficient personnel and hiring well paid technicians.

5.2 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. 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 in long-term returns if he owns the land and is sure of keeping it. In a country where land ownership is unclear or where farmers fear losing their land, land deteriorates rapidly. This results in low investment in agriculture and banks that are reluctant to lend because of the lack of good collateral. Soils get eroded and degraded due to a failure to keep the farm in good condition and invest in improvements.

TABLE 5.9 Number of Farms and Area by Size, DR, 1971 and 1981, hectares

Farm Size	Number	Percent	Area (000)	Percent
1971				
Less than 5	234,943	77.1%	352	12.9%
5-50	62,790	20.6%	819	29.9%
50-200	5,765	1.9%	517	18.9%
More than 200	1,322	0.4%	1,048	38.3%
TOTAL	304,820	100.0%	2,736	100.0%
1981				
Less than 5	314,665	81.7%	326	12.2%
5-50	63,358	16.5%	872	32.6%
50-200	5,906	1.5%	523	19.5%
More than 200	1,131	0.3%	955	35.7%
TOTAL	385,060	100.0%	2,676	100.0%

Note: Agrarian reform collective farms are considered one production unit.

Source: Oficina Nacional de Estadísticas, Agricultural Census of 1971 and 1981 as reported in Proyecto de Desarrollo Agrícola Nizao-Valdesia, 1988. "Marco de Referencia de la Economía Dominicana. Cuadro 32.

If the land markets are imperfect, deterioration also occurs. Imperfections in the land market are due to several causes, including lack of land titles, government ownership, 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.

The GODR is the major land owner in the country,[1] and the distribution of the remaining land is highly skewed. In 1981, 82 percent of the country's farmers owned holdings of less than five hectares, which constituted 12 percent of the country's total farm area. Farmers with farms larger than 50 hectares, representing 1.8 percent of the farmers, owned 55 percent of Dominican farm land (Table 5.9). Of the area in farms, 71 percent was owned by farmers in 1981, while three percent was occupied by renters, and 26 percent represented some other kind of tenure—mostly illegal occupation (Table 5.10).

[1] UEPA. 1989. *La Titulación de la Tierra de Reforma Agraria.* p. 64.

Of the area in farms, 173,700 hectares (6.5 percent) is occupied by the **Consejo Estatal del Azúcar** (CEA - State Sugar Council) and 392,000 hectares (14.6 percent) by IAD. The area occupied by CEA is part of Trujillo's heritage while the area under control of IAD represents both former Trujillo possessions transferred to the Government and areas obtained through the application of several laws (Table 5.11).

TABLE 5.10 Types of Land Tenure in Farm Land in the DR, 1981

Type of Tenure	Area (Has.)	Percent
Owner[1]	1,938,529	70.8%
Land renter	83,972	3.1%
Others	715,226	26.1%
Total	2,737,727	100.0%

[1] Includes land controlled by the Government

Source: National Statistics Office, 1981.

The agrarian reform process started in 1961 after Trujillo's death. It had distributed 6.6 million *tareas*[1] to 75,309 producers by 1989 (JAD, 1991, p.84). Farms under the agrarian reform are managed individually by each farmer in most cases and collectively in others. Farmers were usually given a land title that only allowed them to farm the land. In some instances, they received permanent and transferable titles.[2] IAD is now issuing permanent land titles and people do transfer them. However, the legality of the transferability of these titles is not clear, and it is being done through a slow, inconsistent process. Most of the agrarian reform beneficiaries do not have transferable titles.

On the other hand, many landless rural workers pressure IAD to give them a piece of land. This situation leads to invasion of farms, which in turn also influences willingness to invest. IAD has so far not been able to cope with this situation.

Some of the land under the control of CEA has been transferred to IAD and some has been leased or invested in agro-industrial projects to produce pineapple, palm oil, citrus and other crops.

Due to large Government participation in land ownership, land prices are distorted. The Government's presence in a location increases the scarcity of privately owned land, increasing the price above what it would be if the Government did not own

TABLE 5.11 Control of Land Use in Farms in the DR, 1986

Controller Office	Area (000 has)	Percent
CEA	173.7	6.5
INDA	5.0	0.2
IAD	392.0	14.6
BAGRICOLA	4.4	0.2
Persons and Others[1]	2,101.6	78.5
Total	2,676.7	100.0

[1] Includes Government land occupied without ownership certificate.

Source: USAID, 1986. The Dominican Republic Agricultural Sector Profile.

[1] One tarea is 629 ms^2.

[2] Permanent land titles had been granted to an area of 128,428 tareas up to 1989 (UEPA, 1990. *Traspasos de Terrenos del Instituto Agrario Dominicano* (Período 1962-1989). p.23).

surrounding land. In addition, this encourages the dividing of the land market into two groups:[1]

- A land market of privately registered and titled units; and
- A market of land investments in improvements in government-owned land or private land occupied by tenants. This market occupies an area of about 1.5 million tareas.

Many land owners have not obtained their titles either because the process is too tedious or because parcels are too small to pay for the legal fees and the transfer tax required to obtain a land title. Thus, many land sales are registered under notarized private agreements. People continue to sell these lands to subsequent buyers. The land titling procedure is based on the Torrens system.

Stability in land ownership is very important in stimulating investments in agricultural production. Title transfer policies in the DR involve several institutions and steps, making the process slow and complicated. A simpler way of transferring land titles would improve buying and selling procedures in the country.

Many of the areas distributed by the IAD have low productivity and in many instances are not suitable for intensive agriculture. In addition, many land distributions were made without previously clearing the land. As a result, many areas of the agrarian reform lands are not being farmed, and have even been abandoned.

In summary, the land tenure problems in the DR are: high participation of the GODR in land ownership; distorted land markets; the large number of agrarian reform participants without transferable titles; a long, tedious process to obtain land titles; and the existence of many tenants who do not have legal land titles issued by the Land Title Registry Office of the Superior Land Court.

5.2.1 Policy Framework

Several transnational, regional, economic, sectoral, and specific policies have influenced land tenure during the last three decades in the DR. Table 5.12 lists the major policies affecting land tenure.

At the transnational level, policies including the financial policies of international organizations such as A.I.D. and IDB have contributed to the development of the agrarian land reform process. This has happened through the use of conditionalities, policy dialogue, and financial assistance.

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[1] UEPA, 1989. *La Titulación de las Tierras de Reforma Agraria*. p. 64-66.

The major macroeconomic policies affecting land tenure include credit, the budget, and the Tax Code. The characteristics of these policies were discussed in the section on land use and soil fertility.

There are many specific laws that regulate land tenure in the DR. These laws define the functions of the land judicial system, the areas controlled by the government, and the lands that are transferred to the agrarian reform process and its participants. A list of these laws appears in Table 5.12.

The most important laws in this area are Law 5879 of 1962 on the agrarian reform, Law 292 of 1972 on the recuperation of government land, Law 282 of 1972 that authorizes IAD to acquire land not in use (*baldía*), Law 290 of 1972 that transferred to IAD rice parcels larger than 500 tareas, Law 126 of 1980 that established a payment in land area for benefits received from irrigation infrastructure built by the Government, and Law 1542 of 1947 that regulates land registration and titling.

5.2.2 Institutional Framework

The government, private, and international institutions that have played an important role in the DR's land tenure situation are listed in Table 5.13. The most relevant organizations are described in this section.

A.I.D. and IDB have 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, agricultural development, evaluation, and other aspects of agrarian reform. IDB funded the rural cadastre, which has not yet been completed.

The **Instituto Agrario Dominicano** (IAD Dominican Agrarian Institute) is the main agency implementing the agrarian reform laws. It acquires land as provided by several laws, assigns parcels to agrarian reform participants, manages some farms, and provides technical assistance to agrarian reform beneficiaries.

The **Dirección General de Catastro** (General Cadastre Directorate) is in charge of inventorying parcels to determine ownership and land use. The **Tribunal Superior de Tierra** (Superior Land Court) determines land ownership and issues land titles through the Office of Land Registry. It has local courts in several provinces of the country. The **Dirección General de Mensura Catastral** (General Directorate for Land Measurement) is in charge of land title registration and control.

The **Secretaría de Finanzas** (Secretary of Finance) intervenes in the collection of the transfer tax when a piece of land is sold.

Table 5.12 Policies Related to Land Tenure, by type, DR, 1992.

Type of Policy			
Transnational	Macroeconomic	Sectoral	Specific
– Financing Policy	– Monetary – Credit – Fiscal – Budget – Fiscal – Tax Code	– Agriculture – Education	– Law 344 of 7–26–43/Procedures for Expropriation of land by the State. Reformed by Law 330 of of 7–18–64; Law 471 of 11–2–64; Law 486 of 11–10–64 – Law 1542 of 11–47/Land registration. Reformed by Law 1800 of 9–1–48; and Law 3589 of 6–25–53 reformed by Law 4804 of 11–20–57; and by Law 35 of 10–13–70 that modified Law 370 of 10–22–68, which was m,odified by Law 467 of 9–11–69. – Law 1783 of 2–12–48/Agrarian colonization. – Law 5879 of 4–27–62/Agrarian Reform. Reformed by by Law 6207 of 2–25–63; Law 44 of 11–4–63; Law 17 Law 17 of 9–21–65; Law 496 of 10–15–69; and Law 570 of 3–15–77. – Law 248 of 5–8–64; Law 441 of 10–14–64; Law 449 of 10–21–64; Law 9 of 9–8–65; Law 197 of 12–20–67. Transferring State owned lands to the IAD. – Law 282 of 3–14–72/Declare of social interest vacant and abandoned lands. – Law 283 of 3–14–71/Created a Commission to implement procedures for recuperating State lands. – Law 287 of 3–23–72/Resolution on Land Rent Contracts – Law 289 of 3–22–72/Land contracts and "aparceria" – Law 290 of 3–24–72/Apropriate lands irrigated by State built canals. Reformed by Law 358 of 8––25–72. – Law 292 of 3–24–72 360/Establishing deadline to return State land to IAD. Reformed by Law 362 of 8–23–72. – Law 314 of 4–12–72/Definition of "latifundio" – Law 357 of 3–25–72/Penalty of unlawful land trasnferring – Law 361 of 8–25–72/Procedures to recuperate vacant lands. – Law 362 of 8–25–72/Regulation for selling lands – Law 363 of 10–22–72/Segrergation and subdivision of recuperated land – Law 145 of 3–30–80/Prohibition of acquisition of plots assigned by the IAD – Law 126 of 3–25–80/"Cuota parte" – Law 2710 of 9–28–72/Transferring "Sabana de Guabatico" to IAD – Decree 2101of 3–20–72 /Create commission to locate and determine State land – Decree 4168 of 4–17–72/Create commission to apply Laws 283,290, and 314 – Regulation 2555 of 8–14–72/Establishment of procedures to aplly Law 292 – Executive Order 480 of 5–20–20/Eminent Domain – Constitution of 1966, Art. 8– Paragraph 13.a.

TABLE 5.13 Institutions Involved in Land Tenure Policies by Type of Policy, DR, 1992

Type of Policy			
Transnational	Macroeconomic	Sectoral	Specific
USAID	Secretariat of Finance	SEA	Dominican Agrarian Institute
IDB	Technical Secretariat of the Presidency	Secretariat of Public Works	General Directorate of Land Measurement
The World Bank	The Central Bank	The Agricultural Bank	State Sugar Council (CEA)
Bank (IDB)		Supreme Justice Court	General Cadastre Directorate
World Bank		Procuraduria General de la República	Superior Land Court
			Municipalities
			Land Title Registry
			National Cotton Institute
			Banana Project "La Cruz de Manzanillo"

5.2.3 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 the DR started with colonization of government land in 1948 through Law 1783 of that year. Then, in 1962, implementation of the agrarian reform began with the distribution of farms previously owned by Trujillo. The Constitution of 1966 (Article 8, Paragraph 8.a) declares as a social interest the gradual elimination of the *latifundio* (large landholding), and specifies that the land belonging to the Government should be used by the agrarian reform.

Law 314 of 1972 defines *latifundio* as a unit with more than 1,500 tareas of first class land, 2,100 tareas of second class land, 4,000 tareas of third class land, 8,000 tareas of fourth class land, 15,000 tareas of fifth class land, 25,000 tareas of sixth class land, and 45,000 tareas of seventh class land. The law makes an exception for areas under sugarcane. It also provides an exception for farms planted technically with optimal crops as determined by a commission formed by the Secretary of Agriculture, the Legal Counsel of the President, the Director of IAD, the General Manager of BAGRICOLA, and one representative of the Dominican Association of Farmers, Inc. This definition should be revised as it restricts the development of large agro-industrial and agro-forestry projects, which are good for generating employment and protecting soils and watersheds. As the law states now, exceptions are left to a commission. This makes

the procedure cumbersome. A more flexible system would be more efficient. Even though this law has been applied on very few occasions, it remains a threat for a large investor.

The Constitution of 1966 and Law 5879 of 1962 on Agrarian Reform and its modifications reflect the Dominican society's vision of agrarian reform. The Government is seen as a provider of basic human needs, which includes land for disadvantaged farmers, and housing and education for all Dominicans. Thus, agrarian reform is meant to achieve the social function of providing these services to landless rural labor and to improve land distribution in the country. Law 5879 also includes in its motivations reducing the human pressure to farm fragile lands on the mountains and hillsides.

The objectives and mandates of agrarian reform require substantial budget resources from the Government. This, however, has not been the case. The Government has used more resources to provide more services to the urban population than to rural inhabitants. This lack of budgetary support contributes to underutilization of productive lands and poor management of fragile lands. This problem must be addressed to find feasible solutions to the DR's agrarian problem. Otherwise, natural resources will continue to deteriorate under the present system.

There is a need to define what the Government can reasonably achieve with its limited resources, and how the Government can leverage international contributions to achieve this social goal.

The fact that the Government is the major land owner in the DR introduces distortions in land markets. In the land market of privately registered and titled lands, the price distortion is manifested in areas where the Government owns large tracts, creating an artificial scarcity of land. While in areas where there are large extensions under agrarian reform, land prices are artificially depressed.[1] In the market of land investments in Government land or occupied private properties, the distortions are due to the insecurity in land transactions. Occupants do not have title to the land, but they can sell the improvements and their natural right to use the land. This is an irregular situation due to Government slackness in applying the law. This contributes to a destruction of the natural resource base, as the occupant is reluctant to invest in significant improvements under the fear of losing their investment.

Insecurity about land ownership is one of the major land tenure problems for agrarian reform beneficiaries. Because the land is not theirs, farmers perceive little risk in borrowing. For the same reason, they have little incentive to invest in improvements and in soil conservation practices. This contributes to soil degradation. There is an intention to assign definite title to agrarian reform beneficiaries. This is a slow process that needs to be accelerated and modified to allow for a more efficient land market.

[1] UEPA, 1989, p. 64.

It is difficult to develop an efficient land market in the DR because transferring land titles is a slow procedure, involving many costly steps. This procedure needs revision and modernization. The Superior Land Court lacks resources to modernize its operation. However, the Government receives a sizable income from the land transfer tax, which should be reinvested in these institutions to improve their efficiency.

Law 282 of 1972 on the transfer to IAD of land not in use, has a net negative impact on the natural resources. It has the positive impact of stimulating people to use land in productive activities, but it also has the negative impact of stimulating people to clear land under the fear that it will be taken away by agrarian reform. Cleared land erodes very quickly.

Due to soil production capability, some of the land owned by IAD and agrarian reform beneficiaries should not be farmed intensively, and should be managed with agro-forestry and conservation practices. However, these areas are either being farmed intensively, or are abandoned. IAD does not have the personnel or the financial resources to develop a conservation and soil management program in these lands. Given the dispersion of these areas and size, it is difficult for an NGO to assume this responsibility. This problem needs to be addressed. It presents an opportunity for international donors to intervene in these areas.

Another problem arises in the land owned by CEA that has been rented for agro-industrial projects. The rental agreements do not include a clause concerning the quality of the land when the renter returns it to the Government. Thus, the renter has no incentive to preserve its productivity, and unproductive land is simply abandoned when the lease is up. This is the case in pineapple production in Villa Altagracia. The production technology used is destroying those soils. The producers are acting as profit maximizers, and there is a need to introduce corrective measures to amend the market failure.

In summary, the agrarian reform process has a social function that has not received adequate resources, and as such needs to be reviewed. The agrarian reform system distributes land that is not suitable for intensive agriculture. This land should be managed differently. Land registration is a long process that needs modernization. The Government is the country's major land owner, which, in addition to the titling procedure, creates obstacles to the development of an efficient land market. The definition of *latifundio* is very restrictive, and must be revised. Government leasing contracts lack clauses requiring the maintenance of soil quality. These are key policies that are contributing to soil degradation and erosion.

5.2.4 Potential Policy Alternatives

Policy alternatives to improve the impact of land tenure issues on sustainable agricultural production include:

- Review the definition of *latifundio* (Law 314 of 1972) to increase the size of farms to allow for large agro-industrial and agro-forestry projects that require large extensions; and

- Design a soil conservation program for agrarian reform participants.

5.2.5 Recommendations for Future Research and Analysis

Further analysis is needed before adopting additional policy reforms. The team recommends the following:

- Review the entire agrarian reform system to make it more relevant to the DR's special needs. The Government does not have the resources to comply with the social functions stated in the Constitution and the agrarian laws. A more viable system must be developed to allow farmers to purchase their land with the right to sell;

- Study alternative mechanisms to improve land title transfers to reduce complicated and slow procedures;

- Study ways to support the National Land Titling Office and the Superior Land Court to modernize and speed up the land titling procedures;

- Dedicate funds to complete and update the rural cadastre started in the late 1970s;

- Study ways to solve the agrarian problem, given the budgetary constraints;

- Study ways to amend government land leasing contracts to include clauses requiring that soil productivity be maintained and erosion be kept to a minimum;

- Identify land under agrarian reform that should not be dedicated to intensive agriculture and design alternative management schemes for this land to maintain or improve its productive capacity;

- Study ways to convert poor land to wildland, wetland or forest; and

- Study possible land tax systems.

5.3 Pesticide Management

Pesticide management is very important for sustainable agriculture. The misuse of pesticides kills the natural predators of common pests. In addition, pests can develop resistance to certain pesticides after continuous use. Both factors increase future pest control costs, as well as create secondary pest and environmental problems. Pesticides also pollute streams and kill soil microorganisms, which are important for soil fertility. Human beings and wild species can also be affected by the misuse of pesticides. On the other hand, if pesticides are appropriately managed, production costs will eventually decrease and the quality of products will improve. Pesticides are important in modern agriculture but at the same time, if not managed and used

appropriately, they produce serious environmental and human hazards. In the DR, the Constanza Valley is an example of pesticides mismanagement. Its unique climatic and agroecological conditions make it suitable for vegetable production. In the last 30 years, this valley has been intensively farmed without any soil or environmental considerations. At present, this valley is extremely polluted and the number of pests has increased. Farmers have increased pesticides doses and the number of applications.

A recent unpublished study[1] shows misuse, unsafe handling, and an unclear legal status for some pesticides that enter the country and bypass the legal controls. This arises when pesticide shipments arrive without notification to the Division of Pesticide Registry, which certifies pesticides' compliance with existing regulations. Although reliable data on human poisoning is lacking, it is speculated that a high number of people are affected by the mismanagement of pesticides.

Since the 1960s, the use of pesticides has increased and today they are available nationwide. The country's imports of pesticides are about US$15.0 million per year. According to information gathered by Segarra-Carmona, there are 1,200 pesticide formulations legally registered in the DR[2] (Table 5.14). Both large and small farmers are accustomed to using pesticides. However, most of these farmers usually do not observe safety regulations. Pesticide mismanagement also affects water bodies (superficial and ground water), wildlife, and wetland ecosystems.

TABLE 5.14 Pesticide Imports, by Type, 1986-1990 (US$)

Year	Fungicide	Herbicide	Insecticide	Row Material	Others	Totals
1986	650,900.37	755,493.78	2,831,073.82	7,891.31	128,007.70	4,439,356.98
1987	2,547,714.22	5,898,965.84	3,589,969.62	2,751,084.35	1,187,781.40	15,975,515.43
1988	3,171,209.98	6,452,322.00	4,046,351.31	3,336,783.00	541,686.00	17,548,534.29
1989	3,870,930.29	10,588,362.71	4,328,448.77	6,950,534.86	994,423.11	26,732,708.74
1990	3,130,822.83	13,841,180.17	4,230,633.30	2,421,228.37	1,229,781.37	24,853,646.04

From:Agricultural Policy Study Unit (UEPA). 1991. "Pocket Data on Dominican Agriculture." Santo Domingo, D.R.

A workshop sponsored by IICA in 1989[3] concluded that the main factors for vegetable export prohibition to the United States are:

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[1] Segarra-Carmona, 1992.

[2] ibid.

[3] Secretariat of Agriculture-Interamerican Institute for Agriculture Cooperation. 1989. "Workshop on Illegal Pesticides Residues and Quarantine Restrictions for Export and Internal Consumption of Vegetables." Draft Report.

- The intensive vegetable planting in some areas requiring heavy and numerous applications of pesticides;

- The lack of technology transfer concerning some pesticides' appropriate application;

- The occurrence of some new pests such as *Thrips palmi*, a mutation of *Bemisia tabaci* (Sweet potato whitefly), and *Pseudoacista persea* (*Chinche de Encajes*); these are very difficult to control;

- The lack of supervision of field activities to enforce Law 311 of 1968 and its Regulation 322-88 of 1988; and

- The lack of appropriate tools to support farmers' pest control programs, such as a list of registered pesticides, recommended doses, and application time before harvest.

By 1988, the loss in fresh vegetable exports was estimated to be between RD$60.00 and RD$80.00 million,[1] primarily from the so called Chinese vegetables and cantaloupe. This was due to pesticide residues found in shipments. These crops, as well as processed tomatoes, were severely affected by thrips and sweet potato whitefly. The situation prompted agricultural officials, producers, USAID, and private institutions to look for an effective solution to the problem.

In summary, the problems of pesticide management in the DR are misuse and unsafe handling of pesticides, deficient law enforcement and excessive residues on some products.

5.3.1 Policy Framework

Table 5.15 presents a list of major policies affecting pesticide use in the DR, classified according to whether the policies are transnational, macroeconomic, sectoral or specific.

At the transnational level the major policy affecting pesticide use in the DR is the establishment of standards for imported agricultural products in industrialized countries, particularly the United States. USEPA, USDA, and USFDA are all agencies that establish parameters for the protection of US consumers. The 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. 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 USFDA is the implementing agency. USFDA samples

[1] SEA-IICA. 1989. "Workshop on Illegal Pesticides Residues and Quarantine Restrictions for Vegetables." Draft Report, p. 16, Santo Domingo.

TABLE 5.15 Policies Related to Pesticides Management, by Type, 1992

Type of Policy			
Transnational	Macroeconomic	Sectoral	Specific
- Import regulations - Production policies of pesticide - FAO-International Pesticides Code - Plant Protection International Convention	- Monetary-Money Supply - Monetary-Credit - Monetary-Foreign Exchange - Fiscal-Budget deficit	- Education Policy - Research - Extension - Law 4471/Health Code of 7-31-73	_ Law 311 of 5-24-78/Pesticides use, and trade regulations - Decree 322-88 of 7-13-88/ Regulation of Law 311, and Regulation 1390 of August 31,1971 - Law 11-92 of May 16, 1992/Tax Code - Decree 217-91 of 4-6-91/Banning import of a number of pesticides - SEA-Resolution 6-89 of 1/16/89/ Creation of a Commission to study *B. tabaci* control - SEA-Resolutions 17-89; 85-89; 44-90; 84-90; 23-90bis; 17-92; and 24-92. Regulating a number of crops planting date and crop zoning.

and analyzes produce in the US and at ports of entry as well. 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 the DR are the following: foreign exchange, credit, import tariffs, and government budget. The major sectoral policies are health, education, agricultural research and extension, agricultural credit, and public health.

The specific policies are Law 311 of May 24, 1968; Decree 322-88 of July 12, 1988 - Regulation to apply Law 311; Decree 217-91 of April 6, 1991, banning import, manufacture, formulation, commerce, and use of 15 pesticides; SEA Resolution 6-89 of January 16, 1989; SEA Resolution 17-89 of February 2, 1989; SEA Resolution 85-89 of September 1, 1989; SEA Resolution 44-90 of March 3, 1990; SEA Resolution 84-90 of June 20, 1990; SEA Resolution 23-90bis of October 12, 1990, SEA Resolution 17-92 of February 10, 1992, and SEA Resolution 20-92 of February 17, 1992, regulating a number of crop planting dates in some areas of the country.

5.3.2 Institutional Framework

The institutions involved in pesticide use and management are listed in Table 5.16, according to four major policy groupings. The DR is a member of the **International Organization for Agricultural Health** (OIRSA), a regional organization headquartered in San Salvador that advises government agencies on regulations needed to avoid pollution of insects and diseases from one country to another.

TABLE 5.16 Institutions Involved in Pesticides Management, by Type of Policy, 1992

Type of Policy			
Transnational	Macroeconomic	Sectoral	Specific
- International Regional Organization of Agriculture Health (OIRSA) - USDA-APHIS - USAID - GTZ-Germany - U.N. Development Program	- The Central Bank - The Banking System - Foreign Exchange - Secretary of Finance - Secretary of Industry Commerce	- Secretariat of Agriculture - Secretariat of Education - Secretariat of Health and Social Assistance - Integrated Pest Management Council	- SEA-Department of Plant Protection - SEA-Undersecretariat of Research, Extension, and Training - Directorate of Livestock - Agrochemical Manufacturers and Importers Association - Dominican Ecological Associations Federation - Association of Agronomists - National Commission for the Environment - Dominican Agribusiness Board - Agricultural Development Foundation - SEA-Department of Research

USDA-APHIS is involved in a pre-inspection program to detect any potential pest that could be taken to the U.S. in Dominican agricultural export products. According to the Department of Plant Protection, they are looking forward to renewing the existing agreement to maintain this program. This agreement is executed through J.A.D., representing the farmers, who are now assuming economic responsibility for implementing the program.

USAID, UNDP, CEE, and IDB are involved in financing agricultural projects. Policies are influenced to the degree that projects funded by these entities make recommendations and set requirements and restrictions for pesticide use.

GTZ, a German organization, has worked for many years in the country focusing on pesticide use and pest control, training technicians and supporting research efforts. GTZ is providing nim (*Azadirata indica*) trees to support the development of botanical insecticides. This project is being carried out in cooperation with the Loyola Politechnical Institute. Rural dwellers can get nim trees free of charge for planting in their plots through this project

Japanese International Cooperation Agency—JICA. This Japanese agency grants US$2.5 million per year in agricultural inputs and equipment to the GODR through SEA, for sale to farmers at low prices. These inputs and equipment are sold by CVMA.

SEA is in charge of implementing and setting agricultural production policy. It is also responsible of enforcing the law related to pesticides management. The **Departamento de Sanidad Vegetal** (Department of Plant Protection of the Secretariat of Agriculture) is the unit responsible for supervising and controlling pesticide use, and offers technical advise to farmers, according to the existing regulations. This Department is also in charge of pesticides

registration, which is done through the Division of Pesticides Registry. At the **Centro Sur de Desarrollo Agropecuario** (CESDA - Southern Center for Agricultural Development) in San Cristóbal there is an analytical laboratory which was once well organized with both lab equipment and personnel. The SEA also distributes agro-chemical inputs through its **Centro de Venta de Materiales Agropecuarios** (CVMA - Agricultural Products Trade Center). CVMA sold RD$11.5 million of pesticides in 1988, but this figure decreased in 1989 to about RD$5.0 million.

BAGRICOLA is a government bank established to promote agriculture. The BAGRICOLA provides limited technical assistance in addition to its main function, which is to lend money to farmers. This is frequently the only formal source of credit available to poorer farmers from the traditional and the agrarian reform sectors. Its clients can obtain inputs from CVMA by using a letter of credit issued by BAGRICOLA, according to the farm plan developed and approved. During the 1980s, BAGRICOLA also assumed other responsibilities such as the control of rice commerce and the operation of some rice factories.

The **Comisión Nacional para el Medio Ambiente** (National Environmental Commission) is a Government Commission created by Decree 155-87 of March 28, 1987. The chief of this Commission is the President. It was created to accomplish 16 objectives, from the control, reduction, and elimination of activities hazardous to human beings and ecosystems to the coordination of all GODR institutional activities related to the environment. This Commission influences policy by presenting legislative proposals to the Government and by offering public information regarding environmental issues.

The **Consejo Nacional de Manejo Integrado de Plagas** (National Integrated Pest Management Council) is made up of relevant officials from the SEA, FDA, and JAD. This Council is implementing an integrated pest management project funded by USAID with PL-480 funds. The Council also includes the Technical Secretariat of the Presidency. The project is managed by JAD, which represents the producers. The project's initial operational budget is RD$14 million dedicated to research, technology transfer, and training. The IPM project is organizationally decentralized, integrated as follows: regional activities and staff are controlled by a Regional IPM Council. At the national level the project is managed by a National Coordinator under the National Council Authority. The project is staffed by 11 technicians located in three regions (Azua, La Vega, and Santiago).

JAD is a non-profit organization whose members are farmers and agricultural businessmen. JAD is establishing a lab to conduct analysis on agricultural products for early detection of pesticides residues. In addition, JAD offers technical assistance to its members on crop production and pest management, among other services.

FDA is a non-profit organization devoted to research support and technology transfer in agriculture. The FDA is supporting research activities on the biological control of pests and has organized training activities on pesticides use. FDA also contracted technical assistance on pesticides and IPM issues to define action plans and better ways to manage pest problems.

The **Asociación de Fabaricantes e Importadores de Productos Agrícolas—AFIPA** (Association of Manufacturers and Importers of Agro-chemical Products) is an organization of manufactures and importers of fertilizers and pesticides. Its main objective is to sell agricultural chemicals. The association also states its interest in the safe use of pesticides in order to protect the environment and human health. AFIPA maintains a communication channel with the Government through the SEA-Department of Plant Protection. It is implementing an informal training program addressed to extension agents and farmers. According to its President, the association is willing to provide economic support to help stop pesticides misuse. It is highly interested in the safe use of pesticides. AFIPA is trying to get tax exemption for pesticides. Presently, pesticides command a 12 percent import tariff. AFIPA claims that a tax reduction will improve Dominican agricultural products' competitiveness in international markets by lowering production costs.

ISA provides education in agricultural science, offering two degrees. This institution also conducts research in agriculture, rural development, pest management, and forestry. ISA has two specialized centers: the **Centro Norte de Desarrollo Agropecuario—CENDA** (Northern Center for Agricultural Development) and the **Centro de Administración y Desarrollo Rural—CADER** (Rural Development and Management Center). The **Universidad Autónoma de Santo Domingo—UASD** (Autonomous University of Santo Domingo) is a public university. UASD's College of Agronomy conducts research in pest management and biological control at a Biological Control Lab located in Engombe, Santo Domingo. Both ISA and UASD have a well-trained faculty to develop pest and pesticide management activities; however, they lack resources to conduct research and to develop an appropriate salary policy to encourage their professional staffs.

5.3.3 Analysis

The most important transnational policies affecting the use of pesticides in the DR are the import regulations established in other countries. These regulations have made farmers and exporters aware of the critical situation generated by misuse of pesticides, which in turn have influenced decisions regarding the use of internationally approved pesticides on a particular crop. Due to pesticide misuse, residues have been found in Dominican agricultural export products which have been banned from entering other countries (e.g. USA).

In the past, differentiated exchange rates subsidized pesticide imports, stimulating higher levels of applications and use. This has been corrected with the unification of the exchange rate. There is a small distortion as the interbank rate is about 5% lower than the informal exchange rate. The Sixth Agricultural Census indicates that 7,593 farms used pesticides to control pests on crops and animals and 57,386 farms did not use pesticides in the country in 1971. Whereas the 1982 Seventh Agricultural Census shows that 7,976 farms classified as larger farms, with 12.5 hectares to 1,000 hectares and up, used pesticides; 5,993 farms of the same type did not.[1]

[1] National Statistic Office (ONE), 6th and 7th Agricultural Censuses of 1971 and 1982, respectively.

(Table 5.17). Due to the fact that data from the 1982 Census is not yet complete, the comparison cannot be made for all the farms.

TABLE 5.17 Number of Farms Using Pesticides, by Size,* 1982

Farm Size (Tareas)	Herbicide	Insecticide and Other Crops	Animals	Non-Use Pesticides
200 - 799	1,549	1,376	498	3,429
800 - 1,599	866	761	925	1,717
1,600 - 3,199	439	348	473	602
3,200 - 7,999	202	146	193	186
8,000 - 15,999	47	34	49	47
16,000 and up	37	29	24	12

Source: National Statistic Office (ONE) *Seventh Agricultural Census of 1982*, Vol.1

Note: * ONE has this information only for the larger farms.

The credit policy implemented by BAGRICOLA has been to offer low interest rates, even below the inflation rate and the interest rate charged by the banking system. BAGRICOLA is the DR's largest provider of formal agricultural production credit, with offices throughout the country and loan agents who work directly with farmers to monitor loans. This bank is the only formal credit source for agrarian reform producers.

The present policy of government budget reduction has been effective for reducing inflation and stabilizing the foreign exchange rate, yet at the same time it has also limited government employees' salaries. This contributes to the reduction of trained personnel in institutions that regulate the use and trade of pesticides in the DR. This is the case at SEA in general and at the Department of Plant Protection in particular. DPP is responsible for controlling pesticides management and for enforcing the existing laws and regulations.

The DR has faced the effects of pests in cocoa and citrus since the 1920s. Recently, several pests have emerged on a number of export and industrial crops as well. According to some Dominican entomologists, it is believed that these pests are imported. This reflects an ineffective control of imports at ports, even though there are plant protection officials to supervise this activity. Various technicians have also indicated that the main cause of pesticides problems is not necessarily in the field but rather in inefficient quarantine procedures. In addition, they state that the Department of Plant Protection can not enforce existing regulations due to a shortage of well-trained and experienced technicians. There is also a lack of support for the officials who currently perform these duties.[1] DPP is also responsible for pesticides registration; yet this mandate is not being met effectively due to inadequate operating resources and inexperienced staff. Most of the few well-trained technicians are now working with agro-chemical companies and other organizations.

[1] Julián De la Rosa (Consultant) and Porfirio / lvárez (National Coordinator IPM Project), Personal Communication.

A number of workshops have been held to discuss the pesticides problem. In addition, USAID has financed some studies to obtain reliable information on the problem and to define necessary approaches in solving the problem. In this context, an institutional reorganization has been suggested in order to efficiently develop activities related to plant protection and to enforcing the above-cited regulations. The suggestion was addressed to SEA, which is responsible for enforcing Law 311 and its Regulation, Decree 322-88. Later on, after the pest problem worsened and expanded to the north and northwest sections of the country, an IPM project was established to implement the required research and technology transfer actions needed to reverse the situation.

However, according to the information gathered, the impact of this project has yet to be seen. Very little is known about the pest population dynamics in the DR because no research has been conducted. In addition, it is argued that the IPM project needs more support to achieve its stated goals. Another important factor is the need for permanent contact with institutions around the world—but mostly in the region—to gain knowledge of the latest results obtained on pest control and pest management. It is believed that the IPM project staff is insufficient to implement all these activities although it could be effective in gathering and transferring technology.[1]

The handling and storage of pesticides is not seen as a big problem by AFIPA because the law is very clear on these issues. However, it has been observed that non-approved containers are used to rebottle pesticides.[2]

AFIPA has stated its willingness to support any effort leading to better pesticides management. In fact, according to its president, AFIPA is participating in training technicians and farmers on the safe use of pesticides. In relation to the use of protective equipment, it was indicated that none of the existing types of equipment is suitable for the DR's warm climate. It was not until recently that appropriate equipment was designed and is now ready for manufacturing and distribution.

In general, AFIPA's president believes that the general public is not well informed about the real situation concerning pesticide management and use. For instance, Constanza Valley has been mentioned as a place where pesticides are misused. However, Constanza's land has been intensively used for agriculture, which makes the reversal of this situation difficult. A well-planned crop rotation is needed to reduce the high levels of pesticides residues in the soil and the environment in general. Crop rotation is both an IPM and a soil conservation practice.

There is a consensus on the ineffectiveness of the Plant Protection Department due to several factors. One factor is the lack of resources for monitoring the commercialization and use of pesticides. This same issue affects highly-trained technicians as well due to the fact that

[1] Rafael Pérez Duvergé, FDA, Personal Communication.

[2] Segarra-Carmona, 1992.

most technicians are not willing to work with SEA under the prevailing conditions of salary and logistical support. Indeed, the Division of Pesticides Registry "struggles to enforce the regulations with three people."[1]

The DR's educational system has been very deficient as shown by the high illiteracy level, which is worse in rural areas. This has been a constraint for training farmers. Traditionally, technicians are not educated in integrated pest management practices. This contributes to the heavy use of pesticides.

Lack of funding and experienced personnel in government institutions limits research in integrated pest management practices for different crops. The extension service is very limited with few trained technicians and limited logistical support, although it is participating with AFIPA in training farmers and technicians on the safe use of pesticides. Under this program, there are now 1,911 trained farmers and 203 technicians.[2] Trained technicians receive a certificate which allows them to prescribe restricted pesticides.

Government institutions, private organizations, and international organizations see pesticide mismanagement as a big problem in the DR. It affects water quality, soil microorganisms, wildlife, human health, and product quality. Generally, this problem is only associated with pesticide use in the field. However, the causes of this problem go beyond the farms. Interviewees indicated that the pests causing the most severe damage in the country are imported. This fact reflects ineffective control at Dominican ports. It appears that the quarantine system is not operating as well as is needed to detect the presence of exotic pests in imported products. That, according to some Dominican entomologists, could allow the introduction and dissemination of pests in the country. The failure of the quarantine system to control the spread of imported pests, as in the case of thirps, has contributed to the heavy use of pesticides.

Ineffective control is connected to the lack of logistical support and well trained personnel assigned to the quarantine station. This station is located at Las Americas International Airport under SEA's Department of Plant Protection. In addition, a general lack of awareness about pesticide management and pest control, only exacerbate the ineffectiveness of the quarantine system and pesticide-use problems.

The major policies regulating pesticides are contained in Law 311, of 1968. This law addresses the manufacture, storage, import, and trade of pesticides. Regulation - Decree 322-88 of July 13, 1988, which modified Regulation 1390 of 1971, establishes mechanisms to enforce the law. The Regulation guarantees the quality and composition of agro-chemicals, defining requirements and actions to prevent damage to human health and the environment. It specifies

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[1] Segarra-Carmona, A. "Environmental Assessment on the Use of Pesticides in the Dominican Republic PVO Co-Financing Project." USAID. Draft Report.

[2] Lora G., Manuel. Director SEA-Dept. of Extension. Personal Communication.

step by step the requirements for product registration, formulation and manufacturing, storage and transportation, commercialization and labeling, management, and use. This regulation is enforced by SEA.

All importers, exporters, manufacturers, formulators, packers, and sellers of pesticides must be registered at SEA. Apparently, the registration requirements for the import and use of Class I (the most toxic) and Class IV (the least toxic) pesticides do not differ. Registration fees are applied according to the type of registration asked for (from US$25.00 to US$100.00 or its equivalent in RD$) rather than using the toxicity classification.[1] It is established that the collected funds should only be used to accomplish the specified objectives.

Pesticide registrations are valid for five years. In order to obtain the registration of a pesticide, the importer must submit information to the Plant Protection Department to certify that the product is registered for the specified use or a similar use in the originating country. The importer must also provide a description of the product, including physical and chemical properties, formulated product characteristics, analytical methodologies, hazards and prevention, recommended use, and effects on the environment. If required by SEA, the company must also submit a sample of the product.

This regulation states that pesticides with restricted use can only be commercialized and used under professional prescription (Art. 75). In addition, it indicates that pesticides in Class I and any other restricted pesticides can only be sold to people who can demonstrate that they have been trained by SEA to manage and use such pesticides (Art.79).

According to Article 43, the company must develop an approved label in Spanish for the product following the basic protocol used by USEPA and FAO. The label must be color coded (e.g. 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 name and the common name, and the percentages of active ingredients.

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[1] Regulation 322-88, page 20, defines the following types of registration fees:

Commercial	US$100.00
Renewing	75.00
Manufacture or formulator	100.00
Research	50.00
Non-commercial	50.00
Dealer	50.00
Professional responsible (Regente)	25.00
Analysis of product quality	75.00
Analysis of residue	75.00
Analysis of product toxicity	75.00

It is claimed that the existing law and its regulations are in accordance with the requirements for the safe use and management of pesticides. Yet the law is not effective due to the fact that SEA fails in enforcement. This is attributed to its lack of funds, logistical support, and insufficient number of well-trained personnel. If funds raised by pesticides registration were used to support the Registry Division to enforce the Law, this division could perform a more efficient control.

In the past, a private cotton producer successfully adapted IPM technology to reduce the number of pesticide applications. Likewise, tomato producers are incorporating IPM practices involving biological control to reduce pesticide applications. This will help to minimize the impact of sweet potato whitefly on tomato processing plantations. Producers have planted rows of sorghum in tomato plantations to facilitate predator development. This practice is the result of research funded by the FDA and Barceló Industrial.

Generally, applicators of pesticides do not use protective equipment or follow safety measures while dealing with pesticides. Despite AFIPA claims that the existing set of protective equipment is not suitable for the DR climate, masks could be easily found in stores. It seems that the most critical issue concerning pesticide misuse is the lack of awareness and training, as a recent unpublished study conducted in the country demonstrates. One applicator was observed wearing a mask with the filter incorrectly placed.[1]

The existing Law and its Regulations on pesticides appear to cover the essential issues of pesticide use in the DR. Nevertheless, SEA does not have the capacity to enforce them. The unpublished study conducted by Segarra-Carmona reveals several violations of the Regulations. Often these violations are due to the lack of knowledge of pesticides' effects on people and animals. An example of this is the use of these products for fishing. People drop pesticides in rivers and ponds to kill the fish and catch them to sell them in the market.

In summary, Regulation 322-88 is good enough to control pesticides management in the DR. However, SEA is too weak to enforce it. On the other hand, training programs on pesticide use are not coordinated. SEA and AFIPA are each conducting a training program and the IPM project is implementing another one to train farmers and technicians.

5.3.4 Potential Policy Alternatives

Alternative policies should be aimed at the following objectives:

- Strengthen the participation of private organizations in IPM activities being implemented to encourage adoption of biological controls and other practices to eventually decrease pesticide use;

[1] Segarra-Carmona, 1992.

- Establish mandatory research requirements on new products to be registered, charging the research costs to the interested company;

- Establish a policy requiring information on pesticide effects on wildlife and aquatic ecosystems before granting pesticide registration; and

- Study the possibility of modifying Article 24 of Law 311 to increase the fine applied to the violators of the law and its regulation.

The following suggestions are means to be considered for achieving these objectives:

- Due to insufficient government funding, use revenues from import taxes on pesticides to finance research on IPM, improve staff salaries, hire qualified technicians, and equip the regulating institutions;

- Include protection equipment in agricultural loans;

- SEA should select a well-trained and experienced group of technicians to organize a supervisory staff for monitoring pesticide storage, handling, selling, and transport conditions, as well as field application to enforce Regulation 322-88; and

- SEA and private institutions should organize a decentralized plant protection extension service for advising and training pesticide users. This staff should receive special training in pest control and pesticide management. It might be a good idea to start redefining the tasks of the existing JAD/IPM project.

5.3.5 Recommendations For Future Research and Analysis

The following studies are recommended to improve the information required for adopting sound policies in pesticide management:

- Study the country's quarantine system to improve its technical capability and logistical support;

- Study ways of establishing an appropriate monitoring system on human health or the early detection of pesticides residues in the blood of people dealing with these chemicals;

- Study ways to establish an appropriate pesticide management information and training system that includes applicators, farmers, technicians, and agro-chemical companies;

- Study ways to improve the wise use of pesticides including protection equipment, more appropriate levels of crop application, better timing, and better product handling to avoid run-off contamination and heavy pesticide residue on agricultural and livestock products (both on and off the farm);

- Study the impact of IPM on pests and pesticide management. Define the appropriate actions to be undertaken to cope with the most relevant issues on pesticide use;

- Analyze the present status of plant protection research institutions, trained personnel, and equipment, defining procedures to strengthen the country's capability to adapt technology and conduct research;

- Study the ways to encourage agro-chemical companies to pay for pesticide related research;

- Define a set of research priorities and actions to control existing pests and prevent the entry of others; and

- Study research systems to encourage organic farming on a large scale, minimizing the use of chemicals.

6. CROSSCUTTING ISSUES

Previous chapters dealt with policies that directly and specifically affect each area. Certain over-arching issues were repeated in each chapter and others were left to be discussed in this chapter due to their importance to overall natural resource management in the DR. These issues include:

- Declining per capita income and the increasing proportion of Dominicans below the poverty line;
- A natural resource preservation policy that conflicts with the poverty level of the country;
- Low budgets and salaries at institutions dealing with natural resources;
- Ignorance of the causes and effects of natural resource destruction;
- Lack of institutional development and lack of coordination among institutions;
- Conflicting institutional objectives;
- Tolerance for corruption and inefficiency of government institutions;
- Over-centralization;
- Undefined relationships and levels of participation between GODR institutions and private organizations involved in natural resource management;
- Lack of commitment for implementing and supporting a well-planned national training program on natural resources and related issues; and
- Inadequate basic information on the present situation of natural resources, and a the need for a system to maintain an updated data base pertaining to these areas.

6.1 Major Policy Considerations

Real per capita income in the DR has been declining while the proportion of the population below the poverty line has increased and the level of agricultural output has decreased. This growing low-income population survives by extracting whatever it can from the natural resources. The Government's response to this situation has been to guard and protect the forest resources, mainly in the uplands of critical watersheds. This reflects a preservation policy that reacts to a pressing problem rather than managing natural resources to fulfill the

human needs of present and future generations. This preservation policy conflicts with basic human needs, mainly of inhabitants in fragile lands.

The expansionary economic policies of the present Government have created economic instability that in the past has resulted in very high levels of inflation. An economic stabilization program has now stabilized the economy, but the Government has not made sufficient salary adjustments in the public sector to adequately compensate qualified employees. In addition, the agencies working in natural resources have not received adequate operating budgets, limiting their capacity to carry out their mandates. It is a day-to-day budget, continuously modified. Agency budgets are difficult to assess. Budgets are often legally approved but seldom funded. For many agencies, budgets are spent on employee salaries and office operating costs.

Budgetary allocations are generally assigned to an entire agency and not to particular departments or projects. There are insufficient budgetary controls over public officials, who may divert funds to facilitate programs and projects that meet their perceptions. There is no prosecution for mismanagement of public funds.

Low salaries and the lack of resources foster informal policies on the part of public servants designed to accommodate private sector demands. The private sector behaves as a profit maximizer and pays the cost of doing business with an ethics code accepted in the DR by the business community. There is a generally high tolerance for corruption in the DR. This accepted behavior distorts the application of laws and policies. The application of laws and regulations is inconsistent, and personal arrangements allow for different interpretations. This is the case concerning import tariffs, the application of the now-extinct Law 409 on agroindustrial promotion, and Law 290 on forestry incentives.

The valuation system for the import tariff is applied on a case by case basis. In the application of the other two laws, projects and incentives were approved without full compliance to the law. Private interests often find a way to manage the system, characteristic of rent seeking behavior. On some occasions, staffs are linked to private companies. In other situations, they have to respond to the political party. And still, on other occasions, people grant personal favors motivated by private gains. This behavior is difficult to control in an administrative system that is internally dominated by informal relations. Paying employees for Government services has become more open than it used to be, and in many instances public servants even solicit payments. Some officials perceive this payment as part of their regular income or salary. This is further exacerbated by the Government's lack of severe punishment for mismanagement.

This acceptance of the "Dominican way of doing business," has added to ignorance about the causes and effects of natural resource degradation and destruction. It has also contributed to the adoption of a protective policy towards natural resources. The Government is afraid to allow for resource management in a system with questionable honesty and ethics. However, there are some cases of ignorance about the effect of certain practices on natural resources. One example is the pineapple plantation in Villa Altagracia and even the traditional

plantations of yuca in Moca. The authorities did not consider the erosion potential or the general environmental consequences of these production systems beforehand. It wasn't until recently that technicians started to question the sustainability of these farming practices.

The high illiteracy rate is an indicator of the education policy in the country. It is a constraint on training farmers to adopt cost-effective technology for crop production and pesticides management, as well as natural resource conservation practices. This, in turn, affects soil productivity and the country's capability to take advantage of modern agricultural techniques. Extension activities are hindered by illiteracy, which is worse in rural communities.

Education is also a problem in agricultural careers. There are many of schools and universities granting degrees in agricultural science. These degrees are *Maestro en Cultivos*, *Bachiller en Ciencias Agrícolas*, *Perito Agrónomo*, *Técnico en Agronomía*, and *Ingeniero Agrónomo*. Most of these agricultural professionals—at both middle and university level—are trained to apply crop production recipes. This has been the traditional method of teaching agriculture in the DR.

However, in the last few years some schools have been changing their curricula. They are now including environmental and natural resources teaching to all students, and offering specialized graduate programs in natural resources. In addition, informal environmental education programs have been in place for training school teachers and students. A legal instrument exists to teach environmental education at the elementary school grades, but this mandate has not been implemented due to the lack of resources, teaching material, and logistical support.

The management of natural resources also involves a lack of institutional development and a lack of coordination among institutions. There are many laws covering just about everything. However, the institutions are too weak to implement them. There are even cases of Presidential Decrees modifying laws when a law is technically immune to a Presidential Decree. The national budget is a good example. The Congress approves the budget as a law, but the Office of the President controls a large proportion of the budget, spending it in the way it thinks most appropriate. This problem is exacerbated by an extensive fragmentation of public agencies.

Another problem affecting the management of natural resources is conflicting institutional objectives. This conflict is clear in SEA. The Secretary of Agriculture is evaluated by agricultural output and not by the condition of the natural resources. The conditions of the natural resources affect production over a long period of time and not over the time a Secretary stays in office. Thus, the Secretary tends to place priority on production activities and not on natural resources conservation activities implemented by the Sub-Secretary of Natural Resources. This has also been a historical conflict at INDRHI. INDRHI has a legal mandate to manage the watersheds, but its priority has been to build irrigation infrastructure; few resources and efforts have been dedicated to watershed management.

Undefined relationships between GODR institutions and private organizations involved in natural resource management affect resource development due to the duplication of efforts. In addition, this situation affects investments due to shifting decisions, inefficient control of activities, and contradictions. An example of this issue is the relationship between SEA and the National IPM Council (integrated by SEA, JAD, and FDA). While the Council was established to implement an IPM project with funds from the private sector, USAID and SEA, the Secretariat of Agriculture is implementing parallel activities on the same problems. In addition, SEA has not revoked the resolution creating the National Commission for Sweet Potato White Fly Control. Duplication of activities and incoherent decisions sometimes are due to personal motives among middle-level decision makers who neglect to follow-up and support agreements.

Overcentralization is another crosscutting issue that affects natural resource management. Everyone wants to see the boss because he will find a solution. Minor decisions, such as a permit to cut a tree, are approved in Santo Domingo. Simple technical decisions that could be resolved by technical personnel are taken to the President. There is still a legacy from Trujillo's era that everything has to be decided by the boss. This centralization hinders the capacity of local authorities to manage their natural resources. Local communities are the main beneficiaries of the natural resources, and they need to have control over their management, following national policies and standards as mandated by the national laws. The DGF would be much more efficient if it would territorially decentralize its functions. Again, adequate salaries must be paid and a system of checks and balances established to assure that national policies are followed at the local level.

The lack of commitment for implementing and supporting a well-planned training program on natural resources and its associated issues has limited the level of participation of local communities in natural resource-related activities. This contributes to a lack of awareness of local communities about the impact of natural resources on their livelihood. Private and public institutions have not demonstrated a commitment to support international sponsored programs. Once international agencies end their support of a project, the activity ceases to exist.

The three branches of government (Executive, Judiciary, and Legislative) are not independent. Those branches do not share equally in government power, and power is centralized in the Office of the Executive or in the President himself. The budget of the judiciary system is approved by the Executive and Congress, and its members are appointed by Congress. The judiciary system lacks resources to modernize its processes and maintain honesty and openness in its decisions. A good judicial system is essential to enforce the existing laws and regulations and to prosecute violators in both the private and public sectors. Judges should be elected officials with enough independence to be impartial in their decisions.

Another common problem in all the areas of natural resources is the proliferation of laws and regulations, making interpretation and common knowledge difficult. The long lists of specific policies in each of the four major areas studied illustrate this situation. A revision is needed to consolidate and update these pieces of legislation to unify them into comprehensive laws—such as the tax and labor codes and the recently approved general import tariff. There

are proposals for a Health Code, a Water Code, and a Forestry Code. These should be studied and analyzed by technicians and discussed in open fora before their approval.

Basic information on the present state of the natural resources of the DR is deficient. The last population census was in 1981. The agricultural census of 1981 is now partially available, but now is almost obsolete. The most recent aerial photographs are from 1984. Land use maps are from 1984 and do not cover the entire country. The rural cadastre was never completed and much of its information is now obsolete. The Natural Resource Inventory Department of SEA and the Cartographic Military Institute have equipment and personnel to process natural resource information, but they lack the resources to purchase satellite imagery and to conduct field surveys.

6.2 Potential Policy Alternatives

The issues discussed above are very complex and some of them are accepted as part of the Dominican cultural heritage. However, alternatives are required to maintain and increase the present level of welfare. If nothing is done, there will be more poverty, a further decline in the quality of life for most Dominicans, and a further deterioration of the natural resource base. The implementation of sustainable development policies requires a clear shift away from the current coercive and conflictive administrative apparatus that stresses power imposition, conflict, and contradiction in dealing with development and conservation. This approach has resulted in the mis-utilization of natural resources and an over-stressing of the ecosystems and biodiversity. A shift must be made toward a system that assures people's participation, and emphasizes the cooperative action of institutions to overcome poverty and the environmental threats that the DR is facing. Some alternatives to consider include:

- Adoption of a set of economic policies that foster sustainable economic development to increase family income and reduce pressure on natural resources; and

- Adoption of a natural resource management policy based on community development, incorporating the population in the management and conservation of resources.

6.3 Recommendations for Future Research and Analysis

Studies recommended to improve the policy environment for issues that cut across different themes related to natural resources include:

- Study way to modify the Government's budgetary policy to reduce personnel, increase salaries and improve efficiency in the public sector. If this cannot be achieved, the donor community should find alternative ways of working with NGOs in the management of natural resources, focusing on regional or local organizations;

- Study ways to reorganize public sector units dealing with natural resources to improve their coordination, reduce redundancy, eliminate conflicting objectives and increase efficiency;

- Study ways to make the judiciary branch of Government more independent, giving it its own budget and allowing it to generate income from the services it offers. This way the judicial system can be modernized, improved, and become a watchdog of the other branches of government; and

- Study ways to decentralize government services in natural resource management, incorporating local communities in the management of local resources, utilizing their traditional ecological knowledge.

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. Here, the four policy areas defined in the Scope of Work have served as the inventory's basis for organizing the natural resource subjects in the DR. These are watershed management, forestry, wildlands and biodiversity, and sustainable agriculture. These major areas of focus have been used as themes.

The term *issue* was reserved for the policy concerns identified within each of these themes. For watersheds, the issues included inadequate watershed management, ineffective water use planning, poor water quality regulation, and contamination of the coastal zone and fisheries. In forestry the issues were deforestation, limited reforestation, and inadequate forest management. For wildlands and biodiversity the issues encompassed inadequate protection of endangered species, limited park and reserve management, inattention to ecotourism potential, and diminishing biodiversity. In the area of sustainable agriculture, the issues were land use planning, declining soil fertility, conflicting land tenure arrangements, and effective pesticide management.

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, conflicting policies, budgetary constraints, gaps between policy formulation and implementation, overlapping institutional jurisdiction, the lack of institutional development, conflicting institutional objectives, tolerance for corruption, over centralization, and inadequate basic information on natural resources.

Policies analyzed within each theme and issue were classified as transnational, macroeconomic, sectoral, and specific. Transnational policies address matters beyond the country, 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.

The GODR is able to adopt favorable natural resource policies, but it lacks the budgetary resources to invest in conservation projects and a comprehensive natural resource management plan. 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 Watershed Management

There are roughly 108 rivers in the country, all of which are combined into 14 major hydrographic regions covering the total area of the country (48,442 km^2).

Non-sustainable use of watersheds creates negative consequences that result in serious, environmental, social and economic problems. This specifically leads to a deterioration of the natural resource base, resulting in increasing deforestation, erosion, greater flooding potential, and diminished water productivity. Soil erosion produced at the watershed level has been estimated at 507 mt/ha/year at the Ocoa watershed (Hartshorn, et al. 1981, p.64).

7.1.1 Watershed and Water Management Institutions

Several institutions, including non-governmental organizations, are involved in the area of watershed resource use and watershed management in the country. These include INDRHI, INAPA, SURENA/SEA, DGF, and CDE. INDRHI has the specific mandate in this area and takes the lead among other agencies in this area. Overall, a lack of coordination and limited resources characterize these institutions, and this constrains the achievement of their goals. Commissions have been created to overcome institutional inertia and coordination problems among agencies with responsibility in managing watersheds.

NGOs, such as JUNTA de Ocoa, ENDA-CARIBE and Plan Sierra, just to mention a few, have been successful in performing watershed management activities with support from international institutions.

7.1.2 Watershed Management Policies

Policies addressing watershed resources focus on specific resources rather than on the watershed as a whole, where the human population is considered a main element of watershed management and sustainable development. Thus, watersheds are not managed as units to overcome natural resource deterioration.

Much of the legislation is outdated and does not reflect the reality of a country that has exhibited population growth and increasing competition for scarce resources.

7.1.3 Water Use and Regulation

Drinking water is the first priority for water use followed by irrigation and hydroelectric generation. Water is a scarce resource in the country, but present policies do not adequately address this scarcity. Irrigation fees are extremely low and are based on the area irrigated rather than on the volume of water used. Fees for drinking water are not assigned by volume either. This policy of not using volume-based fees has resulted in great inefficiency in water resource use.

There are many laws and decrees dealing with water management. Law 6 of 1965, which created INDRHI, outlines the mandate for watershed management and for water used for irrigation purposes. Law 5994 of 1962 created INAPA; Law 498 of 1973 created CAASD; Law 582 of 1977 created CORASAN; and Law 4471 of 1956 established the Health Code. Other policies are: Law 487 of 1969 to establish groundwater control; Decree 1638 of 1969, which created a Commission to regulate groundwater use; and Decree 226 of 1990, which created the National Commission for Ecological Sanitation.

Recently, a proposed new Water Law has been submitted to the Executive Branch in order to integrate all regulations and responsibilities. The proposed Law includes a two-percent fee charged to CDE on the value of the electricity generated from water used in hydroelectric plants. The sum collected by this fee will be used by INDRHI in watershed management programs.

7.1.4 Water Quality

The poor quality of the nation's water resources represents a severe obstacle to improvements in health and to the overall economic development of the country. Gastrointestinal diseases are a major cause of morbidity and mortality in the country. Most of the country's surface water is contaminated and groundwater supplies are either polluted or subject to contamination from domestic and industrial points that discharge into rivers, streams and marine waters.

Institutions with responsibilities for drinking water and sewage, such as INAPA, CAASD and CORAASAN, have limited resources to provide secure water quality and water-system maintenance. However, there is now a new Health Code proposal to be approved by the Executive Branch and implemented by SESPAS in substitution of the 1956 Health Code.

7.1.5 Coastal Zone and Fisheries Resources

There are reports on the degradation of mangroves, coral reefs, beaches, coastal waters, lakes and estuaries as well as alterations of fauna populations and abuse in the use of fertilizers and pesticides washed into bodies of water.

The control of the marine and coastal resources has primarily been attempted by the issuance of decrees. Some of the most effective legislation in addressing coastal resources may actually consist of laws establishing the national parks along the coast. If protection of the parks is enforced, important coastal resources will be preserved. Coastal resource management has also been affected by tourism legislation. Shortsighted tourism development strategies deplete coastal resources and ultimately, could threaten tourism development.

Fishing activities are regulated and administered by SEA's Department of Fisheries. Its functions are defined by Law 8 of 1965. The most important function of the Department of Fisheries is the regulation of fisheries through the application of the Fisheries Law 5914 of

1962. The legislation provides for general control and administrative measures as well as the protection of fishing areas.

7.1.6 International Bilateral Agreements

In the area of watershed management, water use, water management, quality coastal zones, and fisheries, the country has signed several agreements. The most important are:

- An International Protocol with Haiti for sharing international water in the Masacre and Pedernales Rivers. It specifies that any infrastructure development designed to use water must be approved by both countries;
- Membership in the Watershed Management Network of FAO;
- International Convention of Hydrographic Organization;
- Membership in the WHO and the PAHO, specifically for water quality regulation; and
- International Treaty on fisheries and the protection of marine resources.

7.1.7 Potential Policy Alternatives

Some policy alternatives to consider include:

- Design a policy on integrated watershed management under the leadership of INDRHI, and provide it with adequate resources to carry out the policy;
- Develop a national watershed management plan and a strategy for sustainable natural resource management;
- Incorporate NGOs with technical capability on watershed management activities;
- Undertake efforts to increase irrigation efficiency through improvements in irrigation infrastructure and on-farm water use;
- Design a mechanism to eliminate the waste of water through leakage losses;
- Develop a policy to transfer the responsibility for the management, operation and maintenance of water systems to communities, giving them ultimate authority to establish water use fees based on true costs;
- Develop a policy that requires all government agencies and industries pay for the use of electricity;

- Consolidate the new water and health law proposals before their approval to better define institutional roles and responsibilities;

- Develop an education policy in schools and through extension programs that addresses the problems of non-point pollution and offers realistic alternatives for all Dominicans;

- Develop a policy that requires an environmental assessment for all major industrial and hotel projects;

- Undertake a plan to consolidate all laws and decrees that deal with coastal resources and design a comprehensive coastal resources legislation; and

- Design a policy to promote education concerning coastal resources to increase the technical capacity of government workers and to educate the public, especially the hotel and restaurant sector, on the ecological and economic importance of managing coastal resources.

7.1.8 Recommendations for Future Research and Analysis

Further studies are needed to design adequate policies. The inventory team identified the following as important:

- Carry out a study to determine the economic value of water in the country in an effort to move water prices closer to their economic value. Study a more coherent water-pricing policy to stimulate more efficient use of water;

- Study mechanisms for strengthening the capacity of institutions to respond to watershed management and water resource management problems in the country;

- Study in more detail the institutional framework in order to reduce overlapping functions and to update functions, focusing on conceptual approaches to watershed management and water resources management;

- Study the feasibility of decentralizing and privatizing water treatment and waste water treatment, and assigning more of a monitoring role to the State;

- Study mechanisms for improving the control of dumping and discharging into coastal waters;

- Investigate the potential for fisheries in the country and determine a package of incentives and controls to promote a sustainable fisheries and aquaculture industry; and

Analyze discharges of hotels and restaurants along the coasts and create a plan that will eliminate the direct discharge of wastes into coastal waters.

7.2 Forestry

The issues affecting the Dominican forestry sector were analyzed, focusing on deforestation, alternative uses of wood, reforestation, forest management, education and forest resource ownership.

Although there is considerable protective legislation on forestry, the Dominican forest resource base has steadily deteriorated over time. More than two-thirds of the Dominican population depends for its energy consumption on firewood and charcoal, which are produced from native dry forests. Current removal levels are creating a deficit which translates into a net loss of forested land over time; and demand levels are estimated at 4 million cubic meters per year.

Forest products are very expensive in the country. However, small farmers maintain a negative attitude towards these resources due to existing government policies and the institutional framework. The importance of resources to the overall economy is little understood in the DR. Market controls have been deliberately introduced to protect/preserve forests as opposed to managing them in a sustainable manner.

Exploitation of native Dominican forests is due, among other things, to:

- The use of slash-and-burn agriculture within forest lands;
- The harvesting of wood material from pine and broadleaf forests for the furniture industry; and
- The harvesting of wood material from dry forests for charcoal and firewood use.

The deforestation process affects overall resources in several ways, including: destroying fauna and flora habitat, causing alarming rates of soil erosion, reducing water availability, and contributing to a general decrease in the country's welfare level.

The major policies affecting forest resources are the forestry law, the overall lack of alternative sources of energy, limited incentive programs, resource ownership, education, and research.

7.2.1 The Forestry Law

Forestry legislation in the Dominican Republic has been concerned with conservation and preservation of forest resources for over 100 years. It is estimated that more than 120 legal instruments dealing with forest policy have been promulgated.

Law 5856 of 1962, the key forestry Law, is outdated. This law is very complex and, thirty years after its enactment, there is still confusion on the implementation mechanisms and the institutional responsibilities.

The combination of Law 5856 of 1962, Law 67 of 1974, and Law 705 of 1982 provide the mandates and functions that DGF, DNP and CONATEF respectively should follow. These laws, however, overlap some ways in terms of delimiting individual institutional functions.

7.2.2 Lack of Alternative Sources of Energy

Charcoal and firewood continue to be the main sources of energy for domestic use in both rural and urban areas. Institutions relevant to the forestry sector do not believe an energy substitution policy can significantly improve the situation due to the inability of the GODR to meet current demands for imported energy materials. Increasing demands for wood energy contribute to high rates of deforestation. However, these demands should also serve as an incentive to develop plantations (i.e. energy farms).

7.2.3 Limited Incentives Programs

The forest incentive Laws (290 of 1985 and 55 of 1988) have been eliminated by the new Tax Code (Law 11 of 1992). These laws promoted reforestation projects for sawtimber, pulp, energy and any other industrial exploitation process, by allowing a tax exemption of up to 100 percent for reinvestment in agroforestry.

However, no alternative avenues were established to promote reforestation programs. The elimination of incentive laws was due in part to two reasons: GODR agencies lacked the proper supervision and follow-up systems to safeguard the Law from misuses; and several interest groups were trying to get as much as they could from the tax exemptions permitted through the Law. Decree 260 of August 1992 is an attempt to provide some incentives. It establishes that the Government will pay RD$0.60 for each tree planted in addition to RD$0.30 per tree for maintenance every six months during the first year.

Compounding the absence of an incentive program is the lack of flexible credit programs for forestry. The credit shortage is due in part to the lack of resource ownership in the country.

There are examples of regulations allowing NGOs to manage forest lands in the country. Three of them are Plan Sierra, Plan Cordillera and Progressio. These regulations propose agreements between the GODR and NGOs, and serve as incentives for private sector participation in forest management. Charcoal zoning was also accepted to create incentives in the country. However, no incentive is given to the small landowners in forested areas from which clear water flows for irrigation, human consumption and electricity uses.

7.2.4 Resource Ownership

Resource ownership is a crucial factor for the forestry sector. Even though there are public and private land ownership rights, there are no forest resource ownership rights. Forest resources have been nationalized and can only be exploited with a harvesting and commercialization permit from DGF. This is true both within private and public forest lands.

Until a better definition of forest resource rights is in place, the domestic private sector will be reluctant to invest since there is no assurance of resource utilization at the end of the rotation.

7.2.5 Education

The educational system for the most part responds to a traditional framework that does not incorporate environmental aspects as an integral part. Even though forest legislation calls for educational programs that consider natural resource issues, the legislation has failed to establish adequate mechanisms for implementation.

Environmental education is taught at only a few graduate level programs. The UNPHU has a one-year post-graduate program on Forestry and manages a private forest; likewise, INTEC has a one-year program on Environmental Education; and the UASD is just starting a similar program. ISA created and supervises one of the few legal commercial forests of the country; it also has a forest science curriculum. ISA has been involved in a number of research projects on dry forest management during the last ten years.

7.2.6 Forest Research

Research and development without a doubt constitute the weakest area of forest policy in the DR. There are no specialized public or private organizations studying forest policy and its effects on resource use, conservation and development in the country. Even though the Dominican forestry sector has received much attention with respect to other natural resources, little is known about native species' agro-climatic environments. There are currently severe limitations to conducting economic analyses and estimating costs, benefits, and returns to investment, especially within the dry forests. A national forestry research agenda should be established to overcome these limitations.

7.2.7 Potential Policy Alternatives

- Categorize and regionalize the timber concession permit system;
- Allow other agencies, beside DGF, to use the Forestry Fund;
- Establish a set of policies for each one of the following categories:

- Forest areas and forest projects;
- Agroforestry projects;
- Forestry protection projects; and
- Reforestation projects with multiple-purpose trees;

- Clarify reforestation objectives for each institution. DGF could concentrate its efforts in areas defined as potential commercial forests, while DNP could concentrate in areas identified as protected forests;

- Reinforce the policy of allowing NGOs to manage forest areas in the country. This should become an established explicit policy;

- Orient forest policy towards the sustainable management of the forest resource base rather than towards forest resource preservation;

- Increase NGO participation in protected area management through the use of debt-for-nature swaps; and

- Promote public fora for forest policy discussions.

7.2.8 Recommendations for Future Research

- Study ways to design a national comprehensive natural resource management policy;

- Study the establishment of a comprehensive forest management incentive package, including:

  - Flexible long-term credit programs
  - Stumpage fee management programs
  - Tax incentive programs
  - Supervision and follow-up programs
  - Revised import tax policies for wood products;

- Study the likely effects of a national policy on energy farms in the short- and medium-term;

- Study the comparative advantages of institutional program alternatives, including the following:

  - A re-arranging of the actions and functions of DGF, DNP, SURENA, INDRHI and CONATEF to increase efficiency within the existing framework;

- The role of NGOs with increased influence in managing forest areas; and
- Improve compensation for public servants to attract highly qualified professionals; and

- Study ways to establish a research program on forest policy and forest management in the country. Areas of research could include:
  - Adaptability studies for introduced foreign species before they are planted on a large scale in the country;
  - Basic research on native species' behavior;
  - Definition of areas suitable for each type of forest according to capability; and
  - Forest restoration possibilities in degraded soils, deforested areas, and in areas severely altered by over-extraction.

7.3 Wildlands and Biodiversity

The wildlands and biodiversity issues can be grouped broadly into four major categories: protection of endangered species, biodiversity, park and natural reserves management and ecotourism.

7.3.1 Protection of Endangered Species

Many of the critical issues involved in assessing the conditions of endangered species have not been properly identified. The effective protection of endangered species within conservation and sustainable development policies requires:

- Information on location, genetic composition and condition of the population;
- Information on the introduction of exotic species of animals, plants and micro-organisms;
- Knowledge and technology for the preservation of genetic material;
- Regulation of unlawful hunting and commercialization of protected species;
- Regulation of the use of fishery and coastal resources; and
- Adequate management of basic resources on which flora and fauna depend.

Major policies affecting the wildlands and the biodiversity sector are the Hunting Law, the Fishing Law, and the CITES Appendix 3. Those legal instruments do not provide for multiple-use management strategies. There is a clear need for a comprehensive law for better management of this sector.

7.3.2 Biodiversity

There is a general lack of knowledge about the merits of increasing biodiversity. There are increasing needs to develop a value system that will recognize the contributions of wildlife and biodiversity to the local and national economy.

7.3.3 Park and Reserve Management

There is a significant portion of the national territory under some sort of protection category. The most important management issues seem to be related to the lack of multiple management. Most protected areas are managed for a single purpose.

7.3.4 Ecotourism

The potential for ecotourism has not been assessed, and present practices are disorganized, lacking adequate regulation and information. Prices charged by private individuals in some parks are very high in response to a rent-seeking behavior with disregard for proper management. There is no control over the number of people visiting the national parks, and there are tourists visiting scientific reserves that should be shielded from human disturbance.

7.3.5 Potential Policy Alternatives

The following are potential policies the team considers important at this time:

- Approve the proposed Fauna Law for the management of wildlife commerce as well as the hunting, export, protection, and recovery of endangered species;
- Define the institutional responsibilities between DVS and the DRP with respect to the protection of marine fauna;
- Establish a clear inter-institutional boundary between DNP, DGF, DRP, and DVS over the functions in wildlife and wildlands management;
- Locate the DVS under a more suitable administrative structure;
- Define CITES Appendix 3;
- Establish wildlife commerce legislation;
- Develop an inter-institutional educational program at both the technical and decision-making levels to create awareness regarding the values of wildlife;
- Direct extra-budgetary revenues to wildlife- and biodiversity-defined priorities;

- Develop a model national park to demonstrate that a well managed, protected natural area can be economically self-sufficient;
- Define roles for DNP and the Secretariat of Tourism in promoting ecotourism;
- Formulate an action plan for natural resources management;
- Expand Isla Cabritos National Park; and
- Expand Del Este National Park.

7.3.6 Recommendations for Future Research and Analysis

More information is needed to adopt additional policies. The team considered the following as important topics for future research and analysis:

- Conduct biodiversity studies in the DR's protected areas;
- Conduct an inventory of flora and fauna in areas critical for protection of valuable endangered species and their habitats;
- Study the economic and social values of specific wildlife species;
- Study ways to increase financial sustainability of the Botanical Garden and other similar institutions;
- Intensify studies and inventories of national wildlife;
- Study ways to develop a vertebrate pest control program;
- Conduct studies to develop a definitive wildlands protection system for the DR;
- Study budgetary possibilities to create, in the DNP, an environmental education unit that includes a component dealing with ecotourism;
- Analyze alternatives for private sector participation in natural protected areas management; and
- Study the possibility of using debt-for-nature swaps to acquire privately held land in protected areas.

7.4 Sustainable Agriculture

The DR has serious problems in all areas of sustainable agriculture. Land is being used contrary to classification recommendations, which reduces soil fertility through soil erosion and degradation. Good land is being under-utilized, contributing to the problem of low incomes in rural areas. There is low productivity in the agricultural and livestock sectors. There is high GODR participation in land ownership. Land markets are distorted. There is a lack of security in land ownership, as agrarian reform beneficiaries do not have permanent and transferable titles. Land transfer procedures are cumbersome. Pesticide management leaves much to be desired. There is misuse and unsafe handling of pesticides Pesticides banned in other countries continue to be used in the DR. High levels of pesticide residues have been found in agricultural products exported to other countries and marketed in the DR. Pesticides regulations are poorly enforced. All of these problems are the result of misguided policies or failure to apply appropriate policies.

The major policies affecting sustainable agriculture are macroeconomic policies, explicit incentives, agricultural credit, research, extension, irrigation, lack of land use planning, lack of soil conservation programs, land tenure, and pesticide management.

7.4.1 Macroeconomic Policies

The major macroeconomic policies affecting sustainable agriculture have been monetary, fiscal and trade policies. The monetary policies include the foreign exchange rate, money supply, and credit. Key fiscal policies include the government deficit and budgetary allocations. Trade policies include import tariffs, bureaucratic export procedures, and trade restrictions.

Past mismanagement of the economy resulted in serious economic imbalances that created high inflation and an extreme shortage of foreign exchange. The country entered an economic reform program in 1990 that resulted in a halt of the inflation rate and the attainment of a stable exchange rate, with recession coming as a consequence. The economy was growing again in 1992, but is now faced with imbalances that have resulted in very high real interest rates. Major reforms include a new import tariff, a new tax code, a reduction of the government deficit, and a tight money supply management. Trade is theoretically open, with the exception that the import of many agricultural commodities is restricted or government-controlled.

These economic imbalances have adversely affected agricultural output and consequently, contribute to lower levels of rural employment and greater pressure from landless farmers on the limited resources. Agriculture's contribution to value added is still below 1983 levels. Macroeconomic policy misalignment has resulted in very high effective protection coefficients for some products and negative ones for others.

The Government's budgetary policy is skewed towards urban areas, especially in the realm of construction. Very low priority is given to Government institutions dealing with agriculture. As a result, employment is not remunerative and the operating budgets for research,

promotion, and extension services are inadequate to meet the requirements of an agricultural sector with the DR's characteristics. Most farmers are small, with low levels of education, or, in many cases, who are illiterate. This situation is leading to a mis-utilization and under-utilization of soils.

7.4.2 Explicit Incentives

The new tax code (Law 11 of 1992) eliminated the tax incentives provided by Law 532 on agricultural promotion and Law 409 on agoindustrial promotion. This will contribute to reduced investment in the agricultural sector in the future. Law 409 contributed to attracting many investments to the agricultural sector in addition to financial resources to fund large agroindustrial projects.

7.4.3 Agricultural Credit

Agriculture is an activity characterized by greater uncertainty than other sectors. In addition, most farmers are small with very low financial management skills, and land distribution is seen as a government social function in the DR. These factors have traditionally constrained credit availability to the agricultural sector. Efforts to stimulate lending to service the agricultural sector included FIDE's selective credit lines for agriculture, selective reserve requirements for commercial banks, the creation of development banks, and Law 409 on agroindustrial promotion. New monetary and fiscal policies, however, eliminate most of these efforts, leaving the agricultural sector with very limited access to credit. This will have a very negative impact on agricultural production and sustainability.

7.4.4 Research

Research has been very limited due to the lack of budget resources. This has led to a deterioration of research equipment, a migration of qualified personnel, and a loss of credibility. Scientific understanding of sustainable agriculture practices is insufficient in the country. Traditional agricultural researchers do not focus their interests on these aspects. It is difficult to apply suitable agricultural practices without such knowledge.

In the last few years, few research efforts have been made on pesticide management. IPM practices are being implemented in very limited ways. Larger farmers sponsored by private organizations have started IPM research activities, looking for alternative practices to manage the most important pests affecting crop production. Nevertheless, greater support and participation are needed to integrate research into an approach to sustainable agriculture. Traditionally, research activities have rested on GODR institutions, especially SEA. Very few private agricultural corporations have dedicated resources to research. However, the situation should be reversed. There is a need for private agricultural organizations and larger farms to be actively involved in research to improve crop production techniques, and to facilitate technology transfer and adoption of modern agricultural practices.

7.4.5 Extension

During the last several years, the extension service has not been offering advice to farmers due to insufficient resources and well trained personnel. In addition, the Extension Department does not have a strategy for conducting its activities. Another limitation is that extension and research have not been integrated in the DR.

Pesticide advice is offered mostly by technicians representing agrochemical companies trying to introduce their products. The Department of Plant Protection is also supposed to offer pest management assistance to farmers but it does not have sufficient personnel to do so. In the last three years, the IPM project has been offering extension services to farmers in some areas of the country, mostly on vegetable pest management. A well organized extension service is needed to lead the adoption of new technology. This service should respond to agricultural production needs and farmer expectations and integrate public and private initiatives.

7.4.6 Lack of Land Use Planning

The DR has no land use planning, which induces the planting of crops in inappropriate soils, and contributes to soil erosion and degradation.

7.4.7 Lack of a Soil Conservation Policy

There is not a policy on soil conservation in the DR. There is no recognition of the social value of soil amendments; thus, the GODR does not have a program to encourage farmers to adopt better farming practices or to subsidize them on soil conservation investments such as water retention ditches, flood control barriers, and others. There are only a few projects with international funding that do these practices.

7.4.8 Land Tenure

Most of the land is owned by the Government, few agrarian reform beneficiaries receive transferable titles, and land title registration is a long, cumbersome process. These factors contribute to a distorted land market. Land distribution is skewed, with two percent of the farmers owning 56 percent of the land. Eighty percent of farmers have less than five hectares per capita.

The agrarian reform process is perceived as a social program to provide land to landless rural workers. And, even though the Government is the largest land owner, the agrarian laws allow the Government to acquire more land from existing farmers. The law and the Constitution are against ownership of large land holdings, which is a constraint to the development of large agribusiness ventures. All of these factors contribute to land tenure insecurity, providing little incentive to invest in soil conservation measures.

Government land leasing agreements do not provide an incentive for renters to improve the soil. As a result some areas leased by CEA to plant pineapple are being eroded and degraded very quickly.

7.4.9 Pesticide Management

Law 311 and its Regulation 322-88 regulate pesticides use and commerce. If enforced adequately, this policy would be a good legal instrument for controlling pesticide misuse. However, SEA lacks the budget to apply adequate controls. It has neither the trained personnel nor the logistical support. Regulation 322-88 states that registration fees are to be used to satisfy the needs of the enforcing unit; whereas Law 311 indicates that fees should go to the central Government. In general, this regulation on pesticide management has been in place since 1988, but it has not been applied. Presently, SEA is trying to enforce it, but does not have the required operational structure to achieve its objectives.

The indiscriminate application of pesticides kills natural predators as well as the target pests. Sometimes farmers apply heavy doses of pesticides to control a particular pest but such application is more dangerous to other organisms and the environment than to intended pests. This increases production costs and may create pest resistance to pesticides.

The JAD/IPM project is a good effort to deal with pesticide issues. This project integrates private and public organizations in an effort to conduct IPM research and technology transfer activities to offer alternative solutions to pest problems. The lack of knowledge on pesticides' collateral effects is one of the main issues relevant to pesticide management. The IPM project should solve this and other problems.

7.4.10 Recommended Policy Alternatives

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

- Reactivate the National Agricultural Council to incorporate the participation of both the public and private sectors in agricultural policy dialogue;
- Design a comprehensive agricultural policy that eliminates distortions, provides stability, and fosters investment in the agricultural sector;
- Review credit policies to make access easier for agricultural investment;
- Review the definition of *latifundio* (Law 314 of 1972) to allow large agro-industrial and agro-forestry projects to acquire large areas;
- Design a soil conservation program for agrarian reform participants;

- Due to insufficient government funding, use import taxes on pesticides to finance research on IPM, improve staff salaries, hire qualified technicians, and equip the regulating institutions; and

- Include protection equipment in agricultural loans.

7.4.11 Recommendations for Future Research and Analysis

Lack of information constrains policy makers from adopting adequate policies. Further research and analyses are needed to improve the knowledge of possible policy outcomes. The following are considered important:

- Analyze ways to stimulate investment in the agricultural sector to compensate for the losses in sugar and other crops and to compensate for the vacuum created with the elimination of Law 409;

- Conduct further analyses to determine distortions in the economy, using simple methodologies such as the Policy Analysis Matrix (PAM);

- Study ways to make the extension service more effective;

- Study the financing system for agriculture to determine alternatives for increasing credit availability for agricultural production;

- Study the potential for establishing an environmental fund with an EAI account in the fund;

- Study ways to invest more resources in rural education;

- Study ways to design a soil amendment project that subsidizes farmers who adopt the recommended practices;

- Study ways to improve SEA's public administration with fewer and better-trained personnel, and adequate resources to establish a soil conservation service with well-trained technicians;

- Review the whole agrarian reform system, making it more responsive to the DR's special needs;

- Study alternative mechanisms for improving land title transfers to reduce complicated and slow procedures;

- Study ways to modernize and speed up land-titling procedures at the National Land Titling Office and the Superior Land Court;

- Dedicate funds to complete and update the rural cadastre started in late 1970s;

- Identify land under the agrarian reform that should not be dedicated to intensive agriculture, designing alternative management schemes to maintain or improve its productive capacity;

- Study the country's quarantine system to improve its technical capability and logistical support;

- Study ways of establishing an appropriate monitoring system on human health or the early detection of pesticide residues in the blood of people dealing with these chemicals;

- Study ways to improve the wise use of pesticides including protection equipment, more appropriate application levels, better timing, and better product handling to avoid run-off contamination and heavy pesticides residues on agricultural and livestock products (both on and off the farm);

- Study the impact of IPM on pests and pesticide management;

- Study ways to encourage agrochemical companies to pay for pesticide-related research; and

- Define a set of research priorities and actions to control existing pests and prevent the entry of others.

7.5 Crosscutting Issues

Certain issues were common to all or several of the major themes, including the following:

- Declining per capita income and the increasing proportion of Dominicans below the poverty line;

- A natural resource preservation policy that conflicts with the poverty level of the country;

- Low budgets and salaries in institutions dealing with natural resources;

- Ignorance of the causes and effects of natural resource destruction;

- Lack of institutional development and lack of coordination among institutions;

- Conflicting institutional objectives;

- Tolerance for corruption;
- Over-centralization;
- Undefined relationships and levels of participation between GODR institutions and private organizations involved in natural resource management;
- Lack of commitment for implementing and supporting a well planned national training program concerning natural resources and related issues; and
- Inadequate basic information on the present situation of the natural resources, and the need for a system to maintain an updated data base.

All of these issues contribute to a deterioration of the natural resource base.

7.5.1 Potential Policy Alternatives

Potential policy alternatives include:

- Adoption of a set of economic policies that will foster sustainable economic development to increase family income and reduce pressure on natural resources; and
- Adoption of a natural resource management policy based on community development, incorporating the population in the management and conservation of resources.

7.5.2 Recommendations For Future Research and Analysis

The following studies are recommended:

- Study ways to modify the Government's budgetary policy to reduce personnel, increase salaries and improve efficiency in the public sector;
- Study ways to reorganize public-sector units that deal with natural resources to improve their coordination, reduce redundancy, eliminate conflicting objectives, and increase efficiency;
- Study ways to make the judiciary branch of Government more independent so that it can have its own budget, generating income from the services it offers; and
- Study ways to decentralize government services in natural resource management, incorporating local communities in the management of local resources, utilizing their traditional ecological knowledge.

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APPENDIX A

SCOPE OF WORK

The Agricultural Policy Analysis Project, Phase II (APAP II) will assist USAID/Dominican Republic (DR) to carry out a natural resource policy inventory in the Dominican Republic and to provide an overview of environmental and agricultural policies having a detrimental impact on the environment and the management of natural resources. In addition, APAP II will assist in the development of a policy research agenda to identify research areas which might assist in changing current policies which negatively impact natural resources.

The Policy Inventory will identify policies and regulations that affect the natural resource base (especially water resources) in the Dominican Republic. The Inventory is designed to serve as the basis for in-depth policy analysis and to facilitate policy dialogue concerning natural resources in the Dominican Republic. Natural resource issues emphasized in the inventory will include the following:

- Watershed management, including water use, energy source, fisheries, water quality and water management.
- Production from natural forests, including deforestation, energy source, reforestation and forest management.
- Wildlands and biodiversity including endangered species protection, park and reserve management as well as other biodiversity and resource use interdependencies.
- Sustainable agriculture, including land utilization, land tenure, soil fertility and pesticide use.

The Policy Inventory will focus on the following tasks within the four major policy areas:

- Identification of policies and regulations of both public and private institutions at the regional, macroeconomic, sector, and subsector levels which affect the natural resource base. The main objective(s) of the respective policies and regulations will be stated in the inventory.
- Identification of public and private institutions which make or implement the respective policies and regulations stated above.
- A preliminary qualitative assessment of the impact of these policies and regulations on each of the natural resources.
- Identification of the main policy alternatives and factors affecting possible policy reform.

The policy inventory will use and verify data obtained from previous studies and the existing national expertise on environmental and natural resource policies. Working closely with

USAID/DR, the APAP team will establish priorities among the wide variety of potential policy research possibilities.

The APAP team will draw on the experience of the policy inventories conducted in Central America, including the synthesis and the matrix recently completed for ROCAP.

An Environmental and Natural Resources (ENR) policy analysis agenda will evolve from the policy inventory. A preliminary qualitative policy analysis will encompass two broad areas of inquiry:

a. Identify alternative environmental and national resource policy options; and,

b. Characterize the political/institutional milieu in which policies are developed and implemented.

Policy options selected for the agenda will be determined by their relevance to existing resource management problems (e.g.; plant protection, farming practices, forestry, management and rehabilitation of critical watersheds, production from natural forests, legislation for parks and reserves, regulations and incentives for the use of pesticides, and policy complements to new technologies for watershed management), and their relevance to national or regional policy agendas. An illustrative list of policy topics include:

a. Watershed Management/Soil Conservation

- Impact of macro-economic policies, such as exchange rates, interest rates, wage rates on incentives to undertake farm level conservation, and their impact on the private profitability of such actions.
- Cross-national institutional arrangements and policy coordination capable of providing the common property resources management needed for effective watershed management.
- Water pricing policy.

b. Pesticides

- Effects of macro-economic exchange rates, tariff structures and agricultural sector policies (Government price supports, relative commodity prices) providing economic incentives for the over application of pesticides on both export and local food crops.
- The relative effectiveness of bans, taxes and/or other regulations on reducing excessive pesticide use.

- Nature and magnitude of unforeseen impacts associated with pesticide use, including the immediate and long-term human health costs associated with current pesticide use practices.
- Relative effectiveness of information progress, warnings and tighter field management regulations (application procedures, and field re-entry on external effects of pesticide use.
- Impact of integrated pest management or pest resistant plant varieties on pesticide use and on the economic/policy incentives for over application of pesticides.

c. Population Pressure and the Environment

- Economic/policy options for altering land use patterns to create more intensive use of existing agricultural land.

d. Natural Forests

- Legislation for parks and reserves; economic potential for exploiting non-forest components of forests.
- Pricing policies and taxation of publicly owned timber.
- Licensing and concession arrangements for timber.
- Impact of land colonization on forestry.
- Fragmentation of land management agencies and impact upon the coordination and management of natural forests.
- Effectiveness of reforestation incentive programs.

APPENDIX B

GUIDELINES FOR CONDUCTING A NATURAL RESOURCE POLICY INVENTORY

B.1 Introduction

A policy inventory is a tool developed by 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, or the 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 team members.

B.2 Causes of Environmental Degradation

The causes of environmental degradation and depletion of natural resources can usually be grouped into:

- population pressures
- market failures
- policy failures

The most important market failures affecting resource use and management are usually the following:

- Ill-defined or totally absent property rights.
- Unpriced resources and absent or weak markets.

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.* Agricultural Policy Analysis Project, Phase I (APAP I) Staff Paper No. 24. Washington, DC: Abt Associates Inc., August 1988. These concepts are then adapted to natural resource policy.

- External diseconomy caused by an inability to assess individuals and enterprises for all the costs which their activities impose on society.

- Public goods that cannot and/or should not be provided by the private sector through the market.

- Lack of competition in the form of monopolies, oligopolies or segmented markets.

- Myopia in the form of planning horizons that are "too short" or "too high" discount rates, arising from poverty, impatience, and the risk or uncertainty which affects individuals but not society as a whole.

- Irreversibility. This is when market decisions under uncertainty lead to irreversible results.

Growing pressure 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 from forests.

B.3 Evaluation of Policy Impacts

Policy interventions are intended to improve the welfare of the agricultural sector, the economy as a whole, or of 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 has been placed on the impact of policies on natural resource depletion or degradation. Policy objectives 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 activities. Also, failure to issue secure land tittles, interest rate ceilings, failure to accommodate the customary rights of communities to use and manage resources, tax regimes and the 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 out-weigh 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 FUTURE RESEARCH

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- Abelardo Jiménez

National Park Directorate

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- Gabriel Valdéz
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- Alfonso Ferreira
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