

PN - AAW - 795

ISN 49468

HONDURAS ENVIRONMENTAL PROFILE

RECOMMENDATIONS

chaps 1-5

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Team Leader
August 5, 1981

IRB Associates
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Chapter I Synthesis

1. A.I.D. is the only international agency present in Honduras with an explicit, legally mandated commitment to include consideration of the environmental factor in development support activities. In keeping with the spirit of A.I.D.'s Regulation 16, and especially section 216.5(b) dealing with building national institutional capabilities in environmental assessment, the USAID Mission should conduct a full environmental assessment of the Yoro Forestry Development Project in concert with a national team complemented by appropriate consultants.
2. A.I.D. should provide encouragement and support to the building of an environmental assessment capability in appropriate COH institutions (CONSUPLANE, RENARE and COHDEFOR) and NGO's such as the Asociacion Hondurena de Ecologia. Once a capability in assessment is created and officially recognized the team can assist World Bank and BID as well as A.I.D. in assessment activities and thus grow in experience and national influence.

Chapter II Agricultural Development

- 1 Incorporate in all appropriate regional development and agricultural projects a focus on the need of the small scale farmer recognizing land and capital constraints, the ecosystem in which he operates and his cultural perspective. This involves the integration of the ecologically based agroecosystems approach with economists small farm systems perspective.
- 2 Closely related to project consideration of the small farmers, encourage the incorporation of small farm adapted technologies in the curriculum of the existing agricultural training institutions.

Chapter III Forestry

1. Give major emphasis to the productive management of the broadleaf forest resource. This includes:
 - a) effective use of a larger percentage of the valuable woods.
 - b) identify areas appropriate for maintaining watershed protection and wildland values.

- c) incorporation of the campesino in a remunerative and stable role combining agriculture and forestry.

Chapter IV. Watershed Management

1. Support the establishment of a legally mandated land capability classification system applicable to all major land using activities including agriculture, forestry, watershed and wildlands maintenance, coastal zone management, and tourism development. Such a system should include:
 - a) Ecological characteristics and dynamics at the Life Zone association level
 - b) Geomorphic structure and processes
 - c) Functional soil capability

Chapter V Social Perspective

1. Until the campesino recognizes a viable and remunerative stake in the forest he will continue to burn it to grow corn in its ashes or just for spite. Encouragement and support should be given to social forestry activities, immediately in the Pine areas, and as technology evolves, in broadleaf areas.
2. Rapid population growth and inequitable distribution of land represent an explosive social and political problem in the future. This problem is also an immediate direct contributing factor in the loss of some 230 million Lempiras worth of broadleaf forest per year, destruction of critical upper watershed forests and the maintenance of rural poverty. This environmental and economic problem represents a critical area for action to achieve a more productive distribution of the land resource.

Chapter VI Coastal Management

1. Establish interagency technical committees to treat issues related to coastal zone management. Issues in the Gulf of Fonseca include:
 - a) Mangrove management and salt production.
 - b) Maintenance dredging, port of San Lorenzo
 - c) extension of Choluteca Watershed project to include estuarine effects of pesticides and sedimentation and effects water use on salt water intrusion.
2. Create an marine research facility through the joint contribution of GOH (RENARE), the marine fishing and aquaculture industry, and A.I.D. The



role of A.I.D. would be to provide fellowships for training of graduate marine resource specialists and technical assistance in resource management. The two areas of emphasis include improved management and production of:

- a) High value export commodities (shrimp and lobsters)
- b) Fish, shellfish and turtles for food

Chapter VII Wildlands and Wildlife

1. Fully integrate wildlands in proposed national program of land capability assessment recognizing wildland contributions to:
 - a) watershed functions of water management and erosion control
 - b) wildlife protection and production
 - c) recreation, tourism and research
 - d) sustained yield of forest products
2. Establish a wildlands and wildlife management agency, either as an independent entity or as a new department in COHDEFOR creating an ecodesarrollo capability involving watershed management, social forestry and wildlands management.

Chapter VIII Waste Management

1. Reevaluate the proposed Tegucigalpa waste treatment facility in light of more appropriate and economical waste treatment technology. This effort should be part of a nationwide assessment of the potential for using natural or constructed pond and marsh systems for treating water to a level equal or better than receiving water quality. Such techniques would be particularly applicable to IHCAFE waste treatment problems.

JTB

ACRONYMS

ANACH ASOCIACION NACIONAL DE CAMPESINOS DE HONDURAS
API AMERICAN PETROLEUM INSTITUTE
BANADESA BANCO NACIONAL DE DESARROLLO AGRICOLA
BID BANCO INTERAMERICANO DE DESARROLLO
CEVER CENTRO EVANGELICO DE CAPACITACION ARTESANAL DE YORO
CIDA AGENCIA CANADIENSE PARA EL DESARROLLO INTERNACIONAL
CMDC CONSEJO METROPOLITANO DEL DISTRITO CENTRAL
COHBANA CORPORACION HONDURENA DE BANANO
COHDEFOR CORPORACION HONDURENA DE DESARROLLO FORESTAL
CONITRIN CONSEJO NACIONAL DE TRIBUS INDIGENAS
CONSUPLANE CONSEJO SUPERIOR DE PLANIFICACION ECONOMICA
CORFINO CORPORACION FORESTAL INDUSTRIAL DE OLANCHO
DIFOOCOOP DIRECCION DE FOMENTO COOPERATIVO
DMHC DIRECCION DE MINAS E HIDROCARBUROS
ENEE EMPRESA NACIONAL DE ENERGIA ELECTRICA
ENP EMPRESA NACIONAL PORTUARIA
ESNACIFOR ESCUELA NACIONAL DE CIENCIAS FORESTALES
FAO ORGANIZACION DE LAS NACIONES UNIDAS PARA LA AGRICULTURA Y LA ALIMENTACION
FECORAH FEDERACION DE COOPERATIVAS DE LA REFORMA AGRARIA DE HONDURAS
GOH GOVERNMENT OF HONDURAS
ICAITI INSTITUTO CENTROAMERICANO DE INVESTIGACION Y TECNOLOGIA INDUSTRIAL
IHMA INSTITUTO HONDURENO DE MERCADEO AGRICOLA
IHT INSTITUTO HONDURENO DE TURISMO
INA INSTITUTO NACIONAL AGRARIO

5

INA AGRARIAN REFORM INSTITUTE
INAH INSTITUTO HONDURENO DE ANTROPOLOGIA E HISTORIA
IUCN INTERNATIONAL UNION FOR CONSERVATION OF NATURE
MSP MINISTERIO DE SALUD PUBLICA
NMFS NATIONAL MARINE FISHERIES SERVICE
OEA ORGANIZACION DE ESTADOS AMERICANOS
PCN PROGRAMA CATASTRO NACIONAL
PLAN COMAYAGUA PROYECTO DE DESARROLLO FORESTAL DE COMAYAGUA
RENARE RECURSOS NATURALES RENOVABLES
RESIHON RESINAS DE HONDURAS, S. A.
SANAA SERVICIO NACIONAL ACUEDUCTOS Y ALCANTARILLADOS
SECOPT SECRETARIA DE COMUNICACIONES, OBRAS PUBLICAS Y TRANSPORTE
SRN SECRETARIA DE RECURSOS NATURALES
SSF SISTEMA SOCIAL FORESTAL
UNAH UNIVERSIDAD NACIONAL AUTONOMA DE HONDURAS
UNEP UNITED NATIONS ENVIRONMENTAL PROGRAM
USAID U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT
WECAF WESTERN CENTRAL ATLANTIC FISHING COMMISSION

Pool

HONDURAS
ENVIRONMENTAL PROFILE.

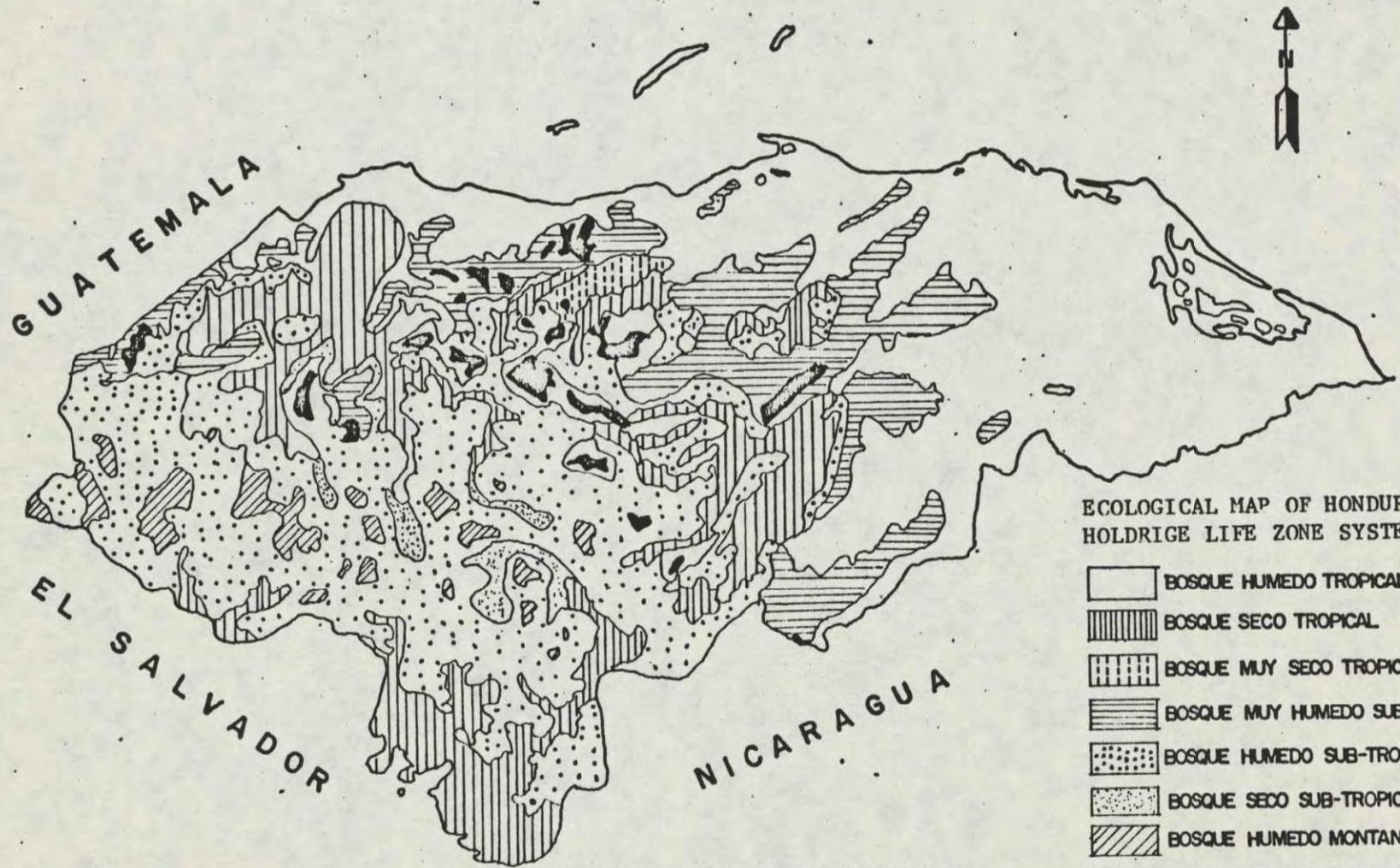
CHAPTER II

ENVIRONMENTAL CONSIDERATIONS
IN AGRICULTURAL DEVELOPMENT

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ECOLOGICAL MAP OF HONDURAS
HOLDRIGE LIFE ZONE SYSTEM

-  BOSQUE HUMEDO TROPICAL
-  BOSQUE SECO TROPICAL
-  BOSQUE MUY SECO TROPICAL
-  BOSQUE MUY HUMEDO SUB-TROPICAL
-  BOSQUE HUMEDO SUB-TROPICAL
-  BOSQUE SECO SUB-TROPICAL
-  BOSQUE HUMEDO MONTANO BAJO
-  BOSQUE MUY HUMEDO MONTANO BAJO

ESCALA APROX. 1:2,500,000

SOURCE: Reserva de la Biosfera del Río Plátano, RENAPE (No date)

Pos 1

Ubicación Aproximada de Grupos Campesinos de la Reforma Agraria por Municipio



ESCALA APROX. 1:2,500,000

INA 1978 RESUMEN DE DATOS GENERALES DEL SECTOR REFORMADO DEPTO. DE PLANIFICACION SECCION DE ESTADISTICA E INFORMACION

8

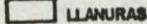
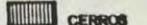
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MAR CARIBE DE LAS ANTILLAS



HONDURAS
CONFIGURACION DE LA SUPERFICIE

SIMBOLOGIA

- | | | | |
|---|---|------------|----------------------------|
|  | LLANURAS | I | TIERRAS BAJAS DEL CARIBE |
|  | CERROS | II | TIERRAS ALTAS DEL INTERIOR |
|  | MONTAÑAS | III | TIERRAS BAJAS DEL PACIFICO |
|  | LINEA DIVISORIA ENTRE LAS DIVISIONES DE FORMACION TERRESTRE | | |

ESCALA APROX. 1:2,500,000

OCEANO PACIFICO

GUATEMALA

EL SALVADOR

NICARAGUA

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ACKNOWLEDGEMENTS

MARC SCOTT AND RUSSELL HAWKINS (USAID/HONDURAS) LISTENED TO OUR PROBLEMS AND ANSWERED OUR MANY QUESTIONS. THE OTHER SEVEN MEMBERS OF THE PROFILE TEAM PROVIDED INTERESTING INTERDISCIPLINARY INSIGHTS AND GRACIOUSLY SHARED MATERIALS.

SPECIAL THANKS ARE DUE TO JORGE BETANCOURT AND JAIME BUSTILLO OF THE ENVIRONMENTAL UNIT OF CONSUPLANE FOR PATIENTLY EXPLAINING THE INTRICACIES OF GOVERNMENTAL INSTITUTIONS AND OFFERING FRIENDLY ASSISTANCE IN LOCATING THE DOCUMENTS NECESSARY FOR THIS EVALUATION. MANY OF THE IDEAS AND CONCEPTS REPORTED HERE ARE THEIRS. HOWEVER, ANY MISINTERPRETATION OR ERRORS IS SOLELY THE RESPONSIBILITY OF THE AUTHOR.

1.0 INTRODUCTION

1.1 ANTECEDENTS

THIS ASSESSMENT WAS CONDUCTED DURING JULY 13-31, 1981. FIELD TRIPS WERE TAKEN TO LA LIMA, AND LA CEIBA WHERE THE RESEARCHERS OF UNITED BRANDS AND THE STANDARD FRUIT CO. DISCUSSED THEIR OUTLOOK ON BANANA AND PINEAPPLE PRODUCTION IN PARTICULAR AND GENERAL LAND USE TRENDS OF THE ATLANTIC COAST. SMALL FARMERS WERE VISITED IN THE VICINITY OF LAKE YOJOA. AN OVERFLIGHT OF THE CHOLUTECA WATERSHED PROVIDED AN OVERVIEW OF LAND USE PATTERNS AND RURAL SETTLEMENT CONDITIONS IN THE SOUTHERN REGION OF HONDURAS. THE BULK OF THE TIME IN HONDURAS WAS DEVOTED TO REVIEWING DOCUMENTS AND INTERVIEWING OFFICIALS.

1.2 SUMMARY

AGRICULTURAL IMPACTS ON THE ENVIRONMENT. TWO TYPES OF ENVIRONMENTAL ISSUES HAVE BEEN PRESENTED. FIRST, IS THE TRADITIONAL CONCEPT OF ENVIRONMENTAL IMPACT SUCH AS THE NEGATIVE EFFECT OF PESTICIDE USE ON HUMAN HEALTH AND WATER QUALITY. SECOND, IS THE POSITIVE IMPACT ON RURAL HONDURANS OF MANAGING THE ENVIRONMENT TO ACHIEVE LONG-TERM SUSTAINED PRODUCTION.

1.2.1. SOIL EROSION. LACK OF DATA QUANTIFYING THE SERIOUSNESS OF EROSIONAL PROCESSES COMBINED WITH THE LACK OF A COHERENT PROGRAM TO MITIGATE THE PROBLEM COULD LEAD TO DECREASED AGRICULTURAL PRODUCTIVITY IN THE FUTURE.

1.2.2. UNSTABLE RURAL POPULATION. THE COMBINATION OF LIMITED AVAILABILITY OF LEVEL, FERTILE SOILS, INEQUITABLE LAND DISTRIBUTION, AND A LARGE COMPONENT OF THE RURAL LANDLESS POPULATION RESULTS IN THE CULTIVATION OF MARGINALLY PRODUCTIVE STEEP LANDS BY INVADING CAMPESINOS AND CONTINUED SUBSISTENCE LEVEL OF LIVING. OVER THE LONG-RUN, THE IMPACTS OF THIS PROCESS WILL BE COSTLY, TO THE INDIVIDUAL FARMER AS WELL AS TO THE PRODUCTIVITY OF THE LAND.

1.2.3. UNDESQUILIBRATION OF SOIL RESOURCES. ALL THE FERTILE, ALLUVIAL SOILS THAT CAN BE INTENSIVELY CULTIVATED ARE ALREADY OCCUPIED, BUT FREQUENTLY UNDERUTILIZED. IN THE CARIBBEAN COASTAL PLAIN THESE SOILS ARE SOMETIMES PLANTED TO PASTURES AND DEDICATED TO LIVESTOCK PRODUCTION DUE TO THE HIGH PRICE FOR BEEF EXPORTED TO THE U.S. THESE SOILS HAVE A HIGHER POTENTIAL USE. LIKEWISE UNCONTROLLED RURAL HOUSING CONCENTRATIONS FREQUENTLY FOUND IN THE INTERIOR VALLEYS OCCUPY AGRICULTURAL LANDS THAT COULD BE CULTIVATED. HOUSING SHOULD BE RESTRICTED TO MARGINAL OR SLOPING LANDS.

1.2.4. PESTICIDE POLLUTION. THERE IS LITTLE KNOWN ABOUT THE CONCENTRATION OF AGRICULTURAL PESTICIDES IN STREAMS, ESTUARIES, OR FRESH WATER BODIES THAT MAY BE AFFECTING HUMANS AS WELL AS ADJACENT NON-AGRICULTURAL ECOSYSTEMS. THERE IS A HIGH PROBABILITY OF PESTICIDE CONTAMINATION IN AREAS OF INTENSIVE COMMERCIAL AGRICULTURE ON BOTH THE NORTH AND SOUTH COASTS.

1.2.5. REFUGEE MIGRATION. INCREASED LAND USE PRESSURE RESULTING FROM THE MIGRATION OF POLITICAL REFUGEES FROM NICARAGUA AND EL SALVADOR WILL NOT

ONLY INCREASE THE NUMBERS OF THE LANDLESS POOR, BUT ALSO ACCELERATE DEGRADATION OF SOIL RESOURCES OBLIGATING THE RURAL POPULATION TO REMAIN AT A SUBSISTENCE LEVEL.

2.0 THE HONDURAN AGRICULTURAL ENVIRONMENT

2.1 TOPOGRAPHY

HONDURAS IS THE SECOND LARGEST AND MOST MOUNTAINOUS COUNTRY IN CENTRAL AMERICA (FIGURE 1) WITH AN ESTIMATED POPULATION OF 3.5 MILLION. 69% OF THE POPULATION LIVES IN RURAL AREAS AND AN ESTIMATED 50% OF THE RURAL POPULATION IS ILLITERATE. MORE THAN 75% OF THE LAND HAS SLOPES GREATER THAN 25% (CONSUPLANE, 1978). A BRIEF DESCRIPTION OF THE CHARACTERISTICS OF THE AGROECOSYSTEMS (TABLE 1) IS PRESENTED IN THE FOLLOWING SECTIONS. DETAILED DESCRIPTIONS OF THE HONDURAN ENVIRONMENT CAN BE FOUND IN GLICK (1980), BETANCOURT AND DULIN (1970), KRAMER AND AROLEC (1980), AND MAB (1981).

2.2 CLIMATE (MAB, 1981)

THE CARIBBEAN COAST RECEIVES MORE THAN 2400 MM OF RAIN ANNUALLY DUE TO THE PREVAILING EASTERLY TRADE WINDS. A PACKET OF EQUALLY HIGH CARIBBEAN RAINFALL OCCURS IN THE VALLEY JUST NORTH OF LAKE YOJOA. PRECIPITATION DECREASES IN THE INTERIOR HIGHLANDS WITH LESS THAN 1000 MM ANNUALLY RAINFALL REPORTED IN A DRY AREA NEAR TEGUCIGALPA. THE PACIFIC LOWLANDS, WHILE BETTER THAN THE CENTRAL HIGHLANDS, ARE DRIER THAN THE EASTERN LOWLANDS. RAINFALL RANGES FROM 400 MM TO 2200 MM ANNUALLY DEPENDING ON LOCAL TOPOGRAPHIC CONDITIONS.

TEMPERATURES ARE DETERMINED PRIMARILY BY ELEVATION. COASTAL LOWLANDS BELOW 500 METERS HAVE MEAN ANNUAL TEMPERATURES FROM 26-28 DEGREES C WHEREAS MOUNTAIN BASINS BETWEEN 500 AND 2000 METERS RANGE FROM 24 - 16 DEGREES C. ZONES ABOVE 2100 METERS HAVE ANNUAL MEANS AS LOW AS 14-15 C.

HISTORICALLY HURRICANES HAVE CAUSED EXTENSIVE DAMAGE TO THE NORTHEAST COAST, ESPECIALLY IN 1935, 1954, 1969, AND 1974. HIGH WINDS AND HEAVY RAINFALL CAUSE EROSION AND LANDSLIDES AND CROP LOSSES, MOST NOTABLY TO BANANA PLANTATIONS WHICH PROVIDE 40% OF THE EXPORT INCOME.

TABLE 1: THE AGROECOSYSTEMS OF HONDURAS.

GEOGRAPHIC AREA	ESTIMATED % TOTAL LAND	ESTIMATED % TOTAL PEPL.	PREDOMINANT AGRICULTURAL ACTIVITIES
NORTHERN COASTAL PLAINS AND LOWER MOUNTAINS SLOPES	13	24	BANANAS, PINEAPPLE, LIVESTOCK, SUGAR CANE, CITRUS AFRICAN OIL PALM.
EASTERN LOWLANDS	20	61	SPARSE RIVERINE AGRICULTURE NEAR COAST
CENTRAL HIGHLANDS	65	70	SHIFTING AGRICULTURE, SMALL FARMERS PRODUCE BASIC GRAINS, COFFEE, TABACCO, AND LIVESTOCK, SOME VEGETABLES AND FRUITS.
PACIFIC LOWLANDS	2	5	COTTON, SUGAR CANE, MELONS, VEGETABLES, LIVESTOCK
TOTALS	100	100	

2.3 LIFE ZONES AND POTENTIAL LAND USE.

THERE ARE EIGHT ECOLOGICAL LIFE ZONES IN HONDURAS (HOLDRIDGE, 1962) FOR WHICH APPROPRIATE LAND USES HAVE BEEN RECOMMENDED TAKING INTO CONSIDERATION CLIMATE, GEOMORPHOLOGY AND CROP ADAPTATIONS (TABLE 2). MORE DETAILED LIFE ZONE AND ASSOCIATION MAPPING HAS BEEN COMPLETED FOR THE DEPARTMENTS OF ATLANTIDA, COMAYAGUA, CORTES, FRANCISCO MORAZAN AND YORO, BUT NOT PUBLISHED YET (P.C.N. 1980).

BEST
AVAILABLE

TABLE 2

LIFE ZONES OF HONDURAS AND THEIR APPROPRIATE USE

SYMBOL	ECOLOGICAL FORMATION	APPROPRIATE USE	PRINCIPAL RECOMMENDED SPECIES	AREA	
				HECTARES	PERCENTAGE
BH-T	MOIST TROPICAL FOREST	INTENSIVE AGRICULTURE ON ALLUVIAL SOILS, CATTLE PRODUCTION ON LEVELED MODERATELY SLOPING LANDS, AND FOREST PRODUCTION ON STEEP SLOPES.	BANANAS, CACAO, RICE, RUBBER, YUCA, TROPICAL FRUITS, AFRICAN OIL PALM, PEJIBAYE PALM, ROBUSTA COFFEE, BEEF CATTLE, AND NATIVE FOREST SPECIES.	3,273,900	29.0
BS-T	DRY TROPICAL FOREST	INTENSIVE AGRICULTURE WITH SUPPLEMENTARY IRRIGATION ON ALLUVIAL SOILS, INTENSIVE CATTLE PRODUCTION AND CULTIVATION OF ANNUAL CROPS WITHOUT IRRIGATION ON NON-ALLUVIAL SOILS OF GENTLE TO MODERATE SLOPE, PERMANENT FOREST PRODUCTION ON STEEP SLOPES.	COTTON, SUGARCANE, TABACCO, RICE UNDER EVENTUAL IRRIGATION, SESAME, CORN, YUCA, BEANS, SORGHUM, TROPICAL FRUITS (MANGO, PAPAYA, ZAPOTILLO, CITRUS, ETC.) CATTLE ON IRRIGATED OR NON-IRRIGATED PASTURE AND SWINE, NATIVE FOREST SPECIES.	1,721,800	15.2
BMS-T	VERY DRY TROPICAL FOREST	INTENSIVE AGRICULTURE WITH IRRIGATION ON ALLUVIAL SOILS, ANNUAL CROPS WITHOUT IRRIGATION AND EXTENSIVE CATTLE PRODUCTION ON LEVELED AND MODERATELY SLOPING LAND, FOREST ON STEEP SLOPES.	SUGARCANE, COTTON, CORN, MILO, MILLET, HENEQUEN, MELONS, TROPICAL FRUITS, BEEF CATTLE, AND NATIVE FOREST SPECIES.	34,750	0.003
BMH-ST	WET SUB-TROPICAL FOREST	AGRICULTURE ON DEEP VOLCANIC SOILS ON GENTLE TO MODERATE SLOPE AND DAIRY PRODUCTION ON VOLCANIC SOILS OF MODERATE SLOPES, FOREST PRODUCTION ON NON-VOLCANIC SOILS AND ON STEEP SLOPES.	COFFEE, TEA, SUB-TROPICAL FRUITS AND NATIVE FOREST SPECIES.	1,607,850	14.1
BH-ST	MOIST SUB-TROPICAL FOREST	INTENSIVE AGRICULTURE AND CATTLE PRODUCTION ON LANDS OF GENTLE TO MODERATE SLOPES, FOREST PRODUCTION ON STEEP SLOPES.	ARABICA COFFEE, TABACCO, CORN, SUGARCANE, PEANUTS, SUB-TROPICAL FRUITS (PINEAPPLE, AVOCADO, CITRUS), DAIRY CATTLE AND SWINE, PINE (FOR WOOD AND RESIN).	4,058,750	35.4
BS-ST	DRY SUB-TROPICAL FOREST	AGRICULTURE (WITH SUPPLEMENTARY IRRIGATION) ON ALLUVIAL SOILS, EXTENSIVE CATTLE PRODUCTION ON NON-ALLUVIAL SOILS OF MODERATE SLOPE	COTTON, SUGARCANE, TABACCO, RICE, CORN, BEANS, MILLET, TROPICAL FRUITS (MANGO, PAPAYA, ZAPOTILLO, GUANABANA, CITRUS), BEEF CATTLE,	170,900	1.5

FOREST PRODUCTION ON STEEP SLOPES.

PINE (FOR WOOD AND RESIN).

BH-MB	PRE-MOUNTANE MOIST FOREST	INTENSIVE AGRICULTURE AND CATTLE PRODUCTION ON GENTLE TO MODERATE SLOPES, FOREST PRODUCTION ON STEEP SLOPES.	POTATOES, CORN WHEAT, ALFALFA, VEGETABLES, FLOWERS, TEMPERATE CLIMATE FRUITS, DAIRY PRODUCTION SWINE, PINES.	298,950	2.6
BMH-MB	WET PRE-MOUNTANE FOREST	FOREST PRODUCTION ON LANDS OF MODERATE SLOPES AND FOREST MANAGED FOR WATERSHED PROTECTION ON STEEP SLOPES.	NATIVE FOREST SPECIES, IN PARTICULAR PINES AND FIRS.	243,300	2.1

SOURCE: MAPA ECOLOGICO DE HONDURAS, 1962, PREPARED BY DR. LESLIE R. HOLDRIDGE., ORGANIZATION OF AMERICAN STATES.

2.4 ACTUAL LAND USE.

THE TOTAL LAND AREA OF HONDURAS IS APPROXIMATELY 112,088,000 HAS. OF WHICH IT IS ESTIMATED THAT 25% HAS A POTENTIAL AGRICULTURAL USE, 66% FOREST AND NON-AGRICULTURAL LANDS AND 9% UREAN AND UNDEFINED LANDS (TABLE 3). THE BEST SOILS FOR INTENSIVE USE ARE LOCATED ON THE COASTAL PLAINS AND RIVER VALLEYS OF THE NORTH AND SOUTH COAST (I.E. NACAOME AND CHOLUTECA IN THE SOUTH, GUAYAPE, PATUCA AND AGUAN IN THE CENTRAL AND NORTHEAST, AND SULA AND LEON ON THE NORTH), AND THE INTERIOR VALLEYS (ZAMORANO AND COMAYAGUA) FIGURE 2. CURRENT AND PROJECTED AREAS OF IMPORTANT CROPS IS SHOWN IN TABLE 4.

IN COMPARING THE ESTIMATES OF POTENTIAL USE WITH ACTUAL LAND USE, IT IS NOTED THAT ONLY 33% OF LAND CLASSIFIED AS ADEQUATE FOR ANNUAL CROPS IS UTILIZED IN THIS MANNER. IN CONTRAST MUCH LAND THAT IS UTILIZED FOR ANNUAL AND PERENNIAL CROPS IS ONLY CLASSIFIED FOR FORESTRY OR EXTENSIVE USES (TABLE 4) THESE IRONIES ARE CAUSED PRINCIPALLY BY THE EXISTENCE OF LARGE HOLDINGS USING GOOD SOILS EXTENSIVELY FOR CATTLE OR RESERVE LANDS WHILE SMALL HOLDINGS ON STEEP SLOPES AND/OR POOR SOILS ARE UTILIZED INTENSIVELY BY A DENSE POPULATION. FOR EXAMPLE, LIVESTOCK GRAZING ON ALLUVIAL SOILS OF THE CARIBBEAN LOWLANDS WHICH MAY BE ECONOMICALLY VIABLE, BUT CERTAINLY AN UNDERUTILIZATION OF THE LAND RESOURCES.

TABLE 3: LAND USE IN 1970/1972 AND IN 1975/1977

-----%-----	-----1970/72-----		-----1975/77-----	
	(1000_HA)	-----%-----	(1000_HA)	-----%-----
A. FOREST AREA AND NON-UTILIZATION LAND	62544.2	56.21	72380.0	65.85
1. TROPICAL HARDWOODS	3,408.3	29.64	3,920.0	34.98
2. ERODED LANDS AND OTHER	397.8	3.46	760.0	6.78
3. PINE FOREST AREAS	2,738.8	23.82	2,700.0	24.09
B. AGRICULTURE LAND	32869.0	33.64	22800.0	24.28
1. CULTIVATED LAND	12370.5	11.22	12769.1	15.78
A. CROPS	643.8	5.52	719.6	6.42
B. CULTIVATED PASTURES	735.7	6.40	1,049.5	9.26
2. NON-CULTIVATED LAND	22398.5	21.73	12030.9	2.20
A. POTENTIALLY AVAILABLE	1,824.5	15.87	741.0	6.61
B. NATURAL PASTURES	449.6	3.91	289.9	2.59
C. FALLOW LAND	224.4	1.95	-	-
C. URBAN AREAS, MANGROVES AND SWAMP AREAS	12026.1	2.44	12228.8	2.18
D. TOTAL GEOGRAPHIC AREA	11,500.0	100.00%	11,208.8	100.00%

1/ THE TOTAL AREAS WAS OFFICIALLY MODIFIED AFTER 1972.

SOURCE: U.S. AID 1980. ORIGINALLY FROM CONSUPLANE, PLAN NACIONAL AGROPECUARIO 1979/83, P.2.

TABLE 4: CURRENT AND PROJECTED AREAS (1000 HA) OF IMPORTANT CROPS
(YEAR OF CURRENT CENSUS GIVEN IN PARENTHESES)

	CURRENT	PROJECTED (1983)
BASIC GRAINS		
CORN (73-74)	319.9	386.1
BEANS "	70.4	70.4
RICE "	14.8	14.8
SORGHUM "	59.0	59.0
WHEAT (73-77)	0.2	0.8
VEGETABLES		
TOMATOES (73-74); POTATOES, ONIONS, GARLIC, CABBAGE	3.39	4.12
STARCHY CROPS		
BANANA (73-74)	42.7	51.4
PLANTAIN (77-78), YUCA (73-74)	11.5	21.2
FRUITS		
ORANGES, LEMONS (75)	2.45	2.05
PINEAPPLE (75-77)	1.0	3.1
MELONS (75-77)	1.5	2.5
CASHEW (77)	0.9	7.9
OIL SEED CROPS		
AFRICAN PALM (78)	2.8	7.6
COCONUT (73-74)	3.8	4.5
SESAME (73-74); PEANUTS (78); SOYBEANS (75-77); CASTOR BEANS (77-78)	3.5	5.38
OTHER CASH CROPS		
CACAO (75?)	0.5	1.0
SUGAR CANE (?)	35.0	45.2
COFFEE (?)	116.5	121.2
TABACCO (?)	10.3	12.7
COTTON (?)	7.7	13.7
TOTAL	707.84	834.25

SOURCE: U.S. AID, 1978.

2.5 LAND TENANCY

LAND TENANCY IS CHARACTERIZED BY MANY SMALL HOLDINGS AND A FEW VERY LARGE HOLDINGS (TABLE 5). THERE ARE AN ESTIMATED 195,297 FARMS IN THE COUNTRY, BUT OVER 50% OF THEM RANGE FROM LESS THAN 1 HA. TO 3 HAS. SMALL FARMERS PRACTICE SHIFTING AND SEMI-PERMANENT AGRICULTURE, GENERALLY ON SLOPING OR MARGINALLY PRODUCTIVE SOILS WHEREAS THE LARGE COMMERCIAL FARMS UTILIZE SOME MECHANIZATION, FERTILIZERS AND PESTICIDES ON THE BETTER AGRICULTURAL LANDS. THE INCORPORATION OF THE LANDLESS RURAL POPULATION INTO A PRODUCTIVE AGRICULTURAL ECONOMY CONTINUES TO BE AN IMPORTANT SOCIAL PROBLEM WITH LONG-TERM ENVIRONMENTAL CONSEQUENCES.

TABLE 5: NUMBER OF FARMS AND AMOUNT OF FARMLAND BY FARM SIZE
 (ACCORDING TO 1974 AGRICULTURAL CENSUS)

FARMSIZE	NUMBER OF FARMS	% OF TOTAL	AREA OF FARMS	% OF TOTAL
LESS THAN 1 HECTARES	33,774	17.3	21,534	0.8
1-2 HECTARES	38,643	19.8	53,584	2.0
2-3 HECTARES	28,699	14.7	69,865	2.6
3-5 HECTARES	23,631	12.1	93,696	3.5
5-20 HECTARES	47,478	24.3	468,983	17.6
20-50 HECTARES	15,164	7.8	461,464	56.0
GREATER THAN 50 HECTARES	7,908	4.0	1,485,949	56.0
TOTAL	195,297	100.0	2,655,095	100.0

SOURCE: U.S. AID 1978.

2.6 STREAM FLOW AND AGRICULTURAL RUNOFF

THE COMBINATION OF IRREGULAR RAINFALL PATTERNS RESULTING IN SEASONAL VARIATIONS OF STREAMFLOW REQUIRES CROP SCHEDULING AND IRRIGATION TO INSURE HARVEST IN MANY PARTS OF HONDURAS.

ALTHOUGH THERE ARE NO AVAILABLE DATA DESCRIBING WATER QUALITY INCLUDING AGRICULTURAL PESTICIDES OR FERTILIZER CONCENTRATION, IT CAN BE ASSUMED THE AGRICULTURAL CONTAMINANTS BECOME MORE CONCENTRATED DURING PERIODS OF LOW STREAMFLOW ESPECIALLY IN COTTON-GROWING REGIONS. ON THE OTHER HAND, PERIODS OF PEAK STREAMFLOW PRODUCE SEDIMENTS AND FLOODING ON POTENTIALLY PRODUCTIVE LANDS IN THE LOWER WATERSHEDS. RATES OF EROSION HAVE ACCELERATED DUE TO DEFORESTATION, OVERGRAZING, AND INAPPROPRIATE LAND USES (CONSUPLANE, 1978). FURTHERMORE ESTIMATES OF INCREASES IN ERODED LANDS FROM 3.5 TO 6.8 % OF TOTAL LANDS FROM 1970 TO 1977 (USAID, 1980) SHOULD BE EVALUATED AS ONLY A ROUGH APPROXIMATION.

THE SUPPLY OF SURFACE WATER IS AMPLE FOR THE COUNTRY AS WHOLE, BUT ITS DISTRIBUTION IS NOT UNIFORM. MANY OF THE AREAS WITH HIGHEST POPULATION DENSITY AND DEMAND ARE LOCATED IN ZONES WITH LOWER WATER YIELDS. DURING THE

3
DRY SEASON, HONDURAS RIVERS DISCHARGE ONLY ABOUT 40 M³ PER SECOND AS COMPARED WITH SIX TIMES THAT AMOUNT IN THE WET SEASONS (USAID, 1978). IT IS UNKNOWN WHETHER SALT WATER INTRUSION MAY BE OCCURRING IN THE LOWER CHOLUTECA RIVER SINCE IRRIGATED COTTON AND VEGETABLES ARE BEING IRRIGATED AT PERIODS THAT COINCIDE WITH LOW SURFACE-WATER FLOW. NO DATA WAS AVAILABLE TO ESTIMATE FRESHWATER REQUIREMENT FOR ESTUARIES AND MANGROVES LOCATED AT THE MOUTH OF THE CHOLUTECA IN FONSECA BAY.

2.7 PESTICIDES IN THE ENVIRONMENT

THE TRUE STATUS OF PESTICIDE USE IS NOT CLEAR DUE TO THE LACK OF ADEQUATE DOCUMENTATION AND THE CONTINUALLY CHANGING ASPECT OF PESTICIDE UTILIZATION. IN 1978, PESTICIDES (HERBICIDES, INSECTICIDES, NEMATOCIDES, FUNGICIDES) IMPORTED TO HONDURAS AMOUNTED TO U.S. 18.6 MILLION OF WHICH TWO-THIRDS WAS OF U. S. ORIGIN (MINISTRY OF ECONOMY, 1980). EARLIER REPORTS AND WATER QUALITY DATA SHOW THAT DDT, DIELDRIN, TOXAPHENE, METHYL ETHYL, PARATHION AND ENDRIN WERE UTILIZED HEAVILY IN COTTON GROWING AREAS, PRIMARILY IN CHOLUTECA AND OLANCHO (ICAITI, 1976). HOWEVER NO INFORMATION WAS FOUND THAT ESTIMATED PESTICIDE USE ON VEGETABLE CROPS, BASIC GRAINS OR EXPORT FRUIT PRODUCED IN OTHER PARTS OF HONDURAS. SINCE BANANA AND PINEAPPLE PRODUCTION IS DESTINED PARTIALLY FOR U. S. CONSUMPTION, PESTICIDES APPLIED BY THE TWO LARGE INTERNATIONAL COMPANIES ARE APPROVED BY EPA SINCE ALL FRUIT MUST MEET TOLERANCE STANDARDS (PERSONAL COMMUNICATIONS SIATAS - UNITED BRANDS, AND STANDARD FRUIT CO.).

IN 1980 THE FEDERAL INSECTICIDE, FUNGICIDE AND RODENTICIDE ACT WAS PROMULGATED INTO REGULATION STATING THAT ANY U. S. EXPORTER THAT IS SHIPPING A CANCELLED PESTICIDE MUST NOTIFY EPA WHO IN TURN NOTIFIES THE EMBASSY WHO THEN EXPLAINS THE HEALTH HAZARDS TO THE HOST COUNTRY. THE LAW WAS PASSED IN ORDER TO CONTROL INDISCRIMINATE DUMPING OF RESTRICTED PESTICIDES ON THIRD-WORLD

COUNTRIES. SINCE JULY 1980 THERE HAS BEEN ONLY ONE SHIPMENT OF DDT IMPORTED TO HONDURAS FROM U. S. ORIGIN. THIS DOES NOT IMPLY THAT HARMFUL PESTICIDES ARE NOT BEING APPLIED SINCE THERE ARE NOT LAWS WHICH CONTROL IMPORTATION OF PESTICIDES FROM NEIGHBORING COUNTRIES OR EUROPE.

ALL SHIPMENTS OF BEEF EXPORTED TO THE U. S. ARE INSPECTED AND ANALYZED FOR PESTICIDE RESIDUES AT PORT OF ENTRY. SINCE SEPTEMBER 1980, THERE HAVE BEEN FIVE OR SIX CASES WHERE EXPORT MEAT HAS BEEN REJECTED SINCE TOLERANCE LEVELS WERE EXCEEDED WITH DDT, DIELDRIN, AND HEPTACHLOR. THESE VIOLATIONS STAND OUT SINCE THERE WERE NO CITATIONS PREVIOUS TO SEPTEMBER, 1980 NOR AFTER DECEMBER, 1980. NEVER-THE-LESS IN JUNE 1980, TWO MEAT PACKING IN GUATEMALA WERE CLOSED DOWN DUE TO EXCESSIVE PESTICIDE LEVELS IN U. S. DESTINED BEEF, BUT THERE IS NO EVIDENCE AS TO THE SOURCE OF THE HONDURAN MEAT CONTAMINATION PROBLEM. ONLY TWO PUBLICATIONS WERE LISTED IN THE AGRICULTURAL BIBLIOGRAPHY (SRN, 1980) CONCERNING INDISCRIMINATE USE OF AGRICULTURAL PESTICIDES. OBVIOUSLY THE PESTICIDES IN THE HONDURAN ENVIRONMENT HAVE NOT BEEN QUANTIFIED AND MORE EFFORT SHOULD BE DEVOTED TOWARD INVESTIGATION ESPECIALLY IN AREAS OF HUMAN HEALTH, WATER QUALITY AND IMPACTS OF AGRICULTURAL RUNOFF, ON RIVERS, LAKES, LAGOONS, AND ESTUARIES.

3.0 CONSERVATION DEVELOPMENT

3.1 GENERALITIES

- A) THERE IS A LACK OF OFFICIAL ACCEPTANCE THAT ENVIRONMENTAL MANAGEMENT GOES HAND IN HAND WITH ECONOMIC DEVELOPMENT BOTH AT THE SECTORIAL AND NATIONAL LEVEL. THERE IS A GENERAL PERCEPTION THAT CONSERVATION MEASURES AND ENVIRONMENTAL MANAGEMENT DO NOT CONTRIBUTE TO ECONOMIC GROWTH AND PRODUCTION.
- B) LACK OF A WELL-DEFINED ENVIRONMENTAL MANAGEMENT STRATEGY WHICH LEGALLY LINKS AN OFFICIAL LAND USE POLICY WITH AGRARIAN REFORM AND THE OVERALL NATIONAL DEVELOPMENT PLAN.
- C) ABSENCE OF INSTITUTIONAL GUIDELINES AND ENVIRONMENTAL MANAGEMENT CRITERIA THAT LINKS AGRICULTURAL CREDIT WITH TECHNICAL ASSISTANCE IN AREAS OF SOIL CONSERVATION, APPROPRIATE TECHNOLOGIES FOR SMALL FARMERS OR APPROPRIATE LAND UTILIZATION. MOST OF THE RESPONSIBILITY FOR THESE WEAKNESSES LIE WITH INTERNATIONAL DONOR AGENCIES WHO PROVIDE FUNDS FOR LOCAL BANADESA AGRICULTURAL CREDIT PROGRAMS OR DIRECT TECHNICAL ASSISTANCE FOR AGRICULTURAL DEVELOPMENT OR WATERSHED MANAGEMENT PROJECTS.
- D) PROMOTION OF INAPPROPRIATE OR ENERGY-DEPENDENT AGRICULTURAL TECHNOLOGIES.
- E) LACK OF DEVELOPED INSTITUTIONAL LINKAGES THAT PROMOTE INFORMATION EXCHANGE AND AVOID DUPLICITY.

3.2 LANDLESS RURAL POPULATION

THE DEMANDS FOR LAND AND THE PROCESSES OF SHIFTING CULTIVATION AND INVASION OF FORESTED LANDS ARE WELL DOCUMENTED AND EMPHASIZE THE SEVERITY OF THE PROBLEM CONCERNING THE LANDLESS RURAL POPULATION (S.R.N. 1977; CONSULANE 1978; MAJ, 1981; USAID, 1978). UNFORTUNATELY A LARGE MAJORITY OF THE PEOPLE THAT HAVE THE GREATEST IMPACT ON NATURAL RESOURCES ARE THOSE OCCUPYING UNTITLED LANDS, ARE NOT INCORPORATED INTO THE AGRARIAN REFORM PROCESS BECAUSE THEY LACK PAPERS, AND IN ESSENCE ARE NON-ENTITIES OUT OF REACH OF ANY GOVERNMENTAL INSTITUTION OR REGULATIONS. EVEN THE IMPLEMENTATION OF AN APPROPRIATE NATIONAL LAND USE POLICY MAY HAVE CONSIDERABLE DIFFICULTY IN ENCOMPASSING THE MIGRATORY RURAL POPULATION SINCE THEY FREQUENTLY INVADE NEW FOREST LANDS OR AREAS WITH LITTLE ROAD ACCESS. FURTHERMORE THE GEOGRAPHIC REMOTENESS OF THE SHIFTING CULTIVATION PROVIDES CONVENIENT CAMOUFLAGE FOR REFUGEES WITHOUT DOCUMENTATION FROM NEIGHBORING COUNTRIES.

SINCE SHIFTING CULTIVATORS FREQUENTLY CULTIVATE MARGINAL SOILS, YIELDS DECREASE, AND WEEDS AND PESTS BECOME MORE DIFFICULT TO CONTROL AFTER 1 OR 2 CROPS, SO HE MOVES ON TO SEARCH FOR NEW AREAS TO CLEAR. WITHOUT RADICAL CHANGES IN RURAL EMPLOYMENT OPPORTUNITIES COMBINED WITH AN INCREASED AGRICULTURAL PRODUCTIVITY ON THE BEST SOILS, AND COMPLETION OF A MORE EQUITABLE LAND DISTRIBUTION, THIS PROCESS OF INVADING BROADLEAF FORESTS AND CULTIVATION OF MARGINAL STEEP LANDS CAN BE EXPECTED TO CONTINUE.

SOMETIMES ASSOCIATED WITH THE ABOVE MENTIONED PROCESS ARE CATTLEMEN WHO PURCHASES THE IMPROVEMENTS (LAND CLEARING) FROM THE SHIFTING CULTIVATOR AND PLANTS PASTURE. CONSEQUENTLY, WHAT WAS HISTORICALLY A ROTATIONAL CROPPING/FALLOW-SYSTEM IS NOW A SEMI- OR PERMANENT AGRICULTURE WITHOUT FALLOW PERIODS WHICH ALLOW FOR NUTRIENT CYCLING AND ACCUMULATION AND PROVIDE SOIL STABILITY. IDEALLY, ON APPROPRIATE SOILS, YIELDS CAN BE MAINTAINED WITH COMBINATIONS OF CROP MIXES AND LOW INPUT OF FERTILIZER AND PESTICIDES THAT MAINTAIN SOIL FERTILITY AND STABILITY, OR IN OTHER WORDS LOW INPUTS APPROPRIATE SMALL FARMER TECHNOLOGY.

HOWEVER, THE TENDENCY TO CONVERT MARGINAL STEEPLANDS THAT ARE CLASSIFIED AS PROTECTIVE OR FORESTRY USE TO PASTURES WILL FREQUENTLY RESULT IN POOR PASTURES AND COSTLY LOSSES OF SOIL RESOURCES. IN DRY AREAS WITH SLOPING SOILS, THERE IS THE TENDENCY TO OVERGRAZE LEAVING LITTLE VEGETATIVE COVER TO HOLD THE SOIL DURING PERIODS OF RAINFALL. PASTURE QUALITY AND MAINTENANCE IN VERY HUMID AREAS AND THOSE EXPOSED SOILS ARE ALSO VERY SUSCEPTIBLE TO EROSION. THEREFORE THE CONVERSION OF THE RURAL POPULATION TO A PERMANENT AGRICULTURE ADAPTED TO SOILS AND ECOLOGICAL CHARACTERISTICS OF THE AREA WILL HELP STABILIZE THESE PEOPLE SINCE THE LAND IS CAPABLE OF PRODUCING SUSTAINED YIELDS. ON THE CONTRARY, VERY LITTLE, IF ANY LONG-TERM AGRICULTURAL PRODUCTION CAN BE EXPECTED IN AREAS WITH SERIOUS ECOLOGICAL LIMITATION (I.E. TOO WET, DRY, STEEP, ROCKY, POOR SOIL, ETC). APPROPRIATE CROP MIXES AND LAND USE PRACTICES FOR SUSTAINED YIELD PRODUCTION WILL BE DISCUSSED UNDER APPROPRIATE SMALL FARMER TECHNOLOGY.

3.3 BEEF EXPORTS TO U. S. MARKETS

IN RECENT YEARS BEEF EXPORTS HAVE INCREASED MARKEDLY AND NOW RANKS FOURTH (AFTER BANANAS, COFFEE, AND WOOD) IN TERMS OF GNP. THERE ARE APPROXIMATELY 2,219,925 HEAD OF LIVESTOCK OF WHICH 10-15% ARE SLAUGHTERED EACH YEAR FOR EXPORT MARKETS (CONSULANE, 1980). WITH A RECENTLY ANNOUNCED UNLIMITED MARKETING QUOTA FOR 1981, IT IS POSSIBLE TO SEND ALL THE BEEF PRODUCED TO EXPORT MARKETS; HOWEVER, IF SO LOCAL HONDURAN MARKETS WOULD GO UNSERVED.

MEAT PRODUCTION IS RELATIVELY LOW (45 KG/HA/YEAR) BUT COMBINED WITH MILK PRODUCTION (208 L/HA/YR) YIELDS A COMBINED GROSS INCOME OF \$140/HA/YR, WHICH SERVES AS AN INCENTIVE TO INTENSIFY AND EXPAND BEEF PRODUCTION IN ADAPTABLE AND MARGINAL AREAS ALIKE.

APPROXIMATELY 60-70% OF ALL THE BEEF PRODUCED COMES FROM SMALL LIVESTOCK PRODUCERS (15-20 HEAD EACH) WHICH MAY OR MAY NOT HAVE LAND TITLES. THIS IS ALSO THE TARGET GROUP THAT WILL MOST LIKELY EXPAND THEIR GRAZING ON ADJACENT STEEPLANDS SINCE CREDIT ASSISTANCE PROVIDED BY GOV COMBINED WITH INCENTIVES OF HIGH PRICE PROMOTE EXPLOITATION OF MARGINAL RESOURCES. EVALUATION OF GRAZING PRACTICES AND EXPLOITATION OF CENTRAL AMERICAN NATURAL RESOURCES FOR BENEFIT OF U. S. MARKETS HAVE BEEN CRITICAL (HOOFPRIANTS IN THE FOREST, 1979 AND MYERS, 1981).

CONTINUAL EXPLOITATION AND EXPANSION OF CATTLE GRAZING IN MARGINAL STEEPLANDS NOT ECOLOGICALLY SUITED FOR THIS ACTIVITY CAN CAUSE INCREASE RIVER SEDIMENTATION, LOSS OF SOIL AND OVERALL RESOURCE DEGRADATION DUE TO OVERGRAZING AND SOIL SLIPPAGE. THEREFORE, IT IS IMPORTANT THAT ECOLOGICAL CRITERIA AND THE PHILOSOPHY OF ENVIRONMENTAL MANAGEMENT BE INCORPORATED AS AN INTEGRAL PART OF THE LOAN EVALUATION PROCEDURE TO AVOID CONFLICTS BETWEEN SHORT TERM ECONOMIC INTEREST AND LONG TERM HUMAN WELL-BEING AND LAND RESOURCE PRODUCTIVITY.

3.4. SITUATION OF THE SMALL INDEPENDENT FARMER.

60% OF THE BASIC GRAINS ARE PRODUCED BY SMALL FARMERS. 60-70% OF THE LIVESTOCK PRODUCED COMES FROM SMALL PRODUCERS. SOME OF THESE SMALL FARMERS ARE PROBABLY SERVED BY THE AGRARIAN REFORM PROGRAM, BUT IN MANY CASES NOT. THESE ARE ALSO THE FARMERS THAT UTILIZE AND MANAGE A LARGE PORTION OF LAND AND WATER RESOURCES TO PRODUCE THEIR CROPS AND LIVESTOCK, BUT ACCESS TO THE SERVICES IS LIMITED AND GOVERNMENT ASSISTANCE IS OFTEN SLOW AND POORLY TIMED. FURTHER EVIDENCE THAT A LARGE PERCENTAGE OF SMALL FARMERS ARE ESSENTIALLY LIVING OUTSIDE OF THE ECONOMY IS DEMONSTRATED BY COMPARING THE USE OF AGRICULTURAL TECHNOLOGY WITH FARM SIZE (TABLE 6).

TO SAY THAT EXTERNAL ASSISTANCE NEEDS TO BE INCREASED OR IS LACKING FOR AGRICULTURAL DEVELOPMENT IS NOT TRUE. IN 1978 TEN MAJOR ASSISTANCE AGENCIES PROVIDED THE EQUIVALENT OF US \$170 PER RURAL INHABITANT, APPROXIMATELY DOUBLE THE AVERAGE ANNUAL RURAL PER CAPITAL INCOME (USAID, 1978). OF THE FARM CREDIT ASSISTANCE 60% WENT TO AGRARIAN REFORM, 25-30% TO

MEDIUM SIZED CATTLE FARMERS AND ONLY 10-15% TO SMALL MEDIUM INDEPENDENT FARMERS. CONSEQUENTLY IT IS RECOMMENDED THAT FUTURE PROJECTS DEAL DIRECTLY WITH THE SMALL FARMER ATTEMPTING TO FIND OUT WHAT IS THE SIZE OF AN ECONOMICAL UNIT AND WHAT ALTERNATIVES SHOULD BE IMPLEMENTED TO MAKE IT A VIABLE VENTURE (HART, 1979):

TABLE 6: USE OF AGRICULTURAL TECHNOLOGY BY FARM SIZE

SIZE OF FARM (HA)-----	TOTAL NO. IN COUNTRY--	NO. AND % USING FERTILIZER	NO. & % USING BOUGHT SEED-----	NO. & % USING SOME TYPE OF INPUT-----
1 - 3	101,116	2,923 (2.9)	2,354 (2.3)	8,921 (8.8)
3 - 5	23,631	1,062 (4.5)	562 (2.4)	2,986 (12.3)
5 - 10	28,259	1,615 (5.7)	926 (3.3)	4,514 (16.0)
11 - 20	19,219	1,428 (7.4)	922 (4.7)	4,239 (22.1)
21 - 50	15,164	1,509 (10)	1,264 (8.3)	4,814 (31.7)
51 OR MORE	7,908	1,609 (20.3)	1,650 (20.9)	4,284 (54.1)
TOTAL	195,297	10,146 (5.2)	7,678 (3.9)	29,663 (15.2)

* FERTILIZER, INSECTICIDES, FUNGICIDES, HERBICIDES, VETERINARY PRODUCTS AND BOUGHT SEED.

SOURCE: U. S. AID. 1978.

3.5 INSTITUTIONAL FRAGMENTATION

SEVERAL DOCUMENTS ILLUSTRATE IN GREAT DETAIL THE INSTITUTIONAL CONSTRAINTS TO AGRICULTURAL DEVELOPMENT SO ONLY A BRIEF SUMMARY WILL BE DISCUSSED HERE (INA, CONSUPLANE, ST-C.P.A., 1980; USAID, S.R.N., CONSUPLANE, 1978; USAID, 1978, BIRF, BID, AID, 1978; CONSUPLANE, 1978; ANDERSON, 1977).

THE FOLLOWING DESCRIPTION IS AN EXAMPLE OF HOW CROP SPECIFIC PROJECTS CREATE SEVERE PROBLEMS OF NOT ONLY COORDINATION OF TECHNICAL ASSISTANCE BUT ALSO CROP PLANNING, ENVIRONMENTAL MANAGEMENT AND INVESTMENT PLANNING FOR THE INDIVIDUAL FARM GROUP (ANDERSON, 1977).

THE KEY AGRICULTURAL DEVELOPMENT INSTITUTIONS ARE PLAGUED BY OVERLAPPING ASSIGNMENTS, THE DUPLICATION OF FUNCTIONS AND TECHNICAL MANPOWER AND FRAGMENTED JURISDICTIONS. FOR EXAMPLE, MANY OF THE AGENCIES ARE

PERFORMING THE SAME OR SIMILAR TASKS USING THE SAME KINDS OF TECHNICIANS. CONSEQUENTLY COMPETITION FOR AGRICULTURISTS OCCURS AMONG INA, SRN, AND BANADESA SINCE EACH AGENCY PROVIDES TECHNICAL ASSISTANCE TO CARRY OUT AGRICULTURAL DEVELOPMENT PROGRAMS AND PROVIDE SERVICES AT THE LOCAL LEVEL.

THERE IS ALSO FRAGMENTATION IN THE FUNCTIONS PERFORMED AND SERVICES DELIVERED TO THE AREAS UNDER AGRARIAN REFORM AND THOSE IN NON-REFORM AREAS. FOR EXAMPLE, IN THE AGUAN VALLEY THE INA PROJECT IS SITUATED NEAR TOCOA AND COHBANA HAS A PROJECT IN ISLETAS ABOUT 40 KMS AWAY. COHBANA IS RESPONSIBLE FOR ASSISTANCE IN BANANA PRODUCTION; INA ASSISTS ON OIL PALM AND GRAPEFRUITS; AND SRN ASSISTS WITH BASIC GRAIN PRODUCTION, ALL IN THE SAME AREA.

MANY OF THE COOPERATIVES IN THE TOCOA AREA GROW AFRICAN OIL PALM, CITRUS, AND GRAINS AND MUST RELY ON BOTH INA AND SRN FOR TECHNICAL HELP, SEEDS AND INPUTS FROM INA AND THE OIL PALM AND CITRUS, SEEDS AND INPUTS FROM BANADESA FOR THE BASIC GRAINS, PRODUCTION CREDIT AND CAPITAL IMPROVEMENTS, I.E., LAND LEVELING AND DRAINAGE ARE PROVIDED BY INA.

LAND REFORM AREAS ARE ALSO SURROUNDED BY SMALL INDEPENDENT FARMERS THAT ALSO REQUIRE TECHNICAL ASSISTANCE AND CREDIT. FARM SIZE AND INCOME ARE CRITERIA FOR DELIVERING SOME GOVERNMENT SERVICES; WHEREAS, IN OTHER INSTANCES THE CROP ITSELF (BANANAS, COFFEE) GOVERNS HOW THE FARMER IS SERVED.

THE CURRENT FRAGMENTED AGRICULTURE SECTOR ORGANIZATION; DUPLICATIVE FUNCTIONS; DUPLICATIVE AND COMPETITIVE MANPOWER STRUCTURES; UNCOORDINATED INSTITUTIONAL POLICIES; INEFFECTIVE COORDINATION OF OPERATIONS AND LACK OF FLEXIBLE AUTHORITY AND OPERATIONAL RESOURCES IN THE FIELD, ALL ADD UP TO REDUCING THE OPPORTUNITY FOR EFFECTIVE AND EFFICIENT DELIVERY OF DEVELOPMENT SERVICES TO THE AGRICULTURAL SECTOR. EXTERNAL FINANCING AGENCIES HAVE AND CONTINUE TO CONTRIBUTE TO THIS FRAGMENTATION BY INSISTING ON ESTABLISHING PROJECTS WITH RELATIVELY AUTONOMOUS AUTHORITY. WITH THESE CONSTRAINTS IT IS DIFFICULT TO SEE HOW A NATIONAL LAND USE POLICY CAN BE IMPLEMENTED AND THE STATUS OF THE RURAL POOR IMPROVED.

4.0 INSTITUTIONAL ANALYSIS

4.1 INSTITUTIONS RELATING TO AGRICULTURAL DEVELOPMENT

THE FOLLOWING LIST INCLUDES THE PRINCIPAL GOVERNMENTAL INSTITUTIONS THAT DIRECTLY AFFECT AGRICULTURAL PRODUCTION, LAND USE, RESEARCH, AGRICULTURAL CREDIT, AND AGRICULTURAL PLANNING (ANDERSON, 1977).

4.1.1. INSTITUTO NACIONAL AGRARIO (INA) - WAS ESTABLISHED IN 1963 AS A SEMI-AUTONOMOUS LAND REFORM AGENCY DIRECTLY RESPONSIBLE TO THE CHIEF OF STATE FOR EXPROPRIATING PRIVATE LANDS AND TRANSFERRING AND TITLING THESE LANDS TO LAND REFORM BENEFICIARIES. HISTORICALLY CAMPESINO PRESSURE, BOTH THROUGH DEMONSTRATIONS AND LAND INVASION HAS PROVIDED IMPETUS FOR LAND REFORM ACTIVITIES. FURTHER PRESSURE MAY BE EXPECTED TO INCREASE AS A RESULT OF DRAMATIC STRUCTURAL CHANGES IN NEARBY NICARAGUA AND EL SALVADOR (USAID, 1980) SINCE ITS INCEPTION, INA HAS EXPANDED IN RESPONSE TO CRISIS AND POLITICAL

PRESSURES, ADDING DEPARTMENTS AND FUNCTIONS AS THE SITUATION DEMANDED. MOST OF THE LAND TO BE TRANSFERRED OR TITLED UNDER THE AGRARIAN REFORM LAW WAS FOR NEW SETTLEMENTS ON PREVIOUSLY UNCULTIVATED LAND WITH LITTLE OR NO INFRASTRUCTURE. SINCE 1978, THE EFFORTS OF INA HAVE BEEN DEDICATED TO ASSISTING THE ESTABLISHED, HIGH COST LAND REFORM SETTLEMENTS WITH FARM MANAGEMENT, TRAINING, MARKETING, TECHNICAL ASSISTANCE AND CREDIT, TO THE DETRIMENT OF THE LARGE MAJORITY OF SMALLER SETTLEMENTS AND THE REDISTRIBUTION OF ADDITIONAL LAND. IN ADDITION TO ITS LAND REFORM AND SOCIAL FUNCTIONS, INA ALSO PROVIDES SOME TECHNICAL ASSISTANCE, BUT IS NOT RESPONSIBLE FOR CREDIT, RESEARCH OR MARKETING (ANDERSON, 1977). TO DATE THERE IS LITTLE EVIDENCE OF ANY ENVIRONMENTAL MANAGEMENT APPLIED TO THE IMPLEMENTATION OF THEIR LAND USE POLICY OR PRODUCTION SYSTEMS.

4.1.2. MINISTRY OF NATURAL RESOURCES (S.B.N.) - THIS MINISTRY IS COMPOSED OF FIVE SEPARATE DEPARTMENTS (PLANNING, AGRICULTURAL OPERATIONS, RENEWABLE NATURAL RESOURCES, MINING, AND WATER RESOURCES) IN WHICH AGRICULTURAL OPERATION, AND RENEWABLE NATURAL RESOURCES ARE RESPONSIBLE FOR PRODUCTION, RESEARCH, AND EXTENSION CONCERNING THE AGRICULTURAL SECTOR. THERE ARE ONLY 300 EXTENSION AGENTS FOR THE ENTIRE COUNTRY OF WHICH FEWER THAN 50% ACTUALLY HAVE CONTACT AT THE MEDIUM AND SMALL FARMER LEVEL. THE PROGRAM FOR SOIL CONSERVATION GENERALLY EMPHASIZE FERTILITY RATHER THAN SOIL AND WATER CONSERVATION PRACTICES. THE MINISTRY IS ORGANIZED IN SEVEN REGIONAL OFFICES AND SERVE THE AGRARIAN REFORM SECTOR AS WELL AS INDEPENDENT FARMERS (S.R.N., 1979)

4.1.3. INSTITUTO HONDUREÑO DEL CAFE (IHCAFE) - THIS AUTONOMOUS INSTITUTE WAS ESTABLISHED TO PROVIDE ASSISTANCE TO SMALL COFFEE FARMERS AND CO-OPS. IT'S FUNCTIONS INCLUDE: RESEARCH, TECHNICAL ASSISTANCE, SALES OF INPUTS, ROAD CONSTRUCTION, CO-OP PROMOTION, COOP DIVERSIFICATION, MARKETING INFORMATION AND REGULATION OF EXPORT MARKETING. OF ALL THE AGENCIES ENGAGED IN AGRICULTURAL DEVELOPMENT IHCAFE IS PROBABLY HAVING THE GREATEST IMPACT BY SERVICING THE SMALL FARMER AND PROVIDING APPROPRIATE TECHNOLOGIES SUCH AS SOIL CONSERVATION MEASURES AND ALTERNATIVE ADAPTED CROPS TO SUBSTITUTE FOR COFFEE.

4.1.4. BANCO NACIONAL DE DESARROLLO AGRICOLA (BANADESA) - THE FORMER BANCO NACIONAL DE FOMENTO HAS BEEN RESTRUCTURED TO SERVE AS THE PRINCIPAL CREDIT AND BANKING AGENCY FOR AGRICULTURAL DEVELOPMENT. LOANS ARE AVAILABLE FOR PRODUCTION OF BASIC GRAINS, LIVESTOCK, CITRUS, FRUIT TREE CROPS, VEGETABLES, OIL SEED CROPS, COFFEE, COTTON, CANE AND OTHERS. GENERALLY INA HAS TO SUPPLY A GUARANTEE SINCE ALMOST ALL THE SMALL FARMERS APPLYING FOR LOANS DO NOT HOLD LAND TITLE.

A BRIEF SUMMARY OF LOAN PROCEDURES AND PROBLEMS IS PRESENTED AS FOLLOWS:

- A) UPON RECEIVING A CREDIT PETITION, BANADESA SEND AN INSPECTOR TO EVALUATE LAND, DISCUSS PLANTING SCHEDULE, AND PREPARES A BUDGET FOR ESTIMATED PRODUCTION COSTS.

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- B) AG EXTENSION AGENTS (SRN) ACCOMPANY BANADESA INSPECTORS AND WORK IN COORDINATION IN FARMER EVALUATION.
- C) IF LOAN IS APPROVED THERE IS NO ECOLOGICAL (I.E. LAND CAPABILITY) CONSIDERED FOR LOAN DISBURSEMENTS. IF SOIL CONSERVATION MEASURES ARE RECOMMENDED THEN THESE COSTS COULD BE INCORPORATED INTO LOAN AGREEMENT, BUT CURRENTLY THEY ARE UNSPECIFIED AND CONSEQUENTLY OMITTED.
- D) LONG-TERM LOANS (5-7 YEARS) FOR LIVESTOCK, PERENNIAL CROPS, OR EQUIPMENT REQUIRE LAND TITLE AS COLLATERAL, BUT SHORT-TERM CREDIT (6 MONTHS) USUALLY USES A CROP MORTGAGE FOR COLLATERAL. THIS PROCEDURE LEAVE OPPORTUNITY FOR FARMERS TO USE CREDIT TO CULTIVATE MARGINAL SOILS THUS ENCOURAGING UNSTABLE RURAL POPULATION.
- E) LOAN DEFAULT IS MUCH GREATER WITH FARMER GROUPS ORGANIZED IN COOPERATIVES UNDER THE REFORMED SECTOR AS COMPARED TO PRIVATE INDEPENDENT FARMERS (AN ESTIMATED 60 VS 40% - PERSONAL COMMUNICATION - ING. R. MUNOZ - BANADESA). SOCIAL STRUCTURE OF ORGANIZED COOPERATIVES IS THE PRINCIPAL REASON FOR DEFAULT; WHEREAS, INAPPROPRIATE LAND USE OR DEGRADED SOILS RESOURCES IS RARELY A REASON FOR DEFAULT. ON THE OTHER HAND SMALL FARMERS ENGAGED IN SHIFTING AGRICULTURE RARELY RECEIVE CREDIT ASSISTANCE.
- F) EXTERNAL SOURCES (USAID, WB, BID) DO NOT REQUIRE THE EVALUATION OF ANY ENVIRONMENTAL MANAGEMENT (LAND USE CAPABILITY, CROP ADAPTABILITY, LEVEL OF PRODUCTION INPUTS, APPROPRIATE TECHNOLOGIES) CRITERIA FOR LOANS TO INSTITUTIONS EXTENDING AGRICULTURAL CREDIT TO HONDURAN FARMERS.

4.1.5. CORPORACION NACIONAL DEL BANANO (COBANANA) - THIS AUTONOMOUS CORPORATION WAS ESTABLISHED TO PROVIDE ASSISTANCE TO INDEPENDENT SMALL AND LARGE OWNERS, CO-OPS AND REFORMED GROUPS ON BANANA LANDS AS WELL AS TO MANAGE BANANA PROJECTS ON LAND TURNED OVER TO THE AGRARIAN REFORM PROGRAM. IT PROVIDES CREDIT, FARM MANAGEMENT, TECHNICAL ASSISTANCE, CAPITAL IMPROVEMENTS AND MARKETING. COBANANA IS SUPPOSED TO BECOME SELF-SUSTAINING FROM REVENUES GENERATED BY A SURCHARGE ON PRODUCTION UNDER ITS CONTROL (ANDERSON, 1977).

4.1.6. DIRECCION GENERAL DE FOMENTO COOPERATIVO (DIFCOOP) - THIS DECENTRALIZED UNIT OF THE MINISTRY OF ECONOMY IS RESPONSIBLE FOR THE LEGALIZATION OF COOPERATIVES, OVERVIEW OF THE LEGAL REQUIREMENTS FOR OPERATIONS OF SUCH CO-OPS AND FOR TRAINING AND DEVELOPMENT PROGRAMS RELATING TO COOPERATIVE DEVELOPMENT. AGRICULTURAL SECTOR CO-OPS CONSTITUTE THE MOST SIGNIFICANT NUMBERS.

4.1.7. CONSEJO SUPERIOR DE PLANIFICACION ECONOMICA (CONSUELANE) - THIS SECTOR-WIDE INSTITUTION IS RESPONSIBLE FOR NATIONAL PLANNING AND HAS A

SECTION DEVOTED TO AGRICULTURAL PLANNING WHICH DEVELOPS THE NATIONAL DEVELOPMENT PLAN, THE ANNUAL AGRICULTURE OPERATING PLAN, REVIEWS THE SECTOR BUDGET, COORDINATES EXTERNAL TECHNICAL ASSISTANCE AND EVALUATES PROGRAMS. THE ENVIRONMENTAL UNIT IS ONE DIVISION OF AGRICULTURAL PLANNING THAT IS RESPONSIBLE FOR CONSERVATION OF NATURAL RESOURCES FOR ALL SECTORS, HOWEVER LACK OF FUNDING AND PERSONNEL HAS RESULTED IN LITTLE IMPACT OR UTILIZATION OF THIS UNIT.

4.2 EFFECTIVENESS OF AGRARIAN REFORM

THE AGRARIAN REFORM HAS SET AS A GOAL THE RELOCATION OF 120,000 FAMILIES ON 600,000 HAS. AS OF 1980, 33,381 FAMILIES (1292 GROUPS) HAVE BEEN PLACED ON 209,403 HAS. (INA, 1980) (FIGURE 3). IN BRIEF, THE RATE OF NEW LAND SETTLEMENTS PER YEAR IS JUST ABOUT EQUAL TO THE ANNUAL INCREASE IN THE RURAL POPULATION. CONSEQUENTLY THE LAND REFORM PROGRAM ON A NATIONAL BASIS HAS HAD LITTLE NET EFFECT IN REDUCING THE EXTENT OF MINIFUNDO OR LANDLESSNESS AS IT EXISTED IN 1978 (USAID, 1978).

RATE OF ABANDONMENT HAS BEEN HIGH, PARTICULARLY IN THE LARGEST PROJECT OF BAJO AGUAN WHICH HAS APPROXIMATELY 25% OF THE TOTAL LAND IN THE LAND REFORM PROGRAM. REASONS FOR POOR PERFORMANCE OF REFORM GROUPS HAVE BEEN SUMMARIZED BY USAID (1978) AND CONSULANE (1978).

- A) HIGH INCIDENCE OF NATURAL DISASTERS - I.E. HURRICANES, FLOODS, DROUGHTS.
- B) IMPRUDENT CHOICE OF CROPS, LEVEL OF INPUTS, AND GENERAL FARMING SYSTEMS IMPLEMENTED MAY NOT HAVE BEEN COMPATIBLE WITH THE ECOLOGICAL CONSTRAINTS OF THE AREA.
- C) HEAVY CONCENTRATION ON PRODUCTION OF BASIC GRAINS AND SUBSEQUENT FAILURE TO PURCHASE GRAINS AT PREVIOUSLY ANNOUNCED SUPPORT PRICES.
- D) POOR MANAGEMENT DECISIONS THAT EXTEND AGRICULTURAL CREDIT AGAINST INADEQUATE EVIDENCE OF SPECIFIC YIELDS AND ABILITY TO REPAY LOANS OR UTILIZE SOPHISTICATED MACHINERY WITH UNTRAINED LABOR.
- E) LAND ADJUDICATED UNDER DECREE 8 WAS PREDOMINANTLY MARGINAL WITH SOME LANDS OF MORE THAN 15% SLOPE.

UNDER THE AGRARIAN REFORM LAW, THE BENEFICIARIES OF THE PROGRAM ARE TO EVENTUALLY ASSUME FULL RESPONSIBILITY FOR PRODUCTION ACTIVITIES. THIS IMPLIES THE NEED FOR A PROGRAM OF FARMER TRAINING. ADEQUATE TRAINING FOR BENEFICIARY GROUPS TO PREPARE THEM FOR FUTURE MANAGERIAL ROLES DOES NOT EXIST AND SHORT COURSES ARE POORLY COORDINATED WITH RESPECT TO CONTENT AND TARGET GROUP. THE OVERALL EFFECT OF THE TRAINING PROGRAM HAS BEEN MIXED AND TRAINING EFFORTS HAVE ONLY PARTIALLY ACCOMPLISHED THEIR OBJECTIVES (USAID, 1978).

BEFORE LARGE GOVERNMENT INVESTMENTS ARE COMMITTED, IT IS RECOMMENDED THAT THE PRESENT LAND REFORM PROGRAM BE CRITICALLY REVIEWED IN TERMS OF ECONOMIC, SOCIAL AND ECOLOGICAL ACCEPTABILITY AND COMPATIBLE WITH NATIONAL AGRICULTURAL DEVELOPMENT POLICY.

4.3 REVIEW OF USAID ENVIRONMENTAL ANALYSIS PROCEDURE

THE ENVIRONMENTAL REVIEW PROCEDURE OF THE MISSION HAS TAKEN A TRADITIONAL VIEW OF DEVELOPMENT VERSUS PRESERVATION WHERE ENVIRONMENTAL CONTAMINATION IS CONSIDERED A PRIORITY ISSUE AS COMPARED TO THE IMPACTS OF FUNDING A PROJECT THAT MAY RESULT IN IMPROPER LAND USE. ALTHOUGH THERE IS CERTAINLY AN AWARENESS AND PERSONAL INTEREST, THE LOCAL MISSION ALLOCATES MINIMAL EFFORT FOR ENVIRONMENTAL MANAGEMENT CONSIDERATIONS IN PROJECT INFORMATION DOCUMENT (PID) PREPARATION SINCE THERE ARE OBVIOUS TIME AND PERSONNEL CONSTRAINTS IN ADDITION TO THE INABILITY TO PREDICT THE CHANCES FOR PID APPROVAL AT THE WASHINGTON LEVEL. IF THE PID IS ACCEPTED, THEN A PROJECT PAPER IS PREPARED INCLUDING AN INITIAL ENVIRONMENTAL EVALUATION (IEE) WHICH IS FREQUENTLY TREATED SUPERFICIALLY SINCE FURTHER ANALYSIS WOULD REQUIRE ADDITIONAL WORK FROM MISSION PERSONNEL OR REDUCE THEIR WORKING BUDGET TO CALL IN CONSULTANTS TO PREPARE THE ANALYSIS.

FROM INTERVIEWS WITH A.I.D. OFFICIALS, NONE COULD REMEMBER AN EXAMPLE OF AN ENVIRONMENTAL ASSESSMENT BEING PREPARED FOR ANY PAST MISSION PROJECTS. OBVIOUSLY, NOT ALL PROJECTS NEED IN-DEPTH ENVIRONMENTAL ANALYSIS, BUT RATHER NEED TO INCORPORATE AN ENVIRONMENTAL MANAGEMENT PHILOSOPHY IN EARLY STAGES OF PROJECT IDENTIFICATION AS WELL AS IMPLEMENTATION OF DEVELOPMENT PROJECTS.

AN EXAMPLE OF THE IMPACTS OF SMALL FARMER TECHNOLOGY PROJECT ON THE NATURAL ENVIRONMENT IS POORLY ANALYZED IN THE IEE (USAID, 1976). THE PROJECT GOAL WAS THE LONG-RANGE EFFICIENT USE OF AGRICULTURAL LANDS. THE IEE STATES THAT "FARMERS WHO OPERATE WITHOUT ACCESS TO APPROPRIATE AGRICULTURAL MACHINERY TO PERFORM PRODUCTION TASKS HAVE BEEN FORCED TO RESORT THE SLASH AND BURN LAND PREPARATION TECHNIQUES WHICH ARE DAMAGING TO THE NATURAL ENVIRONMENT" (USAID, 1976). THE PROJECT PROPOSED USE OF AGRICULTURAL MACHINERY FOR CLEARING AND SEEDBED PREPARATION; HOWEVER, THERE WAS NOT MENTION OR ANALYSIS OF POTENTIAL LAND USE CAPABILITY, SLOPE, ADAPTED CROPS, OR SOCIAL ACCEPTANCE OF THESE TECHNOLOGIES. ACCORDING TO THE IEE, AREAS OF GRASSLANDS WOULD BE REDUCED WHILE FOOD PRODUCTION WOULD INCREASE. WHILE THERE ARE NO GLARING ISSUES OF CONTAMINATION IN THE IEE, THERE IS AN ISSUE OF LAND CAPABILITY AND CONVERSION OF GRASSLANDS AND LONG-TERM LAND USE AS EFFECTED BY INTRODUCTION OF FARM MACHINERY FOR CLEARING, POSSIBLY IN AREAS WHERE AGRICULTURAL SUCCESS IS MARGINAL DUE TO ECOLOGICAL OR SOCIAL CONSTRAINTS.

THE SUCCESS OR FAILURE OF AGRICULTURAL DEVELOPMENT PROJECTS IS NOT ONLY BASED ON ECONOMIC COST/BENEFIT ANALYSIS, BUT ALSO ON ECOLOGICAL CONSTRAINTS THAT FREQUENTLY HAVE LONG-TERM CONSEQUENCES NOT READILY OBVIOUS TO ECONOMISTS OR EVEN AGRONOMISTS.

IT IS IMPORTANT TO REALIZE THAT EVEN IF ADVERSE IMPACTS AND/OR IRREVERSIBLE COMMITMENTS OF RESOURCES ARE LIKELY TO OCCUR AS A RESULT OF THE

PROJECT, IT DOES NOT MEAN THE PROJECT OR ACTIVITY CAN NOT PROGRESS. THE ROLE OF THE ENVIRONMENTAL ASSESSMENT IS TO HELP DECISION MAKERS UNDERSTAND LIKELY CONSEQUENCES OF THE ACTIVITIES, MITIGATING ACTIONS THAT MIGHT BE TAKEN, AND ALTERNATIVE APPROACHES TO THE INTENDED GOALS. ITS PURPOSE IS TO PERMIT MORE INFORMED DECISIONS TO BE MADE IN THE CONTEXT OF THE DEVELOPMENT PRIORITIES OF HONDURAS. ENVIRONMENTAL IMPACT IS ONLY ONE OF SEVERAL FACTORS TO BE TAKEN INTO CONSIDERATION IN REACHING THE DECISION AS TO A PROJECT'S WORTHINESS. THE COMMITMENT IS TO ENSURE THAT THIS FACTOR IS EXAMINED IN A RESPONSIBLE AND DEFENSIBLE MANNER (USAID, 1979).

CONSEQUENTLY IT IS RECOMMENDED THAT (1) PROJECT IDENTIFICATION AND PREPARATION GUIDELINES INCLUDE ENVIRONMENTAL MANAGEMENT CRITERIA; (2) RESPONSIBILITIES OF THE NATURAL RESOURCES ADVISOR BE EXPANDED TO PROJECTS IN THE AGRICULTURAL DEVELOPMENT SECTOR AS WELL AS SCIENCE AND TECHNOLOGY; AND (3) SHORT-TERM COURSES AND SEMINARS BE PROVIDED FOR A.I.D. PROFESSIONALS TO SEE HOW ENVIRONMENTAL MANAGEMENT AIDS PROJECT PLANNING WHICH MAY AVOID A WASTED DEVELOPMENT EFFORT IN THE FUTURE.

5.0 AGRICULTURAL TRAINING CENTERS

THE INFORMATION PRESENTED HERE RESULTS FROM VISITS TO EAP AND ESNACFOR AND ANALYSIS OF AGRICULTURAL TRAINING (USAID, S.R.N., CONSUPLANE, 1978).

THE SIX AGRICULTURAL EDUCATIONAL SCHOOLS ARE THE SOURCE OF MOST OF THE PROFESSIONALS TRAINED IN TECHNICAL AGRICULTURE FOR THE PUBLIC AND PRIVATE SECTOR, (TABLE 7). FURTHERMORE, THE GRADUATES OF THESE TRAINING CENTERS FREQUENTLY BECOME INVOLVED IN PLANNING, EXTENSION, AGRARIAN REFORM OR FORESTRY WHERE A BACKGROUND IN SIMPLE LAND USE/LAND CAPABILITY IS USEFUL IN MAKING DECISION AND IMPLEMENTING SPECIFIC PROJECTS. HOWEVER WITH THE EXCEPTION OF THE NATIONAL FORESTRY SCHOOL THERE IS LITTLE EMPHASIS IN ENVIRONMENTAL MANAGEMENT THAT TEACHES PRACTICAL LIFE ZONE ECOLOGY, LAND USE CAPABILITY CLASSIFICATION, OR APPROPRIATE TECHNOLOGIES FOR SMALL FARMERS. THE NATIONAL FORESTRY SCHOOL IS JUST OFFERING A MULTIPLE-USE FORESTRY COURSE THAT WILL INCLUDE ASPECTS OF AGRO-FORESTRY, NURSERIES, PASTURE MANAGEMENT, FRUIT CULTURE, SMALL ANIMAL PRODUCTION AND FUELWOOD PRODUCTION.

THEREFORE IT IS RECOMMENDED AN ENVIRONMENTAL MANAGEMENT COMPONENT BE INCORPORATED INTO THE EXISTING TRAINING INSTITUTIONS THAT INCLUDES HILLSIDE FARMING AND SMALL FARMER TECHNOLOGIES, AGRO-SILVO-PASTURE PRACTICES, AND PRACTICAL APPLICATION OF THE LAND CAPABILITY CLASSIFICATION SYSTEM.

TABLE 7: AGRICULTURAL TRAINING CENTERS IN HONDURAS

TRAINING CENTER	TOTAL YEARS EDUCATION OF GRADUATES	TITLE	GRADUATES/YR. BY '80/81
JOHN F. KENNEDY	13	AG TECHNIION	45-55
NATIONAL AGRICULTURAL SCHOOL (CATACAMAS)	15	BACHILLER	70-90
NATIONAL FORESTRY SCHOOL (SIGUATEPEQUE)	15	FORESTER	35
MENONITE SCHOOL	10	ASSISTANT AGRONOMIST	10
PANAMERICAN AGRICULTURAL SCHOOL (ZAMORANO)	15	AGRONOMIST	35
CURLA (CENTRO UNIVERSITARIO DEL LITORAL ATLANTICO) (LA CEIBA)	16	AGRONOMIST FORESTER	70 70
		TOTAL	335 - 365

SOURCE: MARTINEZ, JOSE L. 1977. ESCUELAS AGRICOLAS DE HONDURAS, OFERTA Y DEMANDA DE RECURSOS HUMANOS A NIVEL MEDIO Y SUPERIOR. USAID.

6.0 RECOMMENDATIONS

6.1 GENERAL

- A) DESIGN A LEGAL BASIS TO IMPLEMENT A COMMON LAND USE CRITERIA FOR ALL INSTITUTIONS DEALING WITH AGRICULTURAL/FORESTRY DEVELOPMENT (CONSUPLANE, SRN, INA, COMDEFOR, IHMA, IHCAFÉ, BANADESA). THIS MEANS AN AGRO-SILVO-PASTORIL INTEGRATED LAND USE POLICY THAT WILL APPLY SIMULTANEOUSLY TO AGRARIAN REFORM, AS WELL AS FORESTRY, COASTAL ZONE, AND WILDLANDS MANAGEMENT.
- B) PROMOTE PROJECTS THAT INCORPORATE ENVIRONMENTAL MANAGEMENT PRACTICES SUCH AS SOIL CONSERVATION, WATERSHED MANAGEMENT, APPROPRIATE TECHNOLOGIES AND CROPPING SYSTEMS FOR SMALL FARMERS WHO TEND TO BE UTILIZING marginally productive lands.
- C) PROMOTE PROJECTS THAT INTENSIFY AGRICULTURAL PRODUCTION BASED ON SOPHISTICATED AND HIGH ENERGY INPUT TECHNOLOGIES ONLY ON THE BEST FERTILE SOIL AVAILABLE.

- D) INCORPORATE INTO THE EXISTING TRAINING INSTITUTIONS (EAP, CURLA, ESNACIFOR, ENA, EAJFK) A COMPONENT OF ENVIRONMENTAL MANAGEMENT THAT INCLUDES AGRO-SILVO-PASTURE PRACTICES, HILLSIDE FARMING, AND SMALL FARMER TECHNOLOGIES. ENVIRONMENTAL EDUCATION SHOULD ALSO BE MADE AVAILABLE TO AGRICULTURAL EXTENSION AGENTS SINCE THEY HAVE THE GREATEST CONTACT WITH THE RURAL POPULATION TARGET GROUP.
- E) ANY DEMONSTRATION OF EROSION CONTROL, CROPPING SYSTEMS, OR APPROPRIATE TECHNOLOGIES SHOULD BE IMPLEMENTED ON PRIVATE LANDS RATHER THAN GOVERNMENT AGRICULTURAL EXPERIMENT STATIONS OR MODEL FARMS.
- F) ENCOURAGE THE IMPLEMENTATION OF A LAW THAT REGULATES PESTICIDE FORMULATION, IMPORTATION, UTILIZATION, AND ESTABLISHES SAFEGUARDS TO AVOID WATER CONTAMINATION AND HUMAN POISONING.
- G) IN COFFEE GROWING AREAS, CROP DIVERSIFICATION SHOULD BE ENCOURAGED ALLOWING SMALL FARMER TO PLANT FRUIT TREES OR OTHER ADAPTED CROPS IN ORDER TO DECREASE THE DEPENDENCE ON COFFEE.

6.2 RECOMMENDATIONS TO USAID/HONDURAS

- A) SUPPORT ADVISORY SERVICES FOR THE DESIGN OF RESEARCH AND DEVELOPMENT IN INTEGRATED PEST MANAGEMENT FOR COTTON PRODUCTION AS WELL AS VEGETABLE CROP PRODUCTION.
- B) AVOID PROMOTION OF NEW HOST COUNTRY INSTITUTIONAL BUREAUCRACIES, BUT RATHER STRENGTHEN EXISTING STRUCTURE SO THAT ENVIRONMENTAL MANAGEMENT POLICIES CAN BE IMPLEMENTED.
- C) DEVELOP PROJECT PREPARATION GUIDELINES THAT INCLUDE ENVIRONMENTAL MANAGEMENT CRITERIA (I.E. LAND USE, LAND CAPABILITY, CROPPING PATTERNS, APPROPRIATE TECHNOLOGIES, WATER AND SOIL CONSERVATION PRACTICES, ETC.) TO BE INCORPORATED AT INITIAL STAGES OF PLANNING. OVERALL ENVIRONMENTAL ASSESSMENT PROCEDURES INCLUDING SOCIAL, ECONOMIC AND NATURAL RESOURCE IMPACTS NEEDS TO BE REVIEWED SO THAT FORMALIZED EVALUATION DOES NOT DETER PROJECT DEVELOPMENT, BUT TAKES A HARD LOOK AT ITS APPROACH AND LONG-TERM CONSEQUENCES.
- D) INCREASE THE MISSION'S AWARENESS OF ENVIRONMENTAL MANAGEMENT BY EXPANDING THE RESPONSIBILITIES OF THE NATURAL RESOURCE ADVISOR TO PROJECTS NOT SOLELY RESTRICTED TO SCIENCE AND TECHNOLOGY, BUT TO THE AGRICULTURAL DEVELOPMENT SECTOR THAT DEALS WITH LAND, WATER AND HUMAN RESOURCES FOR PRODUCTION SYSTEMS.

E) PROVIDE A SHORT-TERM COURSE OR SERIES OF SEMINARS FOR A.I.D. PROFESSIONALS THAT EXPLAINS HOW ENVIRONMENTAL MANAGEMENT FITS INTO THE PROJECT PLANNING PROCESS AND CAN HELP AVOID A WASTED DEVELOPMENT EFFORT IN THE FUTURE.

7.0 BIBLIOGRAPHY

- ANDERSON, D. 1977. PROBLEMS AND CONSTRAINTS WITHIN THE PUBLIC SECTOR IN HONDURAS. STUDY REPORT PREPARED FOR USAID/HONDURAS 77 PGS.
- ANONYMOUS, 1979. HOOFPRINTS IN THE FOREST. USAID CONTRACT.
- BIRF, BID, A.I.D., 1978. ESTUDIO DEL SECTOR AGROPECUARIO/RURAL - VOL. II. DOCUMENTOS DE TRABAJO. INFORME NO. 971-HO.
- BETANCOURT, J. AND P. DULIN, (EDS.) 1978. PLAN DE USO MULTIPLE - LAGO DE YOJGA, SEGUNDA FASE, PROYECTO INTERINSTITUCIONAL - CONDEFOR, RENARE, CATIE, FAO, UNPD.
- CONSUPLANE, 1978. PLAN NACIONAL DE DESARROLLO - SECTOR AGROPECUARIO; ORDENAMIENTO DEL MEDIO AMBIENTE.
- CONSUPLANE, 1980. DIRECCION GENERAL DE ESTADISTICAS Y CENSUS.
- FAO, 1977. HONDURAS - INFORME AL GOBIERNO DE HONDURAS SOBRE LOS SUELOS DE HONDURAS. 92 PGS.
- GLICK, D. 1980. RIO PLATANO BIOSPHERE RESERVE CASE STUDY. ANN ARBOR, MICHIGAN. 120 PGS.
- HART, R.D. 1979. AGROECOSISTEMAS. CATIE TURRIALBA, COSTA RICA. 209 PGS.
- HOLDRIDGE, L.P. 1962. MAPA ECOLOGICO DE HONDURAS. TROPICAL SCIENCE CENTER, SAN JOSE, COSTA RICA
- ICAITI 1976. ESTUDIO DE LAS CONSECUENCIAS AMBIENTALES Y ECONOMICAS DEL USO DE PLAGUICIDAS EN LA PRODUCCION DE ALGODON DE CENTROAMERICA. GUATEMALA. 335 PGS.
- INA 1978. RESUMEN DE DATOS GENERALES DEL SECTOR REFORMADO - DEPTO DE PLANIFICACION - SECCION DE ESTADISTICA E INFORMACION. 35 PGS.
- INA, CONSUPLANE, ST-C.P.A. 1980. PROPUESTA SOBRE MEDIDAS A TOMAR POR EL GOBIERNO PROVISIONAL PARA ACELERAR EL PROCESO DE REFORMA AGRARIA.
- INA, 1980. PLAN OPERATIVO ANUAL Y PRESUPUESTO 1981. 182 PGS.
- KRAMER, J.M. AND J. ARCALEO, 1980. MANAGEMENT OF THE CHOLUTECA RIVER WATERSHED: SUPPLEMENT 1 TO THE NATURAL RESOURCES MANAGEMENT PROJECT PAPER. USAID.
- MAB, 1981. DRAFT ENVIRONMENTAL PROFILE OF HONDURAS PREPARED BY OFFICE OF ARID LANDS STUDIES, UNIVERSITY OF ARIZONA, TUCSON. 110 PGS.

MAB, 1981. DRAFT ENVIRONMENTAL PROFILE OF HONDURAS. 110 PGS.

MARTINEZ, JOSE L. 1977. ESCUELA AGRICOLAS DE HONDURAS, OFERTA Y DEMANDA DE RECURSOS HUMANOS A NIVEL MEDIO Y SUPERIOR. USAID.

MINISTERIO DE ECONOMIA, 1980. COMERCIO EXTERIOR DE HONDURAS - 1978 - TOMO II. DIRECCION GENERAL DE ESTADISTICA Y CENSOS.

MYERS, N. 1981. THE HAMBURGER CONNECTION: HOW CENTRAL AMERICA'S FORESTS BECOME NORTH AMERICA'S HAMBURGER. AMBIO VOL. 10 (1): 3-8

S.R.N. 1977. LA PERDIDA DE LOS RECURSOS NATURALES Y LA EROSION EN HONDURAS. WORKING PAPER PREPARED FOR THE MINISTER OF NATURAL RESOURCES. 56 PGS.

S.R.N. 1979. MEMORIA (BOOKLET DESCRIBING MINISTRY ORGANIZATION AND PROGRAMS).

S.R.N. 1980. BIBLIOGRAFIA AGRICOLA DE HONDURAS 1977-79

USAID/ROCAP, 1966. HONDURAS - NATIONAL INVENTORY OF PHYSICAL RESOURCES OF CENTRAL AMERICA AND PANAMA. 32 PGS AND 32 MAPS (A.I.D./RIC G1PR NO. 5).

USAID, 1976. HONDURAS - SMALL FARMER TECHNOLOGIES. 85 PGS.

USAID, 1978. AGRICULTURE SECTOR ASSESSMENT FOR HONDURAS.

USAID, S.R.N., CONSUPLANE, 1978. COMPLICACION DE LOS ESTUDIOS BASICOS DEL DIAGNOSTICO DEL SECTOR AGRICOLA. TOMO I, II.

USAID, 1979. REVISED ENVIRONMENTAL PROCEDURES AND PRESENTLY ACCEPTABLE ACTIONS. DEPT. OF STATE - AIRGRAM.

USAID, 1980. LAND REFORM LOAN/GRANT PID - USAID/HONDURAS.

8.0 PERSONS CONTACTED

AGUILAR DE, LIC. ROSA AMERICA - PLANNING - INA

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HONDURAS
ENVIRONMENTAL PROFILE
CHAPTER III

MANAGEMENT OF HONDURAN FOREST RESOURCES

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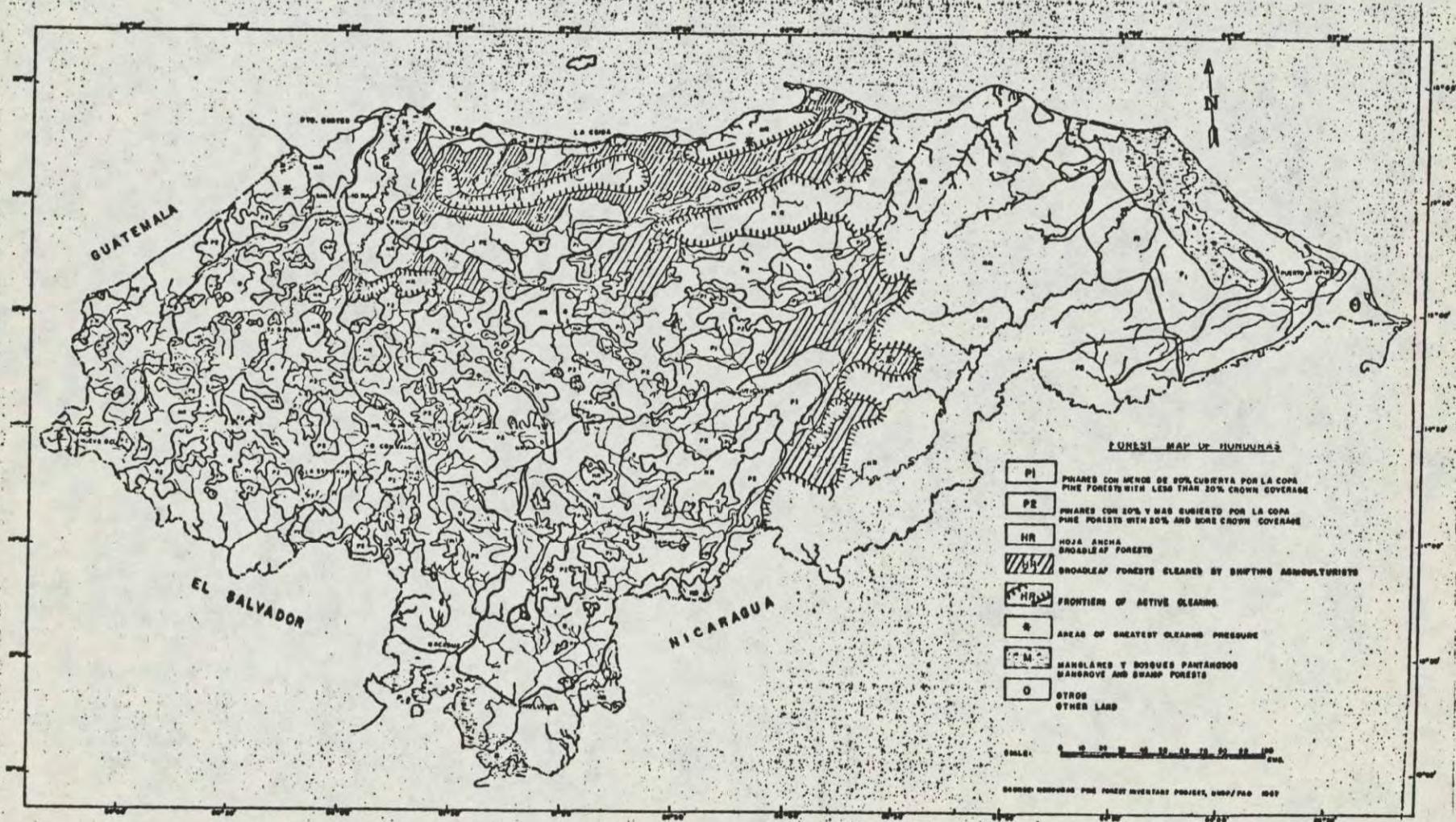
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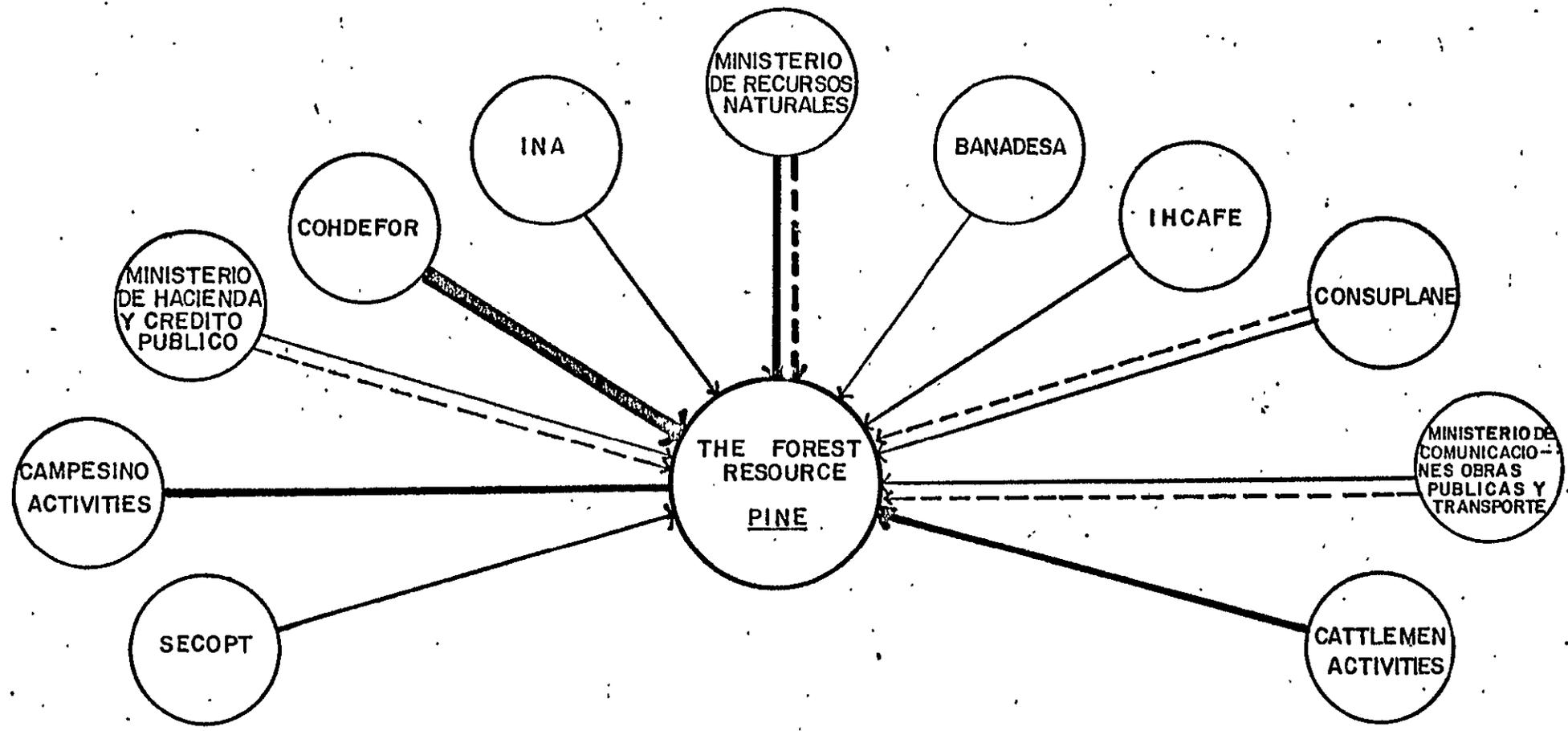
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MAJOR SOURCES OF IMPACT ON PINE FOREST RESOURCES



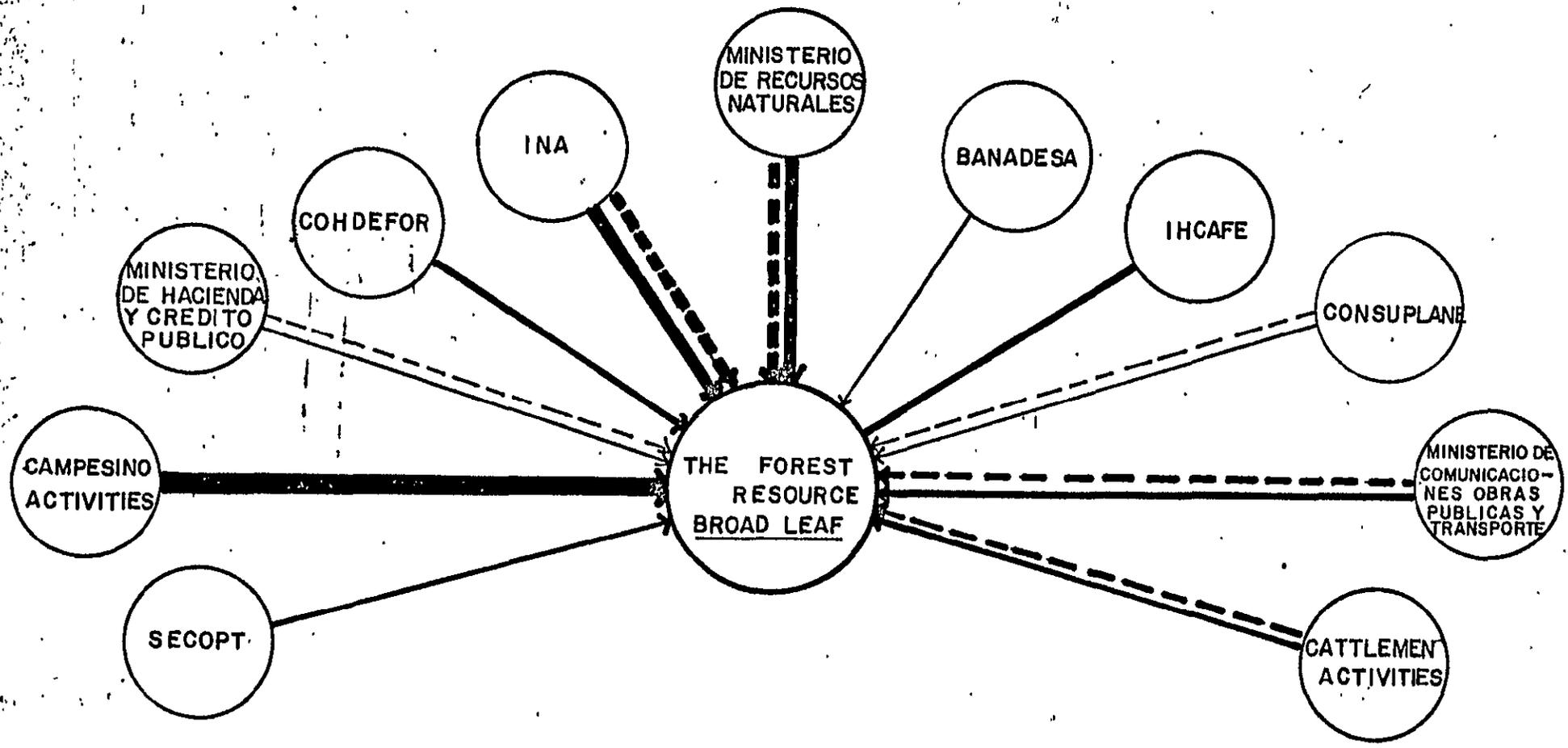
SOLID LINES INDICATE DIRECT IMPACT
 BROKEN LINES INDICATE INDIRECT IMPACT
 WIDTH OF THE LINE INDICATES RELATIVE MAGNITUDE OF IMPACT.

FIGURE 1

43

Mantel

MAJOR SOURCES OF IMPACT ON BROAD LEAF FOREST RESOURCES



SOLID LINES INDICATE DIRECT IMPACT
BROKEN LINES INDICATE INDIRECT IMPACT
WIDTH OF THE LINE INDICATES RELATIVE MAGNITUDE OF IMPACT

FIGURE 2

44

PROJECT IMPACT MATRIX

Mar 11
Exhibit 7

PROJECT COMPONENTS	ENVIRONMENTAL COMPONENTS	PHYSICAL ENVIRONMENT								BIOLOGICAL ENVIRONMENT								SOCIAL ENVIRONMENT													
		AGRICULTURAL LANDS	SOIL EROSION	SLOPE STABILITY	ENERGY MINERAL RESOURCES	SURFACE WATER QUANTITY	SURFACE WATER QUALITY	GROUND WATER QUANTITY	GROUND WATER QUALITY	AIR QUALITY	NOISE	AQUATIC ECOSYSTEMS	WETLAND ECOSYSTEMS	TERRESTRIAL ECOSYSTEMS	ENDANGERED SPECIES	MIGRATORY SPECIES	BENEFICIAL SPECIES	BENEFICIAL PLANTS	PEST PLANTS	PEST ANIMALS	DISEASE VECTORS	PUBLIC HEALTH	RESOURCES / LAND USE	DISTRIBUTION SYSTEMS	EMPLOYMENT	AT-RISK POPULATIONS	MIGRANT POPULATIONS	COMMUNITY POPULATIONS	CULTURAL/RELIGIOUS VALUES	TOURISM / RECREATION	NUTRITION
PLANNING & DESIGN																															
CONSTRUCTION																															
OPERATION																															

1. THE FOREST RESOURCE

1.1 CONDEFOR (CORPORACION HONDURENA DE DESARROLLO FORESTAL), THE NATIONAL FOREST SERVICE OF HONDURAS, ESTIMATED IN 1974 THE FOREST RESOURCES TO BE:

- A. 7,400,000 HECTARES OF FOREST LAND IN THE FOLLOWING CONDITIONS: 68% CONTAINING PRODUCTIVE FOREST; THE REST DEGRADED FOREST FROM INDUSTRIAL EXPLOITATION; AGRICULTURE, AND GRAZING; AND IN MANGROVE AND SECOND GROWTH BRUSH.
- B. 4,400,000 HECTARES OF BROAD LEAF FOREST.
- C. 3,000,000 HECTARES OF PINE FOREST.

BROADLEAF FOREST ARE PRIMARILY LOCATED IN THE DEPARTMENTS OF OLANCHO, GRACIAS A DIOS, CORTES, EL PARAISO AND YORO. MOST OF OTHER AREAS OF BROADLEAF FOREST ARE SMALL ISOLATED UNITS USUALLY ON HIGH MOUNTAINS OR OTHER AREAS OF DIFFICULT ACCESS. PINE FORESTS ARE LOCATED IN THE DEPARTMENTS OF FRANCISCO MORAZAN, COMAYAGUA, OLANCHO, COPAN, YORO, EL PARAISO AND GRACIAS A DIOS.

1.1.1 THE BROAD LEAF FOREST.

THE PRINCIPAL COMMERCIAL SPECIES FOUND IN THE BROADLEAF FOREST ARE NAMED IN APPENDIX 1. THOSE MOST IMPORTANT FOR EXPORT ARE CAOBA (*SWietenia macrophylla*), CEDRO (*CERBELA MEXICANA*), GRANADILLO (*DALBERGIA INCUBENSIS*), AND NOGAL (*JUGLANS OLANCHANA*). ALSO IMPORTANT ARE GUANACASTE (*ETEROLOBIUM CYCLOCARPUM*), CORTES (*IABERUIA GUAYACAN*) AND LAUREL (*CORDIA ALLIARORA*).

ALL THESE ARE USED DOMESTICALLY FOR FURNITURE AND HOUSE CONSTRUCTION. IN ADDITION SAN JUAN (*VOCHYSIA HONDURENSIS*) IS WIDELY USED. APPENDIX 1 GIVES A BREAKDOWN OF USES FOR MANY SPECIES FOUND IN HONDURAS INTO THE AREAS OF VALUABLE, POTENTIAL VALUABLE AND LOW VALUE.

OTHER SPECIES PROVIDE GUMS, RESINS AND MEDICINES. OF NOTE ARE LIQUIDAMBAR (*LIQUIDAMBAR STYRACIOLUA*) WHICH PRODUCES A RESIN AND MANGROVE (SEVERAL SPECIES) WHICH IS USED AS A SOURCE OF TANNIN, ESPECIALLY IN THE SOUTH OF HONDURAS.

FUELWOOD IS VERY IMPORTANT FOR THE PEOPLE OF HONDURAS. IT IS THE PRINCIPAL COOKING FUEL USED BY THE POOR. ESTIMATES OF IT'S USE ARE OVER 5,500,000 CUBIC METERS PER YEAR, OR 5 TIMES THAT USED FOR ALL COMMERCIAL WOOD PRODUCTION. (CONDEFOR, 1979). THIS WOOD IS PRIMARILY FROM BROADLEAF SPECIES BUT PINE IS USED AT TIMES. THE PREFERRED SPECIES IS OAK (*QUERCUS* spp) BUT MANY OTHER SPECIES ARE COMMONLY USED. THE WOOD IS USUALLY USED SPLIT AND DRIED, WITH CHARCOAL ONLY USED OCCASIONALLY AND MOSTLY IN THE CITIES. AT TEGUCIGALPA THE SURROUNDING HILLSIDE HAVE BEEN DISNUDED OF TREES. PHOTOGRAPHS OF THE CITY IN 1905 SHOW THE HILLS WELL FORESTED WITH PINE AND HARDWOODS. ONLY GRASS REMAINS NOW.

THE BROADLEAF FOREST IS UNDER ATTACK FROM ALL SIDES. THE CAMPESINO (PEASANT FARMER) LOOKS TO THE BROADLEAF FOREST AS THE SOURCE OF FUTURE FARM LAND. THE CATTLEMAN FEELS THAT THE FOREST IS AN IMPEDIMENT TO DEVELOPMENT OF THE CATTLE INDUSTRY OF HONDURAS. THE AVERAGE HONDURAN LOOKS UPON THE UNEXPLOITED FOREST AS A SIGN OF UNDERDEVELOPMENT.

COMMERCIAL USE OF HARDWOODS IS LIMITED BECAUSE OF THE SMALL

DOMESTIC MARKET AND A GENERAL APATHY ABOUT DEVELOPING AN EXPORT MARKET. MOST MILLS ONLY TAKE ABOUT 10% OF THE VOLUME, INCLUDING MAHAGONY (CAOBA) AND A FEW OTHER SPECIES, LEAVING THE REST OF THE SPECIES BEHIND AS NON-MERCHANTABLE. BUT ROPER (1981) ESTIMATES THAT APPROXIMATELY 50% OF THE STANDING VOLUME IS MERCHANTABLE.

THE GREATEST DANGER TO THIS BROADLEAF FOREST IS THE CAMPESINO PRACTICING SHIFTING AGRICULTURE FOLLOWED BY THE CATTLEMAN WHO CONVERTS THE NEWLY CLEARED AREAS TO PASTURE. NOT ONLY IS THE FOREST LOST BUT ALSO THE WOOD IS BURNED ON THE SPOT SO EVEN THE IMMEDIATE INCOME FROM THE VALUABLE SPECIES IS NOT REALIZED. ESTIMATES OF REMAINING VIRGIN BROADLEAF FOREST INDICATE THAT MORE THAN 2,000,000 HECTARES HAVE BEEN LOST SINCE 1960. (TROENGAARD, 1980) THE RATE OF CLEARING IS ESTIMATED AT OVER 80,000 HECTARES EACH YEAR OR 4% OF THE REMAINING FOREST. (ROPER, 1981) IF THIS CONTINUES THE LAST REMAINING BROADLEAF WILL DISAPPEAR WITHIN 25 YEARS, A LOSS OF INESTIMABLE VALUE. THE WOOD ALONE HAS AN ESTIMATED PRESENT VALUE OF OVER \$4,000 PER HECTARE OR A YEARLY LOSS OF \$320,000,000. VALUES FOR WATERSHED, SOIL PROTECTION, WILDLIFE, CAN BE ASSUMED TO BE GREAT.

THE PROGNOSIS FOR THE BROADLEAF FOREST IS EXTREMELY POOR. PRESSURES ARE GREAT, SOCIALLY, ECONOMICALLY, AND POLITICALLY. WITHOUT A CHANGE IN THE PRIORITIES OF HONDURAS AND THE INTERNATIONAL ORGANIZATIONS SPONSORING DEVELOPMENT PROGRAMS THE PRESSURE WILL INCREASE ON THE VIRGIN BROADLEAF FOREST.

1.1.2 THE PINE FOREST.

PRINCIPAL SPECIES OF CONIFERS IN HONDURAS ARE PINUS CARIBEAE, PINUS OCCARPA, AND PINUS PSEUDOSTROBUS, THE DIFFERENT SPECIES ARE DISTRIBUTED BY ALTITUDE WITH PINUS CARIBEAE FROM 0-600 METERS, PINUS OCCARPA FROM 500 - 1100 METERS AND PINUS PSEUDOSTROBUS FROM 900 METERS TO. PINUS OCCARPA HAS THE GREATEST RANGE AND VOLUME AND IS THE MAJOR SOURCE OF PINE WOOD PRODUCED IN THE COUNTRY, ALTHOUGH ALL SPECIES ARE USED. PINUS PSEUDOSTROBUS HAS THE SMALLEST RANGE AND VOLUME. THE LARGEST STANDS OF PINUS CARIBEAE ARE FOUND IN THE DEPARTMENT OF GRACIAS A DIOS AND IN OLANCHO IN THE CULMI AREA.

THE WOOD PRODUCED FROM THESE SPECIES IS SOLD AS YELLOW PINE OR PITCH PINE ON THE INTERNATIONAL MARKET. IT HAS CHARACTERISTICS VERY SIMILAR TO WOOD FROM THE SOUTHERN PINE SPECIES OF THE UNITED STATES. THE MAJOR MARKETS FOR THE WOOD OF HONDURAS IS THE CARIBBEAN, VENEZUELA, AND EUROPE.

OTHER COMMERCIAL PRODUCTS OF THE PINE FOREST ARE GUM RESIN, PINE SEED AND TO A LESSER EXTENT FIREWOOD. RESIN IS PARTIALLY REFINED IN HONDURAS THEN SOLD TO THE INTERNATIONAL NAVAL STORES MARKET. SEED IS COLLECTED FROM THE FOREST AND USED FOR DOMESTIC REFORESTATION PROGRAMS AND EXPORTED TO MORE THAN 30 COUNTRIES.

THE AREA OF THE PINE FORESTS HAVE NOT DIMINISHED APPRECIABLY SINCE THE 1964 INVENTORY. (TROENSEGAARD, 1980, FAO, 1968). THE VOLUME OF THE STANDING TIMBER HAS BEEN REDUCED FROM 48 MILLION CUBIC METERS IN 1964 TO AN ESTIMATED 28 MILLION CUBIC METERS IN 1980. (TROENSEGAARD, 1980) THIS INDICATES A FAR DIFFERENT PROBLEM EXISTS IN THE PINE FOREST THAN IN THE HARDWOOD FOREST. CUTTING, BOTH COMMERCIAL AND NON-COMMERCIAL, IS REDUCING THE DENSITY OF THE PINE FOREST. MOST COMMERCIAL EXPLOITATION IS IN MATURE FORESTS. THESE ARE RAPIDLY BEING CUT OVER WITH THE ONLY REMAINING EXTENSIVE STANDS BEING IN OLANCHO AT THE CORFINO RESERVES.

NON-COMMERCIAL CUTTING IS PRINCIPALLY FOR FUELWOOD USED PRINCIPALLY FOR BURNING LIME IN THE AREA OF SIGUATEPEQUE.

THE SECOND GROWTH STANDS ARE EXPLOITED FOR FENCE POSTS, LIGHT POSTS, FUELWOOD, TABACCO STAKES, ETC.

THE PINE FORESTS ARE NOT GOING TO DISAPPEAR FROM HONDURAS. MAN'S ACTIVITIES ARE INSTRUMENTAL IN THE WIDE DISTRIBUTION OF PINE IN HONDURAS. REPEATED FIRES, AGRICULTURAL ACTIVITIES AND GRAZING AID IN SPREADING THESE SUCCESSIONAL SPECIES. NATURAL DISASTERS ALSO HELP PINE SPREAD TO NEW AREAS. FOR EXAMPLE MANY AREAS ON THE NORTH COAST DENUDED BY HURRICANE FIFI IN 1974 HAVE COME BACK IN PURE PINE STANDS. AREAS EASILY SEEN FROM THE HIGHWAY BETWEEN TELA AND LA LIMA WHERE MASIVE SLIDES OCCURED IN 1974 ARE ALMOST FULLY COVERED BY PINUS CARIBBEAE.

PINE IS THE MAJOR SOURCE OF WOOD FOR THE HONDURAN SAWMILL INDUSTRY. IT IS THE MOST ACCESSIBLE AND CONVERTABLE TO A PRODUCT READILY ACCEPTABLE ON WORLD MARKETS. OF THE 241.5 MILLION BOARD FEET OF LUMBER EXPORTED FROM HONDURAS IN 1980 237 MILLION BOARD FEET WAS PINE. (COHDEFOR, 1981) THIS INDUSTRIAL ACTIVITY GIVES EMPLOYMENT TO MORE THAN 36,000 PEOPLE (COHDEFOR, 1979). WHEN THE MATURE PINE RUNS OUT, IF THE SECOND GROWTH FOREST IS NOT READY FOR PRODUCTION, THE INDUSTRIAL WOOD SECTOR WILL FACE SEVERE DISRUPTION OF PRODUCTION. ESTIMATES OF THE PRESENT CUTTING AND THE RATE OF REGROWTH OF THE FORESTS INDICATE THAT AFTER THE MATURE PINE FOREST IS GONE IN A APPROXIMATELY 18 YEARS COMMERCIAL PRODUCTION WILL STOP AND NOT BE ABLE TO RESUME FOR APPROXIMATELY 18 YEARS. (TROENSEGAARD, 1980). THIS ASSUMPTION IS BASED ON THE PRESENT GROWTH OF THE SECOND GROWTH STANDS AFFECTED BY FIRE; EARLY CUTTING OF THE STAND FOR USES SUCH AS POSTS; GRAZING; OR AGRICULTURE.

GOOD FOREST MANAGEMENT COULD ENCOURAGE REGROWTH BY PREVENTING DISTRUCTIVE FIRES, REFORESTATION, CONTROLLING EXPLOITATION, THINNING, AND CONTROLLING DISTRUCTIVE PRACTICES SUCH AS CLEARING FOR MARGINAL AGRICULTURE. BETTER UTILIZATION OF THE RAW MATERIAL WOULD MATERIALLY INCREASE THE LIFE OF THE MATURE STAND. ESTIMATES OF 60% WASTE OF THE USEABLE MATERIAL IN STANDING TIMBER MAY BE LOW. (CLIFF, 1980). WASTE OF RECOVERABLE WOOD AT THE MILL MAY BE AS HIGH AS 50%. (YERKES, 1981).

IF BETTER UTILIZATION OF THIS MATERIAL COULD BE MADE THE LIFE OF THIS IMPORTANT INDUSTRY COULD BE EXTENDED TO COVER THE GAP OF 18 YEARS, ESPECIALLY IF FOREST MANAGEMENT PRACTICES WERE IMPROVED TO BRING THE SECOND GROWTH FOREST UP TO THEIR POTENTIAL FOR PRODUCTION.

2. MAJOR PROBLEMS

2.1 THE FOUR MAJOR PROBLEMS THAT DIRECTLY INFLUENCE CONDITION FOUND IN THE FORESTS OF HONDURAS ARE:

- A. SHIFTING AGRICULTURE
- B. GRAZING OF CATTLE
- C. UNDERUTILIZATION OF THE RAW MATERIAL
- D. LACK OF OR POOR COMMUNICATIONS BETWEEN THOSE ORGANIZATIONS INFLUENCING THE DEVELOPMENT OF HONDURAS.

EACH PROBLEM WILL BE DISCUSSED WITH ITS ACCOMPANIED SUB-PROBLEMS. AN ATTEMPT WILL BE MADE TO POINT OUT THE ROOTS OF THE SITUATION NOW FACING THE FOREST RESOURCE OF THIS COUNTRY.

2.1.1 SHIFTING AGRICULTURE

THROUGHOUT THE WORLD THIS PROBLEM IS RECOGNIZED AS PERHAPS THE MOST DESTRUCTIVE OF ALL. BUT IT IS WELL INGRAINED INTO THE CULTURE OF THE CAMPESINO OF HONDURAS. IT CANNOT BE ELIMINATED. IT CAN BE CONTROLLED.

REASONS FOR SHIFTING AGRICULTURE MOVING INTO VIRGIN FORESTS ARE GIVEN AS POPULATION GROWTH REQUIRING NEW LANDS; LOW OPPORTUNITY FOR WORK IN THE INDUSTRIAL SECTOR; AND THE SCARCITY OF LAND THAT IS APT FOR AGRICULTURE. OTHER REASONS THAT ARE ALSO IMPORTANT ARE THE DISPLACEMENT OF PEOPLE BY LARGE AGRICULTURE DEVELOPMENT PROJECTS THAT UTILIZE NATIONAL LAND FOR PERMANENT AGRICULTURE SUCH AS GROWING AFRICAN OIL PALM. PEOPLE WHO WERE PRACTICING SHIFTING AGRICULTURE ON THESE LANDS ARE FORCED TO FIND OTHER LANDS. THEY COMMONLY MOVE INTO THE VIRGIN FORESTS. THE VALLEY OF THE AGUAN RIVER WAS DEVELOPED BY INA IN JUST THIS WAY. COOPERATIVES OF CAMPESINOS FORMED BY INA PLANTED OIL PALM, BANANAS, AND FRUIT TREES. THOSE CAMPESINOS WHO DID NOT WISH TO WORK WITH A COOPERATIVE OR DID NOT HAVE NECESSARY IDENTIFICATION PAPERS WERE FORCED TO MOVE. AVISINIA, A SMALL VILLAGE CLOSE TO THIS AREA, HAD ONLY 30 PEOPLE IN 1974 BUT BY 1977 HAD A POPULATION OF OVER 1200 AND IS STILL GROWING. (ROPER, 1981).

PEOPLE ARE ATTRACTED BY THE PROMISE OF EMPLOYMENT IN THESE AREAS. EMPLOYMENT OPPORTUNITIES ARE LIMITED AND USUALLY THESE PEOPLE GO ON TO THE MOUNTAINS.

ANOTHER PART OF THIS PROBLEM IS THE FACT THAT MANY PEOPLE IN HONDURAS DO NOT HAVE OFFICIAL IDENTIFICATION PAPERS. THIS IS COMPLICATED BY THE RECENT IMMIGRATION FROM EL SALVADOR AND NICARAGUA BECAUSE OF POLITICAL UNREST. ALL PEOPLE WITHOUT PAPERS ARE SUSPECT. HONDURAN LAW REQUIRES PEOPLE TO HAVE OFFICIAL PAPERS BEFORE THEY CAN BE EMPLOYED OR PARTICIPATE IN ANY GOVERNMENT ACTIVITY SUCH AS COOPERATIVES, ASSOCIATIONS OR AGRICULTURAL REFORM. A NUMBER OF THESE PEOPLE LIVING IN THE MOUNTAINS AND MOST OF THOSE ACTUALLY CUTTING THE VIRGIN BROADLEAF DO NOT HAVE PAPERS.

THESE PEOPLE CANNOT RECEIVE THE BENEFITS OF LAND SETTLEMENT OR REDISTRIBUTION AND ARE ACTUALLY DISPLACED BY AND FORCED TO MOVE AHEAD OF GOVERNMENT SERVICES. PEOPLE WITHOUT PAPERS FORM THE VANGUARD OF DESTRUCTION IN THE BROADLEAF FOREST. IN THE PINE FOREST THESE PEOPLE FEEL THAT THEY ARE NOT ALLOWED TO GAIN FROM THE USE OF THE FOREST. THEY CANNOT BECOME MEMBERS OF RESINATION COOPERATIVES, BECOME EMPLOYED BY COHDEFOR EXCEPT FOR SHORT-TERM (LESS THAN 25 DAYS) PICK-UP LABOR OR PARTICIPATE IN ANY OTHER SCHEME TO BENEFIT THE RURAL POOR. THE RESENTMENT THESE PEOPLE FEEL IS REAL AND SERIOUS. MURRAY, 1981 DESCRIBES WELL THE CONDITIONS OF A GROUP IN YORO. ONE CONCRETE EXAMPLE OF THE PROBLEM IS IN RIO CHIQUITO IN OLANCHO. WHEN COHDEFOR NEEDS SHORT-TERM LABOR THEY MUST HIRE IN TOCOA AND TRANSPORT WORKERS OVER 40 KILOMETERS TO WORK AROUND VILLAGES WHERE MEN ARE UNEMPLOYED BUT DO NOT HAVE PAPERS. THESE MEN ARE UNDERTANDABLY UPSET AND REFUSE TO GIVE COOPERATION TO THE PROGRAMS OF COHDEFOR.

2.1.2 GRAZING OF CATTLE

THIS PROBLEM IS CLOSELY RELATED TO THE PREVIOUS ONE. SHIFTING

AGRICULTURE HAS SEVERAL PHASES. THESE START WITH CLEARING THE VIRGIN FOREST THE A CROP PRODUCTION PERIOD FOLLOWED BY A FALLOW PERIOD. THE CROPPING FOLLOWED BY FALLOW WILL CONTINUE UNTIL THE CAMPESINO DECIDES TO SELL HIS IMPROVEMENTS BY SOWING GRASS THUS CONVERTING THE AGRICULTURE LAND TO GRAZING (MURRAY, 1981). A CATTLEMAN WILL THEN PURCHASE THIS "IMPROVED" GRAZING LAND. THE CAMPESINO VIEWS LAND CONVERTED TO GRAZING LAND AS IRREVERSIBLY REMOVED FROM AGRICULTURALLY SUITABLE LAND. JERRY MURRAY'S REPORT TO USAID DOES AN EXCELLENT JOB OF DESCRIBING THIS PROCESS. FORMER AGRICULTURAL LAND ALL OVER HONDURAS HAS BEEN REMOVED FROM AGRICULTURAL PRODUCTION FORCING THE GROWING POPULATION OF POOR HONDURANS INTO THE VIRGIN FOREST OR TO THE URBAN AREAS. ONE LOOK AROUND TEGUCIGALPA OR SAN PEDRO SULA WILL EASILY VERIFY THIS. THE STATISTICS GIVEN EARLIER SHOW WHAT IS HAPPENING TO THE FOREST.

A SECOND DIRECT EFFECT OF GRAZING IS FIRE. MANY OF THE FIRES STARTED IN THE PINE FOREST EACH YEAR ARE TO IMPROVE GRAZING. PINE AREAS ARE GENERALLY OF VERY LOW PRODUCTIVITY. BUT THE YOUNG GRASS LEAVES PROVIDE TEMPORARY FEED AFTER THE FIRE. THESE FIRES GENERALLY CAUSE WIDESPREAD DESTRUCTION OF YOUNG PINE REGENERATION LESS THAN 3 YEARS OLD. WILDFIRE IS GENERALLY NOT A PROBLEM IN THE BROAD LEAF FOREST.

A THIRD DESTRUCTIVE ACTIVITY IS OCCURING IN OLANCHO. THE CATTLEMAN IS PAYING PEOPLE TO CUT AREAS OF VIRGIN FOREST, BURN IT AND THEN PLAN GASS DIRECTLY, PASSING THE PERIOD OF CROP PRODUCTION. THIS DESTRUCTIVE, WASTEFUL SYSTEM MUST BE STOPPED.

A PRINCIPAL CAUSE OF THIS PROBLEM IS THE OPEN EXPORT MARKET FOR BEEF. THE UNITED STATES HAS RECENTLY LIFTED THE QUOTA OF BEEF ALLOWED TO BE IMPORTED FROM HONDURAS. CATTLEMEN LOOKING FOR SHORT-TERM GAINS ARE TAKING ADVANTAGE OF THIS BY RAPIDLY EXPANDING PRODUCTION, PRINCIPALLY ON PREVIOUSLY FORESTED AREAS.

2.1.3 UNDERTULIZATION OF RAW MATERIAL

THE MAJOR PART OF THE COMMERCIAL WOOD COMES FROM THE PINE FOREST. WASTE STARTS AT THE STUMP. ONLY THE VERY BEST TREES ARE TAKEN. FROM THESE ONLY THE BEST LOGS. LOGS ARE CUT INACCURANTLY OFTEN 8 OR MORE INCHES TOO LONG. THIS RESULTS IN EXCESS TRIM OFTEN 8-10% OF THE LOG VALUE. IF ANY DEFECT SUCH AS ROT IS FOUND THE LOG IS LEFT BEHIND. (YERKES, 1981).

WASTE IS COMMON THROUGHOUT THE WOOD OPERATION AND CONTINUES INTO THE MILL. AS REFERRED TO EARLIER AS MUCH AS 50% OF THE RECOVERABLE WOOD BROUGHT TO THE MILL IS LOST BY OVER SIZEING, POOR SAWING METHODS AND BAD MAINTENANCE OF THE MILLING EQUIPMENT. NOMINAL SIZE 2 X 4'S ARE OFTEN CUT TO 2 1/2 X 5 INCHES. THIS IS DONE SO THAT MINIMUM SIZES CAN STILL BE REACHED WITH THE BADLY MAINTAINED SAW MILL EQUIPMENT.

MARKETING THE WOOD REFLECTS THE SAME WASTE. NO ATTEMPT IS MADE TO SELL LOW GRADE LUMBER SO MILLS DO NOT PRODUCE IT. THIS RESULTS IN MORE WASTE AND WOOD CONSIGNED TO THE BURN PILE INSTEAD OF THE LUMBER PILE.

WITH HARDWOOD MILLING, THE PROBLEMS ARE THE SAME ONLY THE RELATIVE MAGNITUDE OF WASTE IS GREATER. PROBABLY ONLY 10% OF THE MERCHANTABLE VOLUME ON A HECTARE IS REMOVED AND ONLY ABOUT 50% OF THIS ACTUALLY BECOMES SOME SALEABLE PRODUCT.

THE BIGGEST LOSS OF WOOD RESULTS FROM AGRICULTURAL ACTIVITIES. MOST FOREST CLEARED FOR AGRICULTURAL PURPOSES IS SIMPLY BURNED ON THE SPOT AND RESULTS IN 0% UTILIZATION.

COHDEFOR CONTROLS THE SALE OF STANDING TIMBER BY LAW IN HONDURAS. THE ESTABLISHED PRICE FOR PINE IS \$6.00 FOR CUBIC METER OF PINE. SIMILAR MATERIAL IS SELLING IN THE UNITED STATES FOR APPROXIMATELY \$25.00. THE LOW PRICE CHARGED FOR THE RAW MATERIAL INDUCES WASTE. (MERKEL, 1981) ALL LUMBER IS EXPORTED BY COHDEFOR. SEVERAL STUDIES HAVE SHOWN THAT COHDEFOR'S MARKETING IS NOT AGGRESSIVE AND IS BASICLY ORDER TAKING (DRAKE, 1979, SOWLES, 1981). THIS DOES NOT LOCATE NEW MARKETS FOR THE WOOD PRODUCTS NOR DOES IT INDUCE DEVELOPMENT OF NEW PRODUCTS.

2.1.4 POOR COMMUNICATION BETWEEN ORGANIZATIONS INFLUENCING THE DEVELOPMENT OF HONDURAS

THIS PROBLEM HAS RESULTED IN CONFLICTING USE DEVELOPMENT OF AREAS IN HONDURAS. PLANNING WITHOUT CONSIDERATION OF IMPACT ON OTHER SECTORS CAN ADVERSLY AFFECT PROJECTS. FOR EXAMPLE LOGGING ON THE UPPER WATERSHED OF THE AGUAN RIVER IS BLAMED FOR A LARGE PART OF THE SILTATION AND FLOODING IN THE AGUAN VALLEY. ANOTHER EXAMPLE IS THAT CONSUPLANE, RESPONSIBLE FOR COORDINATING ALL NATIONAL PLANNING EFFORTS, DID NOT PARTICIPATE IN THE PREPARATION OF THE NATIONAL DEVELOPMENT PLAN FOR THE FIVE YEAR PERIOD 1979-1980 OR THE OPERATION PLAN FOR THE FORESTRY SECTOR FOR 1980. IN FACT THEY DID NOT EVEN RECEIVE A COPY OF THESE REPORTS THROUGH OFFICIAL CHANNELS AND ONLY RECEIVED COPIES INFORMALLY. (CLIFF, 1980).

THE LACK OF COMMUNICATIONS IS NOT ONLY BETWEEN DEVELOPMENT ORGANIZATIONS BUT ALSO BETWEEN DEPARTMENTS WITHIN SAME ORGANIZATION. COORDINATION BETWEEN THE THREE OPERATION DEPARTMENTS OF COHDEFOR, FORESTRY, PRODUCTION AND COMMERCIALIZATION, IS ONLY INTERMITTANT AT BEST.

THE LACK OF COMMUNICATION AND COORDINATION IS THE NORM FOR ORGANIZATIONS SUCH AS COHDEFOR, INA, CONSUPLANE, SNR. BEFORE EFFECTIVE, PLANNED, AND COORDINATED DEVELOPMENT OF THE FOREST RESOURCE ON AN ECOLOGICALLY SOUND BASIS CAN BE UNDERTAKEN, COMMUNICATION LINES BETWEEN THESE AGENCIES MUST BE ESTABLISHED AND USED.

3. DISCUSSION

3.1 DEFORESTATION

THE MOST SERIOUS PROBLEM IN THE FORESTS OF HONDURAS IS DEFORESTATION. AGRICULTURAL ACTIVITIES, LOGGING, FIRE AND NATURAL DISASTERS SUCH AS HURRICANES ALL CONTRIBUTE TO DEFORESTATION.

IN THE BROADLEAF FOREST AGRICULTURE IS BY FAR THE GREATEST REASON FOR DEFORESTATION. ONCE THIS FOREST IS CLEARED, FOR ALL PRACTICAL PURPOSES, IT IS LOST FOREVER. NO KNOWN SILVICULTURAL SYSTEM CAN RECREATE THE UNIQUE COMBINATION OF CONDITIONS THAT EXISTED BEFORE CLEARING.

INDUSTRIAL DEFORESTATION SELDOM RESULTS IN CLEAR CUTTING. SELECTIVE CUTS ARE MADE WHERE TREES OF KNOWN VALUE ARE REMOVED. BUT THE ACCESS ROADS USED TO EXTRACT THESE TREES PROVIDE THE ROUTES FOR INVASION FOR THE CAMPESINO LOOKING FOR LAND TO FARM. INDUSTRIAL LOGGING IS OFTEN THE FIRST STEP TO THE LOSS OF THE BROADLEAF FOREST.

THE PINE FOREST FACES A DIFFERENT SET OF PROBLEMS. CLEARING OF THIS FOREST IS USUALLY THE RESULT OF LOGGING. AGRICULTURE DOES NOT PLAY A SIGNIFICANT ROLE EXCEPT IN THE SOUTH WEST OF HONDURAS ALONG THE EL SALVADOR BORDER. (HERNANDEZ, 1981).

NATURAL REGENERATION IS GENERALLY MORE THAN ADEQUATE TO REPLACE THE STAND IF A SEED SOURCE REMAINS. BUT YEARLY FIRES, COMMON THROUGHOUT THE PINE STANDS, KILLS ALL REGENERATION LESS THAN 2 YEARS OLD AND SLOWS GROWTH OF YOUNG TREES BY SCORCHING THE CROWNS. (HUDSON, 1981).

PINUS CARIBAEA REGENERATES WELL. STUDIES SHOW THAT MORE THAN 17,000 SEEDLINGS PER HECTARE ARE COMMON THE FIRST YEAR AFTER A FIRE. *PINUS OCCIDENTALIS* DOES NOT REGENERATE AS WELL. VARIABLE SEED PRODUCTION MAY BE THE MAJOR CAUSE. (HUDSON, 1981). NATURAL REGENERATION IS GENERALLY MORE THAN ADEQUATE FOR MOST PINE AREAS IN THE COUNTRY ESPECIALLY FOR *PINUS CARIBAEA*.

PINUS OCCIDENTALIS, WHEN YOUNG, HAS THE ABILITY TO SPROUT AFTER A FIRE OR IF IT IS CUT. THIS ABILITY SOMEWHAT MAKES UP FOR LOWER SEED PRODUCTION. A STUDY OF THIS PHENOMENON SHOULD BE UNDERTAKEN TO DETERMINE ITS IMPORTANCE FOR REFORESTATION AND FIRE PROTECTION.

PINUS PSUEDUOSPICEA IS AN ACTIVE REGENERATOR AND AS SUCH IS SIMILAR TO *PINUS CARIBAEA*.

3.1.1 ARTIFICIAL REFORESTATION IS A RATHER UNSATISFACTORY NAME FOR TREE PLANTING. THE BEST TECHNICAL PLANTING IS DONE TO IMITATE NATURAL REFORESTATION. TREE PLANTING IS NOT NEW IN HONDURAS. THE UNITED FRUIT COMPANY WAS PLANTING TREES IN HONDURAS IN THE 1950S. THEY PLANTED OVER 2000 HECTARES WITH A NUMBER OF SPECIES. PANAMA DISEASE WAS DESTROYING BANANA PLANTATIONS THROUGHOUT CENTRAL AMERICA AND A SEARCH WAS ON FOR A REPLACEMENT CROP. THE DISEASE WAS DEFEATED BUT GREAT EXPERIENCE IN PLANTATION ESTABLISHMENT WAS GAINED. OF SPECIAL NOTE ARE THE PLANTATIONS OF TEAK (*TEAKIA GRANDIS*), A NATIVE SPECIES OF THE SUB-CONTINENT OF ASIA.

TEAK FURNISHED WOOD FOR A FURNITURE MARKET DURING THE 1970S. ALTHOUGH THE WOOD IS HIGHLY PRIZED A LARGE PERCENTAGE OF THE VOLUME WAS DESTROYED CLEARING FOR AGRICULTURE OR FOR ESTABLISHMENT OF AFRICAN OIL PALM PLANTATIONS. THE TEAK WAS CUT AND BURNED ON THE SPOT.

COHDEFOR HAS BEEN DEVELOPING THE ABILITY TO REFOREST SINCE ITS INCEPTION IN 1970. THEY HAVE PLANTED MORE THAN 3,000 HECTARES DURING THE PERIOD OF 1974 - 1980, MOSTLY PINE. COHDEFOR IS BECOMING QUITE SUCCESSFUL AT SOLVING THE TECHNICAL PROBLEMS OF THE NURSERY AND THE PLANTING BUT HAS NOT BEEN ABLE TO SOLVE THE SOCIAL/CULTURAL PROBLEM OF PEOPLE DESTROYING THE PLANTATIONS AFTER THEY ARE PLANTED BY BURNING, GRAZING, PULLING UP THE TREES, ETC.

COHDEFOR ATTEMPTED A LARGE SCALE PROJECT OF REFORESTATION, FUNDED BY THE WORLD BANK IN THE SOUTH WEST OF THE COUNTRY IN COOPERATION WITH A CONSUPLANE PROJECT PRODERO (PROYECTO DE DESARROLLO DE LA REGION OCCIDENTAL). THEY ESTABLISHED A PLAN TO PRODUCE OVER ONE MILLION SEEDLING AND TO PLANT 500 HECTARES. THE PLANTATION WAS TECHNICAL SUCCESS BUT THE ENTIRE PLANTATION WAS SOON DESTROYED BY FIRES AND GRAZING. THE PEOPLE OF THE REGION, ALTHOUGH WILLING TO PLANT THE PINES FOR PAY, WERE NOT WILLING TO SACRIFICE THE LAND FOR FORESTRY. NEW PLANS CALL FOR EMPHASIS ON PROTECTION AND EDUCATION AND RELYING ON NATURAL REGENERATION. (COHDEFOR 1980 - HERNANDEZ 1981).

THE BROADLEAF FOREST DO NOT READILY SELF-REGENERATE, ESPECIALLY WITH DESIRED SPECIES. BEFORE CUTTING SOME DECISION MUST BE MADE FOR THE FUTURE OF THE STAND OR IN OTHER WORDS A FOREST MANAGEMENT PLAN. THE MOST COMMON MANAGEMENT INVOLVES ONE OF THREE DECISIONS. RESERVE STATUS; SELECTIVE CUTTING; OR CLEARCUTTING FOLLOWED BY MONOCULTURE PLANTATIONS. UNFORTUNATELY THE USUALLY CASE IS CLEARCUTTING, BURNING AND CONVERTING THE AREA TO NON-FOREST, EITHER A BRUSH OR GRASS FOR GRAZING. AGRO-FORESTRY METHODS SUCH AS TAUNGYA MIGHT BE USED ON SOILS APPROPRIATE FOR AGRICULTURE.

NATURAL REFORESTATION IS AND WILL BE THE MAIN FORM OF REGENERATION FOR PINE FOR SOMETIME. PLANTATIONS OF PLANTED PINES ARE NOT PRESENTLY FEASIBLE EXCEPT WHERE NO OR INADEQUATE SEED SOURCE IS AVAILABLE OR AS A FILL IN TO SPOTTY NATURAL REGENERATION.

THE BROADLEAF FOREST IS ANOTHER STORY. ARTIFICIAL REGENERATION METHODS THAT ARE ACCEPTABLE SHOULD BE DEVELOPED AND IMPLEMENTED AS SOON AS POSSIBLE, ESPECIALLY FOR FUELWOOD PRODUCTION WHERE NEEDED.

3.2 SOIL EROSION

SOIL EROSION AND SOIL DEVELOPMENT ARE CONTINUOUS NATURAL PROCESSES. WHEN MAN'S ACTIVITIES DISRUPT THE PROCESSES, PROBLEMS ARISE. DEFORESTATION AND ACCOMPANYING ACTIVITIES SUCH AS ROAD BUILDING, LOGGING, FARMING AND GRAZING ARE MAJOR DISRUPTIONS. MOST OF HONDURAS IS MOUNTAINOUS AND STEEP SLOPES ARE THE RULE. THE SOILS ARE QUITE ERRODABLE WHEN UNPROTECTED.

THE GREATEST CAUSE OF SOIL ERROSION IS AGRICULTURAL CLEARING ON STEEP LANDS. THE MAGNITUDE OF THIS PROBLEM CAN BE PICTURED WHEN ONE CONSIDERS THAT OVER 80,000 HECTARES OF NEW FOREST LAND IS CLEARED EVERY YEAR AND ABOUT A THIRD OF THE REST OF THE AGRICULTURAL LAND IS REFARMED PROBABLY ANOTHER 600,000 HECTARES.

THE SECOND GREATEST CAUSE OF EROSION IS LOGGING RELATED ACTIVITY SUCH AS SKIDDING LOGS OR BUILDING ACCESS ROADS. THIS PROBABLY PRODUCES THE GREATEST PER HECTARE EROSION BUT ONLY ABOUT 35,000 HECTARES ARE LOGGED EACH YEAR SO THE TOTAL EROSION, IS FAR LESS THAN WITH AGRICULTURE.

THE THIRD MAJOR SOURCE OF EROSION IS FROM POOR ROAD CONSTRUCTION AND MAINTENANCE. ROADS ARE NOT PROPERLY CROWNED, DITCHED OR CULVERTED. THIS RESULTS IN WATER RUNNING DOWN ROADS AND PICKING UP SOILS AND DEPOSITING THEM IN RIVERS. OFTEN WATER FROM AN ENTIRE SLOPE WILL BE CHANNLED INTO A SINGLE DRAINAGE CAUSING MASSIVE EROSION BECAUSE OF THE UNPRECEDENT QUANTITY OF WATER.

THE FOURTH MAJOR CAUSE OF EROSION IS NATURAL DISASTERS SUCH AS HURRICANES. NOTHING CAN BE DONE TO PREVENT THIS TYPE OF DAMAGE BUT THE PREVIOUS THREE ACTIVITIES CAN AND DO INTENSIFY THE PROBLEM.

3.3 WATERSHED

THE FOREST MANAGER MUST CONSIDER WATERSHED PROTECTION AS A MAJOR GOAL AND CONSTRAINT FOR ACTIVITIES OF FOREST DEVELOPMENT. WHILE CONDEFOR IS DIRECTED BY DECRETO LEY 103 TO BE RESPONSIBLE FOR WATERSHED MANAGEMENT IN HONDURAS, ONLY A FEW SMALL PROJECTS HAVE BEEN STARTED. THERE IS NOT REAL CONSIDERATION OF THIS WATERSHED MANAGEMENT IN LOGGING, ROAD-BUILDING OR OTHER CONDEFOR ACTIVITIES.

AREAS FOR WATER PRODUCTION FOR CITIES HAVE BEEN RESERVED FROM EXPLOITATION IN SEVERAL PARTS OF THE COUNTRY. THIS IS A VERY EXTENSIVE FORM OF MANAGEMENT AND USUALLY DONE AT THE INSISTANCE OF THE CITY, NOT CONDEFOR.

3.4 LOGGING

ALTHOUGH THE NOMINAL SYSTEM OF LOGGING FOR PINE USED IN HONDURAS IS CALLED CLEAR CUTTING USUALLY ONLY ABOUT 60% OF THE TREES ON A SITE ARE CUT. THE OTHERS ARE LEFT BECAUSE THEY ARE TOO SMALL, CROOKED OR ARE THOUGHT TO HAVE ROT. IN HARDWOODS ONLY SELECTED SPECIES WITH SIZE LIMITS ARE TAKEN, USUALLY LESS THAN TEN PERCENT OF THE STAND VOLUME.

THIS RESULTS IN NOT ONLY GREATER WASTE BUT ALSO MAKES RETURNING FOR A SALVAGE CUT UNATTRACTIVE ECONOMICALLY.

PINE LOGGING IS BY FAR THE MOST IMPORTANT, BUT TYPIFIES LOGGING PRACTICES IN ALL FORESTS. LOGGERS ONLY PAY A STUMPAGE FEE ON LOGS REMOVED FROM THE FOREST. SAW MILLS BUY ONLY THOSE LOGS GUARANTEED TO PRODUCE SALEABLE LUMBER EASILY. LOGS WITH ROT OR OTHER DEFECTS ARE LEFT IN THE WOODS. TRUCKERS HAULING LOGS ARE PAID ON A BOARDFOOT BASIS MEASURED BY THE DOYLE RULE. THIS RULE UNDERESTIMATES THE VOLUME OF SMALL LOGS IN BOARDFEET. TRUCKERS REFUSE TO TAKE LOGS OF LESS THAN 12" DIAMETER ON THE SMALL END.

THE LAST AND PROBABLY THE GREATEST INDUCEMENT TO WASTE OF THE WOOD IN THE FOREST IS ITS VERY LOW VALUE. CONDEFOR HAS SET STUMPAGE AT ONLY \$6.00 PER CUBIC METER, ONLY ABOUT 20% OF EQUIVALENT VALUE IN THE UNITED STATES (MERKEL 1981). THIS NOT ONLY DOES NOT PAY FOR SERVICES IN THE WOODS SUCH AS SETTING UP SALES OR MONITORING EXTRACTION BUT ALSO INDUCES WASTE AT EVERY STEP IN THE CONVERSION FROM STANDING TIMBER TO THE FINAL PRODUCT. (SEE 2.1.4)

THE LOW VALUE OF STUMPAGE HAS BEEN CALLED THE MOST SERIOUS ERROR MADE BY CONDEFOR. (FLCRES R. 1980) CLIFF, 1980, POINTS OUT THE DISINCENTIVES RESULTING FROM THESE LOW PRICES. BOTH BID AND USAID HAVE INCLUDED STUMPAGE VALUATION IN PROJECT CONSIDERATION. (BID, 1980, USAID (2) 1980)

ROAD CONSTRUCTION AND SKID TRAILS RESULT IN THE GREATEST DAMAGE CAUSED BY LOGGING. IN THE HARD WOOD FOREST THEY PROVIDE ACCESS FOR THE CAMPESINQ AND USUALLY ARE THE FIRST STEP IN LOSS OF THE FOREST.

IN PINE STANDS, ROADS PRODUCE EROSION AND OCCUPY LARGE AREAS OF PRODUCTIVE LAND. METHODS OF CONSTRUCTION ARE LARGELY LEFT TO THE LOGGER. HE ALSO DECIDES THE ROAD LOCATION. WATERWAYS AND DRAINAGE ARE ONLY CONSIDERED WHEN ABSOLUTELY NECESSARY. MOST MOUNTAIN ROADS ARE UNSUABLE DURING THE 4-6 MONTHS RAINY SEASON. SKID TRAILS ARE OVER USED AND OFTEN USED RIDGE TOPS OR CROSS NATURAL DRAINAGES. ...

CULVERTS, WHEN INSTALLED, ARE POORLY LOCATED AND TOO SMALL. FULL-BENCH ROADS ARE CONSTRUCTED WHEN HALF-BENCH ROADS WOULD SUFFICE. THIS DRASTICALLY INCREASES THE SIDE CAST OF LOOSE SOIL. ROADS ARE OFTEN IN SLOPED FURTHER HOLDING MORE WATER ON THE SURFACE. BALLASTING ROAD SURFACES IS ONLY RARELY DONE. GRADING IS ONLY DONE WHEN THE ROAD BECOMES IMPASSABLE.

FINALLY ROADS AND SKID TRAILS ARE NOT WATER BARRED WHEN THEY ARE NO LONGER NEEDED. THIS SUSTAINS THE EROSION FROM THE SURFACE LONG AFTER OPERATIONS ARE TERMINATED ON THE SITE.

3.5 FIRE

FIRE IS A NATURAL PART OF THE PINE ECOSYSTEM. IT IS THE MOST IMPORTANT SINGLE FACTOR MAINTAINING PINE IN LARGE EXPANSES OF PURE STANDS. FIRE IS RARE IN THE HARDWOOD STANDS, BUT AFTER THE EXTENSIVE DAMAGE TO THE FOREST FROM HURRICANE FIFI IN 1974 SEVERAL VERY LARGE FIRES OCCURED IN THE NORTH COAST MOUNTAINS.

IN ESSENCE ALL FIRES IN HONDURAS MAN CAUSED, FIRES ARE STARTED FOR MANY REASONS - PREPARING LAND FOR FARMING; IMPROVING GRAZING; ELIMINATING TICKS, AND SNAKES; MAKING ACCESS EASIER; HUNTING; AND TO ELIMINATE COMPETITION AND TO REDUCE FUEL LOADS IN THE FOREST. DELIBERATE, MALICIOUS FIRES ARE SET BUT THEIR NUMBER IS NOT EXTENSIVE WHEN COMPARED WITH OTHER TYPES OF FIRES AND ARE OFTEN THE RESULT OF RESENTMENT OF COHDEFOR'S ACTIVITIES. FIRE IS DEFINITELY PART OF THE CULTURE OF THE CAMPESINO OF HONDURAS.

DAMAGE FROM FIRE IS GENERALLY THOUGHT TO BE RESTRICTED TO YOUNG FAST GROWING PINE STANDS. FIRE WILL GENERALLY KILL OR SEVERELY DAMMAGE YOUNG TREES LESS THAN 3 YEARS OLD. LARGER TREES OFTEN HAVE THEIR CROWNS SCORCHED AND LOSE THEIR LEAVES. THIS REPRESENTS A LOSS OF GROWTH FOR 2-3 YEARS. PINES ARE QUITE RESISTANT TO FIRE AND USUALLY ARE NOT KILLED OUTRIGHT EXCEPT WHEN VERY YOUNG. OLDER TREES ARE LOST WHEN CAT FACES DEVELOP AT THE BASE OF THE TRUNK AND BURN THROUGH. LOSSES OF TREES IN MATURE STANDS MAY REACH 2% IN A HOT FIRE (PERSONNAL OBSERVATIONS IN LA MOSQUITIA 1976 - 1979 A. MERKEL). IF THIS IS TRUE THROUGHOUT HONDURAS THE LOSS OF VOLUME DUE TO FIRES IN MATURE STANDS COULD BE CONSIDERABLE.

COHDEFOR HAS MADE GREAT STRIDES IN COMBATING AND PREVENTING WILDFIRES DURING THE LAST FIVE YEARS. THEY ARE NOW BEGINNING TO DEVELOP A PROGRAM OF PRESCRIBED BURNING. INDEED MOST OF THE FILLED EFFORTS OF FOREST MANAGEMENT HAVE CONCENTRATED ON FIRE PREVENTION. FIRE BREAKS AROUND AGRICULTURAL CLEARINGS WERE RARE IN 1977 BUT NOW A CLEARING WITHOUT FIRE BREAK IS RARE. FIRE TOWERS AND AREAS OF PROTECTION HAVE BEEN INSTALLED.

CIDA HAS COMPLETED A PROGRAM OF DEVELOPMENT OF THE FIRE PREVENTION CAPABILITY WITH COHDEFOR THIS YEAR. RADIO COMMUNICATIONS WERE IMPROVED. EQUIPMENT TO TRANSPORT FIREFIGHTER AND EQUIPMENT TO COMBAT FIRES WAS PROVIDED. TECHNICAL ASSISTANCE HELPED DEVELOP THE POLICY AND PROCEDURES FOLLOWED WHEN PREVENTING FIRES.

THE GOVERNMENT OF GREAT BRITAIN HAS PROVIDED A TECHNICIAN TO DEVELOP METHODS OF PRESCRIBED BURNING. THESE PROGRAMS WERE QUITE SUCCESSFUL AND HAVE GREATLY IMPROVED THE TECHNICAL ABILITY OF COHDEFOR TO DEAL WITH FIRE.

BUT A GREAT PROBLEM STILL EXISTS. PEOPLE SET FIRES BECAUSE OF THE TRADITIONS OF AGRICULTURE. ONLY NOW IS COHDEFOR BEGINNING TO REALIZE THAT THE PEOPLE OF HONDURAS MUST REALIZE A BENEFIT FOR NOT BURNING. THEY CURRENTLY REALIZE BENEFITS FROM SETTING FIRES AND GENERALLY FEEL THAT THE PINE FOREST BELONGS TO COHDEFOR AND SERVES NO BENEFIT TO THEM. (MURRAY 1981) FIRE IS DEFINITELY MUCH MORE A SOCIAL PROBLEM THAN A TECHNICAL ONE.

3.5 BIOLOGICAL CONCERNS

THE FORESTS OF HONDURAS, ESPECIALLY THE BROADLEAF FOREST, ARE A

UNIQUE ECOSYSTEMS IN CENTRAL AMERICA. THE FLORA AND FAUNA OF THESE AREAS SERVE AS A STUDY OF ECOLOGICAL RICHNESS PROVIDED BY THE NEAR TROPIC AREAS. THE LAST REMAINING LARGE FLATLAND VIRGIN JUNGLE IN CENTRAL AMERICA EXISTS IN LA MOSQUITIA. NO ONE KNOWS WHAT USEFUL SPECIES ARE HIDDEN THERE.

THE VAST EXPANSES OF PURE STANDS OF PINE ARE TRULY UNIQUE IN THE TROPICS. THE PINE SAVANNA OF LA MOSQUITIA IS A PERFECT EXAMPLE OF A FIRE CLIMAX CARRIED TO AN EXTREME. MANY OF THE PLANTS THERE DO NOT FLOWER UNTIL IMMEDIATELY AFTER A FIRE, SOME WITH 24 HOURS.

POOR MANAGEMENT, UNCONTROLLED EXPLOITATION AND LACK OF UNDERSTANDING OR CONSIDERATION OF ECOLOGICAL REALITIES OF DEVELOPMENT WILL DESTROY THESE FRAGILE ECOSYSTEMS. FOR MORE ON THIS SEE GLICK, CHAPTER VII.

4.0 THE INSTITUTIONAL OVERVIEW

THE INSTITUTION THAT CONTROLS THE FOREST RESOURCES IS COMPRISED OF SEVERAL GOVERNMENT AGENCIES AND MINISTRIES. THE CAMPESINO AND CATTLEMEN ARE PART OF THIS INSTITUTION. THIS PAPER WILL CONSIDER THE "INSTITUTION" ON A BROAD BASES OF ALL GROUPS THAT ACTUALLY CARRY ON ACTIVITIES WITHIN THE FOREST. THE FACT THAT THESE DIFFERENT ORGANIZATIONS WITHIN THE INSTITUTION HAVE EXTREME DIFFICULTY COMMUNICATING WITH EACH OTHER CAUSES PROBLEMS BECAUSE THE EXTERNALITIES OF ONE PROJECT BECOMES THE ECONOMIC IMPACT OF ANOTHER PROJECT. FOR EXAMPLE EROSION FROM LOGGING ROADS BECOMES SILTATION OF A DRINKING WATER RESERVOIR OF THE VILLAGE BELOW AND CAUSES GREAT CONFLICT BETWEEN THE TWO PARTIES.

IN THIS LIGHT THE INSTITUTION WITH REPRESENTATIVE LEVEL OF IMPACT ON EACH TYPE OF FOREST SHOW IN FIGURES 1 AND 2.

4.1. DISCUSSION OF THE ORGANIZATIONS AND GROUPS WITHIN THE INSTITUTION.

4.1.1. COHDEFOR^{1/}

"THE CORPORACION HONDURENA DE DESARROLLO FORESTAL (COHDEFOR) IS THE ORGANIZATION RESPONSIBLE FOR THE DEVELOPMENT OF THE FORESTRY SECTOR. IN ADDITION TO PROTECTION OF THE NATIONAL FOREST AND THE RESTORATION OF THE NATIONAL FOREST RESOURCES, COHDEFOR PLANS, STIMULATES AND FINANCES THE GROWTH OF EFFICIENT PRIMARY AND SECONDARY WOOD PRODUCT INDUSTRIES. COHDEFOR ALSO CONTRIBUTES TO BETTERING THE LIVING CONDITIONS OF RURAL POPULATION, ABOUT A THIRD OF WHICH LIVE IN THE FORESTED AREAS OF THE COUNTRY.

^{1/} TAKEN FROM HERNANDEZ, 1980. TRANSLATED BY ALBERT MERKEL.

IN 1974 COHDEFOR WAS GIVEN SUFFICIENT AUTHORITY TO MANAGE ALL FORESTS IN THE COUNTRY, BOTH PRIVATE AND PUBLIC. COHDEFOR WAS ALSO PUT IN CONTROL OF EXPLOITATION AND MARKETING THE WOOD AND FOR THE FINANCING OF FORESTRY INDUSTRIES.

THE DIRECTING BOARD OF COHDEFOR HAS THE FOLLOWING MEMBERS:

- PRESIDENT OF THE REPUBLIC
- MINISTER OF NATURAL RESOURCES
- MINISTER OF ECONOMICS AND COMMERCE
- MINISTER OF THE TREASURY AND PUBLIC CREDIT

- MINISTER OF DEFENSE AND PUBLIC SAFETY
- SECRETARY OF THE SUPERIOR COMMITTEE OF ECONOMIC PLANNING (CONSUPLANE)
- GENERAL MANAGER OF COMDEFOR (NON-VOTING)

THE CORPORATION CONTAINS FOUR OPERATION DEPARTMENTS, DIRECTLY RESPONSIBLE FOR CARRYING OUT THE GOALS OF COMDEFOR. THESE ARE FORESTRY, PRODUCTION, COMMERCIALIZATION, AND FINANCES. (SEE FIGURE 3). THE DEPARTMENT OF FORESTRY

HAS DIRECT INFLUENCE ON A NATIONAL LEVEL AND MAINTAINS EIGHT FOREST DISTRICTS WHICH ARE DIVIDED INTO MANAGEMENT UNITS THAT ARE RESPONSIBLE FOR CARRYING OUT MANAGEMENT ACTIVITIES SUCH AS SILVICULTURE, PROTECTION, EXTENSION, NURSERY PRODUCTION, REFORESTATION, WATERSHED MANAGEMENT AND DEVELOPING THE SOCIAL FORESTRY SYSTEM. MORE THAN 70% OF THE TOTAL EMPLOYEES OF COHDEFOR ARE IN THIS DEPARTMENT

AID TO DEVELOP FORESTRY INDUSTRY COMES FROM THE DEPARTMENT OF PRODUCTION. THEY ARE RESPONSIBLE FOR CONTROLLING WITH PRODUCTION NATIONWIDE. SERVICES PROVIDED ARE CONTROL OF QUALITY AND TECHNICAL ASSISTANCE TO THE FOREST INDUSTRY OF THE COUNTRY.

THE DEPARTMENT OF COMMERCIALIZATION IS RESPONSIBLE FOR MARKETING THE FOREST PRODUCTS BOTH IN THE DOMESTIC MARKET AND THE INTERNATIONAL MARKET. THE PRINCIPAL INTERNATIONAL MARKETS FOR COHDEFOR ARE THE CARIBBEAN, EUROPE, JAPAN AND OTHER COUNTRIES OF LATIN AMERICA. (SEE TABLE 4). THE OBJECTIVE OF DEVELOPING AND PROMOTING THE INDUSTRIAL FORESTRY SECTOR IS ASSIGNED TO THE FINANCE DEPARTMENT. STRENGTHENING THE PRIMARY AND SECONDARY INDUSTRY REQUIRES FINANCING EQUIPMENT INSTALATIONS THAT ALLOW REALIZATION OF OPTIMUM UTILIZATION OF THE RAW MATERIAL. THIS FINANCING PROVIDED BY THE FINANCE DEPARTMENT EXCEEDED OVER \$7,300,000 DURING THE PERIOD 1974-1980.

COHDEFOR HAS RECEIVED AID FROM SEVERAL INTERNATIONAL AGENCIES IN PROGRAM IMPLEMENTATION. THEY ARE:

- FOOD AND AGRICULTURAL ORGANIZATION OF THE UNITED NATIONS (FAO)
- CANADIAN INTERNATIONAL DEVELOPMENT AGENCY (CIDA)
- PEACE CORPS
- AGENCY FOR INTERNATIONAL DEVELOPMENT (A.I.D.)
- JAPANESE AGENCY FOR INTERNATIONAL COOPERATION (JICA)
- INTERAMERICAN DEVELOPMENT BANK (IDB)

AND OTHERS.

THE STRATEGY FOR INDUSTRIAL DEVELOPMENT OF THE CORPORATION HAS BEEN TO PROVIDE INVESTMENT FROM THE PRIVATE AND THE PUBLIC SECTOR TO CREATE COMPANIES SUCH AS CENTRAL DE ASEBRIQ DE SIGUALIEQUE, S.A. (CASISA) AND FORESTAL INDUSTRIAL AGUA FEBIA, S.A. (FIAFSA), FOUNDED WITH THE KNOWLEDGE OF THE RESOURCE AND ITS SILVICULTURAL CHARACTERISTICS. THE CORFINO PROJECT IN THE FOREST DISTRICT OF OLANCHO HAS BEEN INITIATED RECENTLY. THIS LARGE SCALE PROJECT AFFECTS A CONSIDERABLE AREA OF INTENSIVE FOREST PRODUCTION AND REFORESTATION. THIS PROJECT ALONE WILL REQUIRE AN INVESTMENT OF \$150-200 MILLION DURING THE 1981-1985 PERIOD.

THE STRATEGY OF INVESTMENT BY COHDEFOR IN THE FORESTRY SECTOR INCLUDES SUBSTANTIAL INVESTMENTS SUCH AS THE PROGRAMA DE DESARROLLO FORESTAL DE COMAYAGUA. THIS IS A PROGRAM TO AMPLIFY THE ACTIVITIES OF FOREST MANAGEMENT WITH EMPHASIS ON REFORESTATION AND OPTIMUM UTILIZATION OF THE FOREST RESOURCE OF THE REGION. THE PROJECT COVERS OVER 1,200,000 HECTARES WITH INVESTMENT PLANNED FOR THE PERIOD OF 1981-1985 AT \$15-20,000,000.

4.1.1.1. UNFORTUNATELY THE ACTUAL CONDITIONS WITHIN COHDEFOR ARE NOT PERFECT. AS CLIFF, 1980, POINTS OUT SEVERAL SERIOUS PROBLEMS EXIST. THESE INCLUDE:

- LACK OF REGULATIONS AND GUIDELINES
 - INABILITY TO MAKE DECISIONS
 - LACK OF COORDINATION AND COMMUNICATION BOTH INTRAORGANIZATIONAL AND EXTRAORGANIZATIONAL
- INABILITY TO IMPLEMENT PLANS AND DECISIONS WHEN THEY ARE MADE.

THESE PROBLEMS HAVE CREATED A LARGE INDECISIVE, INEFFECTUAL, BUREAUCRATIC ORGANIZATION. CLIFF'S EXCELLENT REPORT FULLY OUTLINES THE PROBLEMS WITHIN COHDEFOR. (CLIFF, 1980).

THE RESULT OF THE INTERNAL PROBLEMS OF COHDEFOR IS UNCONTROLLED EXPLOITATION OF THE FOREST, USUALLY WITH ECOLOGICALLY UNSOUND METHODS. COHDEFOR HAS OVER 340 TRAINED FORESTERS, ABOUT ONE THIRD ARE COLLEGE GRADUATES WITH THE REST TECHNICIANS. THIS WELL EDUCATED FORCE IS AMONG THE LARGEST IN ANY LESS DEVELOPED COUNTRY. HONDURAN FORESTERS, WHILE WELL EDUCATED, DO NOT HAVE PRACTICAL EXPERIENCE. THERE ARE FEW ROLE MODELS OR EXAMPLES OF SUCCESSFUL PROJECTS FOR THEM TO EMULATE. STANDARDS OF PERFORMANCE ARE LOOSELY ESTABLISHED AND NOT ENFORCED.

ALTHOUGH THESE PROBLEMS SEEM FORMIDABLE, THEY CAN BE RESOLVED. PROGRAMS SUCH AS MID-TERM ASSISTANCE OF TECHNICAL AND ADMINISTRATIVE EXPERTS TO HELP DEVELOP POLICIES AND PROCEDURES AND MORE IMPORTANT TO HELP TO IMPLEMENT THESE POLICIES AND PROCEDURES ARE ESSENTIAL.

4.1.2. INA

THIS AGENCY IS RESPONSIBLE FOR IMPLEMENTING THE AGRICULTURAL REFORM LAW. THEY ALSO ARE REQUIRED TO TRAIN AND GIVE TECHNICAL ASSISTANCE TO CAMPESINOS WHO HAVE RECEIVED LAND UNDER THIS LAW.

INA WITH COHDEFOR HAS THE RESPONSIBILITY TO DEFINE FOREST LANDS. INTERVIEWS WITH INA PERSONNEL INDICATE THAT ARE WILLING TO COOPERATE WITH COHDEFOR BUT FEEL THAT COHDEFOR MUST TAKE THE INITIATIVE.

PAST INA PROJECTS SUCH AT DEVELOPMENT OF THE AGUAN RIVER VALLEY HAVE FORCED PEOPLE OFF VALLEY LAND INTO SURROUNDING FOREST LANDS. ALSO PEOPLE WITHOUT IDENTIFICATION PAPERS CANNOT PARTICIPATE IN INA PROGRAMS AND ARE FORCED TO GO TO THE FOREST WHEN DISPLACED BY INA.

4.1.2. MINISTRY OF NATURAL RESOURCES

THIS MINISTRY IS RESPONSIBLE FOR DEVELOPING THE AGRICULTURAL PRODUCTION OF HONDURAS. THE MINISTER IS A MEMBER OF THE DIRECTING BOARD OF COHDEFOR AND AS SUCH HAS DIRECT INPUT IN BOTH THE FORESTRY AND THE AGRICULTURAL SECTORS.

THE DEPARTMENT DIRECTLY RESPONSIBLE FOR PARK AND RESERVE PLANNING AND WILDLIFE MANAGEMENT, RENARE, IS IN THIS MINISTRY. THERE IS LITTLE COMMUNICATION BETWEEN CONDEFOR AND RENARE. (SEE GLICK AND POOLE FOR MORE).

4.1.3. BANADESA

THIS BANK IS RESPONSIBLE FOR FINANCING AGRICULTURAL ACTIVITIES FOR ALL LEVELS. BUT THE SMALLEST FARMER IS NOT USUALLY HELPED THROUGH THIS BANK. THE BANK OFFICES ARE OFTEN LOCATED FAR FROM THE FARMER'S LAND. THE CAMPESINO CANNOT PARTICIPATE IN THE PROGRAMS IF HE DOES NOT HAVE IDENTIFICATION PAPERS. THE CAMPESINO'S INABILITY TO GET LOANS TO BUY FERTILIZERS OR SEED DIRECTLY AFFECT HIS ABILITY TO OBTAIN MAXIMUM PRODUCTION OF LAND. THIS REQUIRES FURTHER CLEARING OF FOREST.

4.1.4. IHCAFE

THIS AGENCY IS RESPONSIBLE TO GIVE FINANCIAL AND TECHNICAL ASSISTANCE TO COFFEE GROWER. IT IS AN AGGRESSIVE AGENCY AND IS USUALLY THE ONLY OTHER GOVERNMENT PRESENCE BESIDES CONDEFOR IN THE REMOTE AREAS OF THE COUNTRY. COFFEE PROVIDES A MAJOR INCOME CROP FOR THE CAMPESINO. IN COMAYAGUA EXPERIMENTS ARE BEING CARRIED ON TO GROW COFFEE UNDER PINES. THIS AGENCY WILL WORK WITH CAMPESINOS WITHOUT PAPERS AND GENERALLY HAVE A GOOD REPUTATION FOR HELPING THE CAMPESINOS.

4.1.5. CONSUPLANE

THIS INSTITUTION HAS THE RESPONSIBILITY TO COORDINATE THE PLANS OF THE GOVERNMENT INTO A NATIONAL PLAN THAT FULFILLS THE GOALS OF THE CENTRAL GOVERNMENT. THE INSTITUTION IS PLAGUED BY COMMUNICATION PROBLEMS WITH OTHER GOVERNMENT AGENCIES, OFTEN NOT RECEIVING PLANS FOR PROGRAMS UNTIL MONTHS AFTER THE PROGRAMS HAVE BEEN STARTED.

CONSUPLANE IS WORKING ON DEVELOPMENT OF THE AGUAN VALLEY WITH UNDP. THEY ARE QUITE CONCERNED WITH PROTECTION OF THE WATERSHED OF THE AGUAN RIVER.

4.1.6. ENEE

DEVELOPMENT OF THE ELECTRICAL SYSTEM FOR HONDURAS REQUIRES BUILDING DAMS, RESERVOIRS AND POWER LINES THROUGHOUT THE COUNTRY. THESE ACTIVITIES REMOVE PERMANENTLY LANDS FROM FOREST PRODUCTION. IN THE U.S. 3-5% OF THE FOREST LAND IS LOST TO THIS TYPE OF CONSTRUCTION ANNUALLY. POWER LINES AND ROADS PROVIDE ADDITIONAL ACCESS FOR INVASION OF FOREST LANDS.

4.1.7. SECOPT

ROAD CONSTRUCTION IS A KEY FACTOR IN THE TO DEVELOPMENT OF A COUNTRY. IN HONDURAS IT IS ALSO THE KEY TO DESTRUCTION OF THE FOREST RESOURCE, ESPECIALLY THE BROAD LEAF FOREST. ROAD CONSTRUCTION PRODUCES EROSION AND REMOVES LAND FROM PRODUCTION. USUALLY THE ROADS CONSTRUCTED BY SECOP ARE WELL CONSTRUCTED BUT POORLY MAINTAINED. THE ROAD FROM PROGRESO TO YORO IS AN EXAMPLE. EROSION, SLIDES, CLOGGED CULVERTS ARE A COMMON SIGHT ALONG THE ROAD.

THE YORO ROAD PASSES THROUGH WHAT WAS HIGH FOREST ONLY 5 YEARS AGO BUT IS NOW LARGELY CUT OVER AND PLANTED IN CORN AND BEANS. THE SLOPES IN THIS AREA ARE VERY STEEP OFTEN OVER 100%. PERHAPS PRIOR PLANNING COULD HAVE PREVENTED THIS.

4.1.8. MINISTRY OF TREASURY OF PUBLIC CREDIT

THIS MINISTRY IS RESPONSIBLE FOR APPROVING AND FUNDING OF ALL HONDURAN GOVERNMENT BUDGETS. THIS MINISTRY ESTABLISHES THE PROCEDURES FOR PREPARATION AND SUBMITTAL OF THE BUDGET. PRIOR TO BUDGET PREPARATION, THE MINISTRY WILL GIVE MAXIMUM TARGET LIMITS FOR SPENDING TO EACH AGENCY.

ALL INTERNATIONAL DEVELOPMENT LOANS ARE APPROVED BY THIS MINISTRY. THE MINISTER IS A MEMBER OF THE DIRECTING BOARD FOR COHDEFOR.

4.1.9. CATTLEMEN

THIS GROUP IS A MAJOR CONTRIBUTOR TO DEFORESTATION AND OTHER IMPACTS ON THE FOREST RESERVE. THEY HAVE FORMED A POLITICALLY POWERFUL ASSOCIATION AND ARE ABLE TO INFLUENCE LAND MANAGEMENT POLICY AT ALL LEVELS.

THE ACTIVITY OF PLANTING FORMER AGRICULTURAL LANDS WITH PASTURE GRASS HAS EXACERBATED THE DEFORESTATION PROBLEM BY FORCING MARGINAL FARMERS INTO PREVIOUSLY UNFARMED FOREST. (MURRAY, 1981). IN AREAS OF OLANCHO, CATTLEMEN ARE PAYING WORKERS TO CUT THE FOREST, BURN THE WOOD AND PLANT GRASS DIRECTLY WITHOUT GOING THROUGH A PERIOD OF FARMING (ROPER, 1981).

4.1.10. THE CAMPESINO

MOST DEFORESTATION IS AT THE HAND OF THE CAMPESINO. SEVERAL GROUPS, SUCH AS ANACH, ARE HELPING THE CAMPESINO MOVE INTO AREAS PREVIOUSLY UNFARMED.

THE CYCLE OF SHIFTING AGRICULTURE IS WELL EXPLAINED BY MURRAY, 1980, BUT A SHORT DESCRIPTION OF THE PROCESS IS:

1. VIRGIN FOREST IS CLEARED AND BURNED. ESTIMATES ARE 80,000 HECTARES OF HARDWOOD EACH YEAR AND 8,000 HECTARES OF PINE FOREST. (ROBER 1981 AND HOPKINS, 1981).
2. THE AREA IS FARMED 2-3 YEARS DEPENDING ON TIS PRODUCTIVITY.
3. HERE TWO DECISIONS CAN BE MADE:
 - A. LEAVE THE SITE GO TO BRUSH AND RETURN IN 5-15 YEARS TO FARM IT AGAIN. TIME OF FALLOW DEPENDS ON PRODUCTIVITY OF THE SOIL. THIS CYCLE CONTINUES UNTIL B. IS CHOSEN.
 - B. PLANT PASTURE GRASS ON THE SITE AND SELL THE IMPROVEMENTS TO A CATTLEMAN. IF THIS OPTION IS SELECTED THE CAMPESINO BELIEVES THAT THE AREA IS LOST PERMANENTLY FOR FARMING.

OWNERSHIP OF THE IMPROVEMENTS ON THE LAND IS RECOGNIZED BY THE SUERS. A FENCE IS A SURE SIGN OF OWNERSHIP. WHEN DISPUTES OVER THE OWNERSHIP ARISES THEY ARE USUALLY SETTLED LOCALLY. CATTLEMEN ARE USUALLY STRONGER THAN THE CAMPESINO AND OFTEN WINS OUT A DISPUTE.

THE LEGAL DEFINITION OF LAND OWNERSHIP DOES NOT GENERALLY RECOGNIZE THE RIGHT OF THE CAMPESINO TO OWN THE IMPROVEMENTS ON THE LAND. IF THE PERSON CAN PROVE CONTINUOUS POSSESSION OF THE LAND FOR 10 YEARS, HE MAY APPLY TO INA FOR A TITLE TO THE LAND UNDER THE AGRICULTURAL REFORM LAW. BUT, ONCE AGAIN, IF THE PERSON HAS NO IDENTIFICATION PAPERS HE HAS NO RIGHTS TO DO THIS.

THE CAMPESINO AND HIS ACTIVITIES ARE CERTAINLY THE GREATEST FORCE OF DEFORESTATION IN HONDURAS. THE NEEDS AND DESIRES OF THIS GROUP OF PEOPLE MUST BE CONSIDERED IN ANY FOREST RESOURCE DEVELOPMENT PLAN UNDERTAKEN. IT IS NOT ENOUGH TO DEVELOPMENT MANAGEMENT PLANS TO RECTIFY THE DAMAGES HE CAUSES. THE CAMPESINO MUST BE FULLY INTEGRATED INTO THE MANAGEMENT OF THE FOREST. HE MUST RECEIVE DIRECT BENEFITS FOR HIS WORK THERE. THESE BENEFITS MUST NOT ONLY INCLUDE WAGE LABOR BUT ALSO MUST INCLUDE DEVELOPMENT OF OWNERSHIP RIGHTS AND ENTREPRENEURIAL FEELING TOWARD THE FOREST RESOURCE. A MORE COMPLETE DISCUSSION OF THIS FOLLOWS IN SECTION-----.

4.2. INTERNATIONAL AID INSTITUTIONS

4.2.1. BID

INTER AMERICAN DEVELOPMENT BANK. THIS IS A FINANCING INSTITUTION THAT COMMONLY FUNDS RURAL DEVELOPMENT PROJECTS. THEY ARE THE PRINCIPAL SPONSORS OF THE COMAYAGUA FOREST DEVELOPMENT PROJECT OF COHDEFOR. THEY HAVE A LIMITED TECHNICAL STAFF AND OFTEN USE ORGANIZATIONS SUCH AS FAO TO PROVIDE NEEDED TECHNICAL ASSISTANCE.

4.2.2. PEACE CORPS

THE PEACE CORPS HAS LONG BEEN AN INTEGRAL FORCE IN NATURAL RESOURCE DEVELOPMENT IN HONDURAS. THERE HAVE BEEN 33 VOLUNTEERS ASSIGNED TO COHDEFOR SINCE 1974. THEY HAVE FILLED MOSTLY FIELD POSITIONS AND ARE PRESENTLY MOSTLY ASSIGNED PROMOTING THE SOCIAL FORESTRY SYSTEM IN RURAL AREAS. THESE PEOPLE ARE OFTEN YOUNG AND INEXPERIENCED. MANY ARE JUST OUT OF SCHOOL. BUT THEY HAVE EARNED GREAT RESPECT THROUGHOUT HONDURAS AND ARE KNOWN TO WORK WELL UNDER DIFFICULT CONDITIONS. LIMITED EXPERIENCE IS THE GREATEST PROBLEM IN USING THE PCV.

4.2.3. FAO

FAO HAS THE LONGEST CONTINUOUS EXPERIENCE IN HONDURAN FORESTRY. THE EXPERTS PROVIDED ARE OFTEN VERY EXPERIENCED AND HAVE BEEN INSTRUMENTAL IN DEVELOPING SOME OUTSTANDING PROJECTS. THEY ARE VERY THOROUGH IN PLANNING. THE RELIANCE ON HEAVY INPUTS OF TECHNICAL ASSISTANCE IS THE MAJOR FAULT OF THIS GROUP. AFTER PROJECT COMPLETION, HONDURAN AGENCIES OFTEN FIND THAT THEY DO NOT HAVE THE SKILLS OR TECHNICAL ABILITY OR EXPERIENCE TO CONTINUE THE PROJECT IMPLEMENTATION.

4.2.4. USAID

AFTER A PERIOD OF MORE THAN TEN YEARS A.I.D. HAS DECIDED TO REENTER NATURAL RESOURCES PROJECTS. THIS DECISION REQUIRES SOME PREPARATION OF SETTING OF PROCEDURES.

THE FIRST A.I.D. PROJECT, THE CHOLUTECA WATERSHED MANAGEMENT PROJECT, IS INTERESTING BECAUSE IT REQUIRES THAT SEVERAL HONDURAN GOVERNMENT AGENCIES COOPERATE IN ITS IMPLEMENTATION. THIS IS THE PROPER APPROACH TO BUILDING THE FOREST RESOURCES MANAGEMENT INSTITUTION. IT WILL FORCE LINES OF COMMUNICATION TO DEVELOP.

USAID/HONDURAS IS LIMITED IN ITS ABILITY TO DEVELOP AND MANAGE THE PROGRAMS OF NATURAL RESOURCE DEVELOPMENT AND PROTECTION BECAUSE OF UNDERSTAFFING. THERE IS ONLY ONE TRAINED FORESTER, A RECENT IDI GRADUATE, WITH VERY LIMITED EXPERIENCE IN INTERNATIONAL PROGRAM DEVELOPMENT AND SUPERVISION. AID/HONDURAS IS IN THE EARLY DEVELOPMENT PHASE FOR A LARGE FOREST MANAGEMENT PROJECT WITH COHDEFOR. THESE TWO PROGRAMS WOULD CHALLENGE THE ABILITY OF A HIGHLY EXPERIENCED PROJECT MANAGER. AID/HONDURAS MUST REINFORCE THEIR ABILITY TO MANAGE AND SUPERVISE NATURAL RESOURCE DEVELOPMENT PROJECTS. THIS WILL REQUIRE BOTH MORE PEOPLE AND MORE EXPERIENCE.

4.2.5. WORLD BANK

WORLD BANK HAS MUCH THE SAME ROLE AS BID IN HONDURAS. OF NOTE IS THEIR SUPPORTING THE FORESTRY SEGMENT OF THE CONSUPLANE PROJECT FOR RURAL DEVELOPMENT IN THE SOUTHEAST OF HONDURAS, P_____.

4.2.5. GOVERNMENT OF GREAT BRITAIN

THE GOVERNMENT OF GREAT BRITAIN HAS BEEN VERY SUCCESSFUL IN HONDURAS. OF NOTE IS DEVELOPMENT OF A COHDEFOR SEED PROCESSING FACILITY AT ESNACIFOR WHICH NOW EXPORTS TREE SEED TO THE WORLD WHILE PROVIDING HIGH QUALITY SEED FOR REFORESTATION NEEDS OF COHDEFOR. A SUCCESSFUL PROGRAM OF DEVELOPING PROCEDURES FOR PRESCRIBE BURNING IN PINE STANDS HAS BEEN COMPLETED. MUCH OF THE PROCEDURES FOR NURSERY OPERATION AND ARTIFICIAL REFORESTATION HAVE BEEN DEVELOPED BY PERSONNEL OF BRITAIN.

THE SECRET OF THEIR SUCCESS SEEMS TO BE TACKLING SPECIFIC PROBLEMS WITH FEW VERY HIGHLY SKILLED, DEDICATED PEOPLE WHO WORK CLOSELY WITH HONDURAN FIELD TECHNICIANS.

4.2.6. CIDA

THE CANADIAN INTERNATIONAL DEVELOPMENT AGENCY HAS WORKED CLOSELY WITH COHDEFOR IN THE AREAS OF FIRE PROTECTION, FOREST INVENTORIES, BROADLEAF FOREST MANAGEMENT, AND FINANCING OF INDUSTRY. THE RELATIONSHIP HAS NOT ALWAYS BEEN SMOOTH LARGELY BECAUSE OF INEXPERIENCE OF CIDA WHO ONLY STARTED PROJECTS IN HONDURAS IN 1977.

4.2.7. JAPANESE INTERNATIONAL COOPERATION AGENCY

THIS IS THE MOST RECENT ENTRANT TO AID FOR DEVELOPMENT IN HONDURAS. THE ONLY PROJECT IN FORESTRY IS AN INVENTORY AND AERIAL PHOTOGRAPHS FOR THE LA MOSQUITIA PINE AREAS.

5. SOCIAL CONSIDERATIONS IN FOREST MANAGEMENT.

AMERICAN FORESTERS ONCE WERE ABLE TO CARRY OUT THEIR WORK WITH COMPLETE DISREGARD OF THE SOCIAL DESIRES OF PEOPLE. THEY WERE WORKING IN ISOLATED AREAS WHERE MOST OF THE RESIDENT POPULATION WAS EMPLOYED IN SOME ASPECT OF FOREST MANAGEMENT. THIS ALL CHANGED IN THE MID 1960S. PEOPLE EVERYWHERE WERE QUESTIONING TECHNICAL DECISIONS BASED ON VALUES NEVER BEFORE CONSIDERED IMPORTANT SUCH AS SOLITUDE, NATURAL SCENERY, PRESERVATION FOR EXAMPLE. EVEN PRIVATE DEVELOPERS SUCH AS WEYERHAEUSER CO. FOUND GREAT PROBLEMS IF FOREST DEVELOPMENT PROJECTS. IN ARKANSAS, WEYERHAEUSER FOUND THAT PEOPLE DEEPLY RESENTED THEIR REMOVING THE OAK/HICKORY FOREST AND PLANTING PINE IN ITS PLACE. WHILE THE LOCAL PEOPLE DID NOT THINK THEY OWNED THE LAND, THEY SURELY FELT THAT HE HAD A RIGHT TO USE THE LAND AS THEY HAD FOR YEARS; FOR SQUIRREL HUNTING; FOR FREE GRAZING; AND FOR A MYRIAD OF OTHERS USES. REACTION TO WEYERHAEUSER'S OPERATIONS WAS EQUIPMENT SABOTAGE, ARSON IN THE PINES PLANTATIONS, AND EVEN AT TIMES SHOTS FIRED AT THE FORESTERS.

THESE PROBLEMS ARE TYPICAL OF WHAT IS NOW GOING ON IN HONDURAS. THE REASONS ARE THE SAME. TECHNICIANS DISREGARD OR DO NOT UNDERSTAND THE NEEDS OR DESIRES OR CUSTOMS OF THE LOCAL PEOPLE WHEN PLANNING THE DEVELOPMENT OF THE FOREST. HONDURAN FORESTERS HAVE NOT BEEN TRAINED TO UNDERSTAND OR WORK WITH RURAL PEOPLES. THE FORESTER IS OFTEN FROM THE CITY AND DOES NOT HAVE A FEELING FOR LIFE IN THE RURAL AREAS. THOSE PROGRAMS THAT ARE DEVELOPED TO AID THE FOREST DWELLING CAMPESINO ARE USUALLY OF TWO TYPES - DESIGNED TO KEEP THE CAMPESINO FROM THE FOREST OR DESIGNED AROUND INDUSTRIAL EXPLOITATION OF THE RESOURCE. AN EXAMPLE OF THE FIRST IS GIVING THE CAMPESINO BEEHIVES AND HOPING THAT HE WILL MAKE ENOUGH MONEY TO STOP HIS DESTRUCTION OF THE FOREST. AN EXAMPLE OF THE SECOND IS RESINATION OF THE FOREST. WHAT IS MISSING ARE PROJECTS TO BRING THE CAMPESINO INTO THE FOREST, NOT AS ITS DESTROYER, BUT AS ITS MANAGER. WHY SHOULD COHDEFOR BRING ITS EMPLOYEES IN TO PERFORM SILVICULTURAL TREATMENTS IN A PINE STAND ON LAND SURROUNDING A VILLAGE THAT COULD VERY WELL PROVIDE THE PEOPLE AND RECEIVE THE BENEFIT OF THE WAGES FOR THE COMMUNITY? THE LAW THAT CREATED COHDEFOR, DECRETO LEY 103, CAPITULO V, CERTAINLY AUTHORIZES THIS. THE ANSWER IS THAT COHDEFOR DOES NOT HAVE THE KNOWLEDGE OR EXPERIENCE TO DO THIS DIFFICULT, COMPLICATED TASK. THE FORESTER HERE, AS IN THE UNITED STATES, IS UNSURE OF HOW TO PROCEED WITH MANAGEMENT UNDER INSECURE, NEBULOUS CONSTRAINTS OF INCLUDING A GROUP OF PEOPLE WHO HAVE "STRANGE" WANTS AND GOALS. IN OTHER WORDS THE RURAL POOR HAVE NOT BEEN INCLUDED IN THE MANAGEMENT OF THE FORESTS BECAUSE IT IS EASIER FOR THE FORESTER.

IN THE UNITED STATES THE PROBLEM HAS BEEN TAKEN OUT OF THE HANDS OF THE FORESTER AND GIVEN TO THE COURTS. THIS HAS NOT PROVEN SATISFACTORY BECAUSE THE COURTS HAVE NO MORE ABILITY TO MAKE A TECHNICAL DECISION THAN THE FORESTER HAS TO MAKE A SOCIAL DECISION. A BETTER METHOD WOULD BE TO EDUCATE THE FORESTER AND PROVIDE HIM WITH EXPERT ADVICE ON HOW TO INCLUDE THE CAMPESINO INTO THE MANAGEMENT OF THE FOREST.

THE CAMPESINO MUST BENEFIT BOTH DIRECTLY AND INDIRECTLY FROM HIS ACTIVITIES TO THE FOREST. IF HE IS ASKED TO DESIST FROM AN ACTIVITY, HE MUST BE FULLY COMPENSATED FOR THIS LOSS OF BENEFIT. FOR EXAMPLE FIRES WILL CONTINUE UNTIL THE CAMPESINO RECEIVES SOME BENEFIT FROM NOT BURNING.

5.1. AN EXAMPLE OF A PROJECT WITH SOCIAL CONSIDERATIONS IS THE BROADLEAF MANAGEMENT PROJECT OF COHDEFOR WITH TECHNICAL AID FROM CIDA. THIS PROJECT STARTED AS ADMINISTRATION OF BROADLEAF MANAGEMENT AND HAS GROWN TO THE POINT WHERE COHDEFOR IS PLANNING TO CREATE A NEW FOREST DISTRICT IN 1982 WITH THE OBJECTIVE OF MANAGEMENT OF BROADLEAF STANDS. INCLUDED IN THE PROJECT IS FORMATION OF COOPERATIVES OF CAMPESINOS TO SELECTIVE CUT VALUABLE TREES AND TO HAND SAW THEM INTO CANTS FOR SALE TO LOCAL SAWMILLS. THESE COOPERATIVES WILL ALSO TRY TO SAVE SOME OF THE WOOD NOW BURNED BY THE SHIFTING AGRICULTURIST.

RESERVES OF VIRGIN FOREST ARE BEING MARKED OUT SO THE AGRICULTURIST KNOWS WHERE THEY ARE. PLANTATIONS OF SPECIAL USE SPECIES, SUCH A EUCALYPTUS FOR FUELWOOD, ARE BEING PLANTED WHERE LAND IS AVAILABLE. THE PROJECT HAS TALKED WITH INA AND WILL SOON START TO DELINATE LANDS THAT CAN BE PUT UNDER SUCH SYSTEMS AS TAUNGYA AND WILL CONTINUE USING THE SHIFTING AGRICULTURE METHODS KNOWN BY THE CAMPESINO.

THE BIGGEST PROBLEM FACING THIS PROJECT IS FUNDING. CIDA HAS LIMITED FUNDS FOR THIS TYPE OF PROJECT AND COHDEFOR IS VERY CASH SHORT. BUT WHEN ONE THINKS OF THE FACT THAT WOOD LOSS IN THE ANNUAL SLASH AND BURN AGRICULTURE IN

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THE VIRGIN HARDWOODS IS ESTIMATED TO BE THAN 12,000,000 M³, MORE THE ALL OTHER USES OF WOOD IN HONDURAS PUT TOGETHER. (ROPER, 1981). THIS REPRESENTS A LOSS OF OVER \$300,000,000 WITHOUT EVEN CONSIDERING THE LOSS OF HABITAT, WATERSHED OR OTHER MORE AESTHETIC VALUES OF THE VIRGIN BROADLEAF FOREST.

UNTIL THE CAMPESINO IS CONSIDERED IN THE MANAGEMENT OF THE FOREST AND IS INCLUDED AS A BENEFICIARY OF ITS PRODUCTS, LONG TERM FORESTRY GOALS WILL BE IMPOSSIBLE TO ACHIEVE. ONE CONSTRAINT MUST BE ADHERED TO -- THE COST OF THE SOCIAL PROGRAM MUST NOT EXCEED THE PROGRAMMED COST OF THE MANAGEMENT ACTIVITY PERFORMED. THE COST OF THE WORK PERFORMED MUST NOT EXCEED THE VALUE OF THE JOB.

ARTICLE 61 AND 62 SET UP RULES FOR NATIONAL PARK ESTABLISHMENT

LAW 103 WAS THE ONE THAT CREATED COHDEFOR. LAW 103 DOES NOT REPLACE LAW 85. BOTH LAW GOVERN THE OPERATIONS OF COHDEFOR.

THESE LAWS HAVE NOT BEEN REGULATED. MANY RIGHTS THAT ARE GIVEN HAVE NOT BEEN EXERCISED. THE LAWS ARE NOT EXCLUSIVE BUT MANY OF THE REQUIREMENTS ARE UNCLEAR BECAUSE LAW 85 WAS WRITTEN BEFORE COHDEFOR WAS CREATED. THE RESPONSIBILITIES OF COHDEFOR ARE OUTLINED IN LAW 103, ARTICLE 8. THIS APPOINTS COHDEFOR AT THE FOREST ADMINISTRATOR OF THE STATE. SEEMINGLY THIS REQUIRES COHDEFOR TO SELECT, MANAGE AND MAINTAIN NATIONAL PARKS.

6. LAW REVIEW

THE PRINCIPAL LAWS GOVERNING FOREST MANAGEMENT ARE:

DECRETO LEY 85. THE FOREST LAW
DECRETO LEY 103. THE LAW OF THE HONDURAN CORPORATION OF FOREST
DEVELOPMENT

LAW 85 OUTLINES FOREST CONSERVATION AND FOREST MANAGEMENT REQUIREMENTS FOR
HONDURAS. OF SPECIAL NOTE ARE THE FOLLOWING PARTS:

CAPITULO III DEFINITION, CLASSIFICATION, DECLARATION AND
ADMINISTRATION OF FOREST AREAS AND ZONES.

THIS SECTION GIVES THE BASIC RULES FOR CLASSIFYING FOREST LANDS.

CAPITULO V DESLINDE Y ALMACENAMIENTO DE LAS AREAS FORESTALES PUBLICAS
ARTICULO 31 DEFINES PRIVATE LAND OWNERSHIP.

CAPITULO VII PROTECTION OF FOREST AREAS.
REQUIRES FOREST MANAGEMENT PLANS TO INCLUDE CONSIDERATION FOR
WATERSHED, SOIL SCENERY AND WILDLIFE BEFORE APPROVAL AND
RESERVES.

7. EDUCATION

7.1. CUBLA. THIS AGRICULTURAL COLLEGE IN LA CEIBA IS ATTEMPTING TO
DEVELOP A B.S. LEVEL FORESTRY PROGRAM. THEY HAVE AN IMPRESSIVE LIST OF
CLASSES BUT HAVE VERY FEW TRAINED PROFESSORS. THEY ARE LOCATED FAR FROM THE
PINE FORESTS BUT VERY CLOSE TO THE HARDWOODS. CONDEFOR PROFESSIONALS SAY THAT
GRADUATE OF CURLA (ABOUT 10 EACH YEAR) ARE NOT ADEQUATELY TRAINED AND HAVE NO
PRACTICAL EXPERIENCE. TO GIVE FIELD TRAINING, CURLA FOR THE FIRST TIME IN
1981 IS OFFERING A FIELD CAMP IN TALANGA IN THE PINE FOREST.

IT IS QUESTIONABLE WHETHER CURLA CAN DEVELOP A STAFF OF TEACHERS
SUFFICIENTLY EXPERIENCED TO PRODUCE WELL TRAINED FORESTERS WITH A FIVE YEARS.
ANOTHER PROBLEM IS THAT CONDEFOR NOW HAS OVER 340 TRAINED FORESTERS, ABOUT ONE
THIRD ARE COLLEGE GRADUATES, AND JOB OPPORTUNITIES ARE QUICKLY DISAPPEARING.
THE PRIVATE SECTOR ONLY EMPLOYS A FEW FORESTERS.

ESNACIEIQB. THIS FOREST TECHNICIAN SCHOOL, OPERATED BY CONDEFOR IS A
REGIONAL SCHOOL THAT IS ATTENDED BY STUDENTS FROM MOST OF CENTRAL AMERICAN AND
THE CARIBBEAN. THERE HAS BEEN A FEW STUDENTS FROM SOUTH AMERICA. THE SCHOOL
HAS A GOOD REPUTATION FOR PRODUCING WELL TRAINED PEOPLE WITH EMPHASIS ON FIELD
WORK. CONDEFOR HAS CUT THE NUMBER OF SCHOLARSHIPS OFFERED TO HONDURAN STUDENTS
TO 25. THIS FURTHER REFLECTS THE JOB SITUATION FOR FORESTERS IN HONDURAS.

THE SCHOOL SHOULD INCLUDE MORE COURSE WORK IN MULTIPLE USE MANAGEMENT
OF THE FOREST. TEACHING OF RANGE MANAGEMENT, WATERSHED MANAGEMENT, WILDLIFE
MANAGEMENT, PARK MANAGEMENT AND SOIL CONSERVATION SHOULD BE INCLUDED IN THE
CURRICULUM.

THIS WELL-RUN SCHOOL IS A VALUABLE RESOURCE FOR NOT ONLY HONDURAS BUT
ALSO FOR THE ENTIRE REGION.

8. REVIEW OF IMPORTANT PROJECTS

8.1 CORFINO. THIS PROJECT IS A SAWMILL/PULP MILL COMPLEX THAT WILL UTILIZE

THE LAST REMAINING LARGE STANDS OF MATURE PINE. THE FEASIBILITY STUDIES AND MANAGEMENT PLANS WERE DONE BY THE FINISH CONSULTING FIRM OF JAAKKO POYRY. THE ACTUAL PULP MILL HAS NOT BEEN SELECTED BU THE FIRST SAWMILL IS BEING INSTALLED AT BONITO ORIENTAL IN THE NORTH CENTRAL PART OF HONDURAS. THE NEXT SCHEDULED INSTALLATION IS A PLYWOOD PLANT. THE MANAGERS CLAIM THE ENVIRONMENTAL IMPACT OF THE PROJECT IS BEING CONSIDERED IN THE PLANNING.

8.2. INFONAC. COHDEFOR PROJECT TO CONDUCT A NATIONAL INVENTORY OF THE PINE AREAS AND TO PRODUCE UP-TO-DATE TYPE MAPS. THIS IS BEING IN CONJUNCTION WITH CIDA. THE INVENTORY IS ESSENTIAL FOR FOREST MANAGEMENT PLANNING IN HONDURAS.

8.3. PLAN COMAYAGUA. COHDEFOR WITH TECHNICAL ASSISTANCE FROM FAO AND FINANCING FROM BID ARE ESTABLISHING AN INTEGRATED MANAGEMENT PLAN FOR THE WATERSHED OF THE EL CAJON DAM PROJECT.

8.4. CHOLUTECA WATERSHED MANAGEMENT PROJECT. MINISTRY OF NATURAL RESOURCES WITH FINANCING OF USAID IS CONDUCTING AN INTERAGENCY PROJECT TO PROTECT AND REHABILITATE THE WATERSHED OF THE CHOLUTECA RIVER. SOME OTHER AGENCIES INCLUDED ARE COHDEFOR, INA AND NATIONAL CADASTER. THIS IS NOTABLE BECAUSE OF THE ATTEMPT TO FORM INTERAGENCY COOPERATION.

9.0 CONCLUSION

9.1. COHDEFOR IS THE KEY AGENCY FOR PROTECTION, MANAGEMENT, AND DEVELOPMENT OF THE FOREST RESOURCE.

9.2. INTERAGENCY TERRITORIALISM AND LACK OF COMMUNICATION ARE SERIOUS DETRIMENTS TO EFFECTIVE MANAGEMENT OF THE FOREST RESOURCE OF HONDURAS.

9.3. THE SOCIAL CONSIDERATIONS OF FOREST RESOURCE MANAGEMENT ARE NOT FULLY INTEGRATED IN THE MANAGEMENT DECISION PROCESS.

9.4. THE ENVIRONMENTAL COST OF PROJECTS IS NOT GENERALLY CONSIDERED DURING THE PROJECT PLANNING STAGE.

9.5. SERIOUS UNDERUTILIZATION OF THE RAW MATERIALS PRODUCED IN THE FOREST RESOURCE IS EVIDENT.

9.6. INEXPERIENCE AND LACK OF DIRECTION ARE SERIOUS IMPEDIMENTS TO EFFECTIVE MANAGEMENT OF THE FOREST RESOURCE.

9.7. INTERNATIONAL FUNDING CONTROLS THE DIRECTION OF FOREST RESOURCE MANAGEMENT IN HONDURAS.

10 RECOMMENDATIONS

10.1 GENERAL

10.1.1. ALL FOREST RESOURCE MANAGEMENT ACTIVITIES SHOULD BE TRANSFERRED TO COHDEFOR. NATIONAL PARKS, FOREST RESERVE, BIOLOGICAL RESERVE, AND WILDLIFE MANAGEMENT SHOULD BE REMOVED FROM THE MINISTRY OF NATURAL RESOURCES. FORESTRY LAW 85 REQUIRES THAT ALL MANAGEMENT PLANS FOR FOREST DEVELOPMENT CONSIDER THESE FACTORS AND LAW 103 GIVES COHDEFOR THE RESPONSIBILITY TO ADMINISTER LAW 85.

ONLY CONDEFOR HAS THE TRAINED PERSONNEL AND THE FUNDS TO GIVE THESE IMPORTANT NEEDS FULL ATTENTION. MOST CONDEFOR PROFESSIONALS FEEL THEY SHOULD CONTROL ALL FACTORS OF FOREST DEVELOPMENT. GLICK'S REPORT POINTS OUT THE OBVIOUS PROBLEMS OF RENARE.

10.1.2. CURLA SHOULD ABANDON THE GOAL OF PRODUCING FORESTERS AND SHOULD USE THE ALREADY DEVELOPED FORESTRY TRAINING CAPABILITY TO PRODUCE AGRICULTURISTS WITH STRONG TRAINING IN FORESTRY, IE. AGRO-FORESTERS.

THE NEED TO SOLVE AGRICULTURAL PROBLEMS IN THE FOREST OF HONDURAS REQUIRES TRAINED PERSONNEL. THESE COULD BE PRODUCED AT CURLA. THE LOCATION OF THE SCHOOL IS IDEAL, CLOSELY SITUATED TO THE MAIN DESTRUCTION OF BROADLEAF FOREST IN THE DEPARTMENTS OF COLON AND OLANCHO. THE NEED FOR AGRI-FORESTERS IS REGIONAL AND WILL ALL CENTRAL AMERICAN AND CARIBBEAN COUNTRIES FACING THE SAME PROBLEMS. FINANCIAL AID AND TECHNICAL ASSISTANCE WILL BE REQUIRED TO ACCOMPLISH THIS GOAL.

10.1.3. MAJOR EFFORTS MUST BE MADE TO FORCE INTERAGENCY COOPERATION ON NATURAL RESOURCE DEVELOPMENT PROJECTS. THE CHOLUTECA WATERSHED MANAGEMENT PROJECT, FUNDED BY USAID, IS A MAJOR STEP FORWARD IN THIS.

10.1.4. ALL NATURAL RESOURCE DEVELOPMENT PROJECTS MUST INCLUDE SOCIAL ASPECTS IN THEIR PLANNING. THE RURAL POPULATION MUST BE INCLUDED IN THE WORK OF MANAGEMENT AND MUST RECEIVE A BENEFITS DIRECTLY FROM THE FOREST. THE REQUIREMENTS OF LAW 103, CHAPTER II ESPECIALLY ARTICLE 25 B, D, E, AND F REQUIRES THIS.

10.1.5. ALL PROJECTS HAVING INFLUENCE ON THE FOREST RESOURCE MUST HAVE SOME FORM OF ENVIRONMENTAL IMPACT ANALYSIS. THIS SHOULD BE REQUIRED AS INPUT FOR BUDGET PREPARATION BY THE MINISTRY OF HACIENDA AND CREDITO PUBLIC. THE MINISTRY SHOULD ACCEPT NO AGENCY BUDGET AS INTERNATIONAL FUNDED PROJECT THAT DOES NOT HAVE AN ANALYSIS. EXHIBIT_____ GIVES AN EXAMPLE OF A SIMPLE FORM THAT COULD BE ADAPTED FOR UNSE IN HONDURAS. EXHIBIT_____ SHOWS THIS FORM FILLED OUT FOR A SAMPLE PROJECT. APPENDIX 3 GIVES THE QUESTIONARE AND A SHORT EXPLANATION OF HOW THE EVALUATION IS MADE. THIS SYSTEM IS FULLY EXPLAINED IN USAID PUBLICATION "ENVIRONMENTAL DESIGN CONSIDERATIONS FOR RURAL DEVELOPMENT PROJECTS" AVAILABLE FROM THE UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT, WASHINGTON, D.C. 20523.

WHILE THIS SYSTEM IS VERY BASIC, IT IS COMPREHENSIVE AND COULD BE ADAPTED TO FIT THE NEEDS OF HONDURAS. ALL EFFORTS SHOULD BE MADE TO ADOPT A SYSTEM SIMILAR TO THIS IN HONDURAS WITH APPROPRIATE FUNDING WHERE NECESSARY.

10.1.6. UNDER UTILIZATION OF THE RAW MATERIAL OF THE FOREST RESOURCE REQUIRES EXCESSING CUTTING. ESTIMATES OF OVER 60% WASTE IN THE PINE FOREST INDICATE THAT BETTER UTILIZATION OF THIS RESOURCE COULD EFFECTIVELY INCREASE THE G.N.P. OF HONDURAS AND WOULD EXTEND THE LIFE OF THE FOREST INDUSTRY OF HONDURAS.

IMPROVED UTILIZATION OF THE PINE RESOURCE MUST INCLUDE:

- INCREASING THE STUMPAGE VALUE TO REPRESENT A RESIDUAL VALUE BASED ON CONVERSION COSTS AND PRODUCT VALUE.
- MAKE TIMBER SALES BASED ON LUMP-SUM APPRAISALS OF THE STUMPAGE VALUE.
- SETTING NOMINAL LUMBER SIZES WITH MAXIMUM AND MINIMUM SIZE LIMITS.
- PROVIDING TECHNICAL AID TO MILLS TO IMPROVE THE EFFICIENCY OF CONVERSION OF ROUND WOOD TO LUMBER.
- CONVERT WOOD WASTE TO ENERGY.

THE BROADLEAF RESOURCE WILL REQUIRE BETTER ACCESS TO THE AREAS, SATELLITE MILLS AND BETTER MARKETING OF COMMERCIAL WOODS. FUELWOOD PRODUCTION COULD BE IMPORTANT.

THESE CONSIDERATIONS MUST BE INCLUDED IN ALL FOREST MANAGEMENT PROJECT FOR HONDURAS.

10.1.7. LAWS 85 AND 103 MUST HAVE THE PROPER REGULATIONS THAT ASSIGN RESPONSIBILITY AND AUTHORITY TO MANAGE THE FOREST SPELLED OUT. THIS REQUIREMENT SHOULD BE MADE PART OF ANY FOREST MANAGEMENT PROJECT.

10.1.8. TECHNICAL AID FOR ADMINISTRATIVE FUNCTIONS OF HONDURAN AGENCIES IS NEEDED. ALL NATURAL RESOURCE DEVELOPMENT PROJECTS MUST RECOGNIZE THIS FACT.

10.1.9. TO ASSURE BETTER COORDINATION BETWEEN THE VARIOUS INTERNATIONAL FUNDING INSTITUTIONS, A PERIODIC MEETING OF THE COUNTERPART LEADERS IS REQUIRED. USAID SHOULD TAKE THE LEAD IN DEVELOPING THIS MEETING.

10.2 SPECIFIC PROJECTS.

10.2.1. BROADLEAF MANAGEMENT. THE CODEFOR/CIDA BROADLEAF MANAGEMENT PROJECT CAN SERVE AS A PILOT FOR A MUCH LARGER PROJECT. BECAUSE OF THE DIVERSE PROBLEMS AND THE LARGE AREA OF BROADLEAF DESTRUCTION AND THE LEVEL OF FUNDING REQUIRED, A MULTI-LATERAL INTERAGENCY PROJECT IS RECOMMENDED TO INCLUDE:

- AGRO-FORESTRY SYSTEM DEVELOPMENT
- SATELLITE MILLS TO UTILIZE THE RAW MATERIAL
- SOCIAL AND PHYSICAL NEED OF THE PEOPLE CONSIDERED IE: SCHOOLS, MEDICAL FACILITIES, ROADS, ETC.
- REFORESTATION
- PARK AND RESERVE IDENTIFICATION
- BIOLOGICAL STUDIES - TAXONOMIC AND ECOLOGICAL

10.2.2 PINE SAVANNAS OF LA MOSQUITIA. THIS AREA HAS OVER 900,000 HECTARES OF PINE LANDS VERY THINLY FORESTED. THE MAIN PROBLEM IS FIRE. THE SOILS ARE LOW PRODUCTIVE, HIGHLY LEACHED OXISOLS. WITH THE EXCEPTION OF THE GALLERY FOREST ALONG MAJOR RIVERS, NO AGRICULTURAL POTENTIAL EXISTS. THE LAND IS GENERALLY FLAT WITH SLIGHTLY ROLLING HILLS.

THE LOW COST OF FOREST MANAGEMENT AND EXTRACTION AND THE LOW POSSIBILITY OF OTHER USE MAKES THIS AREA IDEAL FOR FOREST MANAGEMENT. LARGE AREAS CAN BE STOCKED FROM NATURAL SEED FALL FROM THE NATIVE *PINUS CARIBEA* AND ALREADY PROVEN REFORESTATION WITH BAREROOT *PINUS CARIBEA* SEEDLINGS CAN BE DONE WHEN NO SEED SOURCE EXISTS. THE AREA COULD BE A MAJOR PRODUCER OF SOFTWOODS BY THE YEAR 2010 IF PUT UNDER MANAGEMENT TODAY. MAJOR PROBLEMS ARE POSED BY LIMITED ACCESS AND POLITICAL PROBLEMS WITH NICARAGUA.

10.2.3. AN INTEGRATED FOREST MANAGEMENT PLAN FOR THE PINE AREA OF CENTRAL HONDURAS IS NEEDED. COHDEFOR IS NOW AT THE STAGE WHERE RAPID GROWTH IS STOPPED AND STAGNATION IS BEGINNING. A PROGRAM TO TAKE A LARGE AREA OF YOUNG FOREST AND ESTABLISH PROFESSIONAL FOREST MANAGEMENT TO INCLUDE THE PEOPLE OF THE REGION WOULD HELP SET AN EXAMPLE OF HOW FOREST MANAGEMENT IS DONE. AS PART OF THIS PROGRAM ORGANIZATIONAL SYSTEMS AND PROCEDURES MUST BE DEVELOPED. USAID IS NOW DEVELOPING SUCH A PROJECT WITH COHDEFOR.

LIST OF KEY PEOPLE

COHDEFOR

LIC. ALBERTO EGUIGUREMS - GENERAL MANAGER
ING. MANUEL HERNANDEZ - INTERNATIONAL PROGRAMS COORDINATOR
LIC. RAMON ZUNIGA, HEAD, PLANNING DEPARTMENT
ING. CARLOS PINEDA - HEAD, DEPARTMENT OF FORESTRY
ING. DANILO ESCOTC - PRODUCTION DEPARTMENT
DR. JOSE FLORES RODAS - DIRECTOR PLAN COMAYAGUA

FIAFSA

ING. JULIO BARAHONA - GENERAL MANAGER

CORFINO

ING. LEONEL GUILLEN - FOREST MANAGEMENT

CONSUPLANE

ING. JORGE PALMA - FOREST PLANNING

CIDA

ING. JOHN WILSON - DIRECTOR FORESTRY PROGRAMS
ING. JOHN ROPER - TECHNICAL ADVISOR BROADLEAF PROJECT

FAO

ING. MANUEL MUNEZ - DIRECTOR FORESTRY PROGRAMS
ING. JAN TROENSEGAARD - FORESTRY TECHNICAL AID
LIC. RICARDO REYES - REGIONAL DIRECTOR INDUSTRIAL FORESTRY

USAID

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BIBLIOGRAPHY

- HUDSON, J. M., J. GUEVARA AND W. RODRIGUEZ. 1981. DISEMINACION NATURAL DE SEMINAS DE PINUS COCARRA EN HONDURAS E IMPLICACIONES PARA LA REGENERACION NATURAL. ESCUELA NACIONAL DE CIENCIAS FORESTALES. CORPORACION HONDURENA DE DESARROLLO FORESTAL. ARTICULO CIENTIFICO 3. SIGUATEPEQUE, HONDURAS.
- MURRAY, GERALD F. 1981. MOUNTAIN PEASANTS OF HONDURAS: GUIDELINES FOR THE REORDERING OF SMALLHOLDING ADAPTION TO THE PINE FOREST FOR USAID/HONDURAS. TEGUCIGALPA, HONDURAS.
- FLÒRES RODAS, JOSE G. 1980. ANALISIS DEL PRIMER SEXENIO DE LA CORPORACION HONDURENA DE DESARROLLO FORESTAL, COHDEFOR. TEGUCIGALPA, HONDURAS.
- COHDEFOR 1979. PLAN NACIONAL DE DESARROLLO FORESTAL. DEPARTAMENTO DE PLANIFICACION. TEGUCIGALPA, HONDURAS.
- ROPER, JOHN. 1981. PROYECTO BOSQUES LATIFOLIADOS EQB DEPARTAMENTO DE BOSQUES, COHDEFOR/CIDA. TEGUCIGALPA, HONDURAS.
- TROENSEGAARD, JAN. 1980. PAUTAS PARA LA ORDENACION FORESTAL EN HONDURAS EQB GERENCIA DE BOSQUES DE COHDEFOR. OFICIAL FORESTAL FAO HON/78/005.
- CLIFF, EDWARD P. 1980. ASSESSMENT OF FOREST RESOURCE DEVELOPMENT IN HONDURAS EQB USAID TEGUCIGALPA, HONDURAS.
- FAO. 1968. SURVEY OF PINE FOREST HONDURAS. FAO/SF:26-HON 50. UNITED NATIONS DEVELOPMENT PROGRAM. FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS. ROME.
- COHDEFOR 1981. CONTROL INDUSTRIAS DE ASERRIO. 1980. DEPARTAMENTO DE PRODUCCION. TEGUCIGALPA, HONDURAS.
- YERKES, VERN. 1981. EFFECTIVENESS OF UTILIZATION IN CURRENT HONDURAN FOREST INDUSTRY AND PROPOSALS FOR IMPROVEMENT. EQB USAID TEGUCIGALPA, HONDURAS.
- RAEL, EDDIE A. 1981. RANGE MANAGEMENT STUDY. EQB USAID TEGUCIGALPA, HONDURAS.
- MERKEL, ALBERT L. 1981. STUMPAGE VALUATION RECOMMENDATIONS AND EXAMPLE. EQB USAID TEGUCIGALPA, HONDURAS.
- DRAKE, PETER. 1979. INSTITUTION SUPPORT PROJECT MARKETING FINAL REPORT. EQB CIDA/COHDEFOR TEGUCIGALPA, HONDURAS.
- SOWLES, KENNETH. 1981. REVIEW OF MARKETING PRACTICES BY COHDEFOR. EQB USAID TEGUCIGALPA, HONDURAS.
- COHDEFOR 1980. INFORME ANUAL DEL PROYECTO VIVEROS Y REFORESTACION. DISTRITO FORESTAL COPAN C.O.L.
- HERNANDEZ R., MANUEL. 1981. SEGUNDO PROYECTO DE CREDITO AGROPECUARIO - COMPONENTE FORESTAL. COHDEFOR TEGUCIGALPA, HONDURAS.

UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT (1) 1980. ENVIRONMENTAL
DESIGN CONSIDERATIONS FOR RURAL DEVELOPMENT PROJECTS. WASHINGTON, D. C.
20523

BANCO INTERAMERICANO DE DESARROLLO (BID). 1980. CONTRATO DE PRESTAMO NO.
625/SF-HO RESOLUCION DE-112/80

USAID (2) 1980. FOREST RESOURCE DEVELOPMENT 522-0172. PROJECT IDENTIFICATION
DOCUMENT (PID).

USAID (3). 1980. DEVELOPMENT ASSISTANCE IN FORESTRY: AN AID POLICY BACKGROUND
PAPER. AGENCY FOR INTERNATIONAL DEVELOPMENT. WASHINGTON, D.C. 20523

HOPKINS, DONALD. 1981. FOREST RESOURCE DEVELOPMENT STUDY - HONDURAS. EQB USAID
HONDURAS, TEGUCIGALPA, HONDURAS.

ROMERO, ESTEVAN. 1981. MULTIPLE USE LAND MANAGEMENT. EQB USAID/HONDURAS.
TEGUCIGALPA, HONDURAS

RAEL, EDWARD. 1981. RANGE MANAGEMENT. EQB USAID/HONDURAS, TEGUCIGALPA,
HONDURAS

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APPENDIX 1

WOODS OF HONDURAS

LIST OF SPECIES BY UTILIZATION CATEGORY

NOTE: NOT ALL WOODS SPECIES IN HONDURAS ARE IN THIS LIST.

CATEGORY A: WOODS CURRENTLY MERCHANTABLE IN HONDURAS OR ELSEWHERE.

I. HIGH VALUE WOODS

WOODS SUITABLE FOR FURNITURE AND CABINETS; DECORATIVE VENEERS AND PLYWOOD PANELLING AND MOULDINGS; AND SIMILAR. WOODS WELL RECOGNIZED IN WORLD MARKETS.

CAOBA (SWIETENIA MACROPHYLLA)
CEDRO (CEDRELA MEXICANA)
CORTES (TABEBUIA GUAYACAN)

GRANADILLO (DALBERGIA TUCURENSIS)
LAUREL (CORDIA ALLIADORA)
NOGAL (JUNGLANS OLANCHANA)

II. LESS VALUABLE WOODS

WOODS SUITABLE FOR UTILITY AND BETTER USES; LUMBER; UTILITY VENEERS AND PLYWOOD, PANELLING AND MOULDINGS. WOOD GENERALLY MARKETED UNDER RECOGNIZED TRADE NAMES; SOME REQUIRING MARKETING EFFORT.

CARBONS (GUAREA SPP)

PINUS SPP

CIPRES
GUANACASTE (ENTEROLOBIUM CYCLOCARPUM)
GUAPINOL (HYMENAEA COURBARIL)
LIQUIDAMBAR (LIQUIDAMBAR STYRACIFLUA)
MACUELIZO (TABEBUIA ROSEA)

ROSITA (HYERONIMA OBLONGA)
SANGRE REAL (VIROLA KOSCHYNI)
SAN JUANS (VOCHYSIA FERRUGINES)
SANTA MARIA (CALOPHYLLUM BRASILIENSE)
VARILLO (SYMPHONIA GLOBULIFERA)

III. GENERAL UTILITY WOODS

WOODS CURRENTLY MERCHANTABLE; MANY REQUIRING MARKETING PROMOTION BEFORE ACCEPTANCE IN WORLD TRADE.

1. PROCESSED IN HONDURAS

ACEITUNO (NEGRITO) (SIMAROUBA GLAUCA)

AGUACATES (PEARSEA SP.)

ALMENDRO, AMARGOZA (ANDIRA INERMIS)
(ANDIRA SP)

BARBA DE JOLOTE (PITHECOLOBIUM
ARBAREUM)

HIGO, HIGUELLO, HIGUERO, HIGUESO,
AMETE DE MONTANA (FICUS SPP).

HORMIGO (PLATYMISCIUM DIMORPHANDRUM)

INDIO DESNUDO (BURSERA SIMARUBA)

JOBO (SPONDIAS MOMBIN)

BARRENILLO (CROTON GLABELLUS)
BELLOTA (ROBLE) (QUERCUS SKINNERI)

BILIHUETE (BILLY WEBB,
CHICHIPATE) (SWEETIA PANAMENSIS)
CEDRILLO (CIRUELILLO) (MOSQUITOXYLON
JAMAICENSE)
CIRUELO DE MONTANA (ASTRONIUM
GRAVEOLENS)
SOMBRA DE TERNERO (CORDIA NITIDA)
TAMBOR (JACARANDA COPAIA)

TANGO (ZOLLERNIA TANGO)

CAIMITO, SELILLON, ZAPOTE,
ZAPOTILLO (CHRYSOPHYLLUM MEXICANA)

ZAPOTON (CALOCARPUM MAMMOSUM)
GUACO (HERNANDIA SONORA)

MASICA (BROSIMUM ALICASTRUM)
NANCE (PEPENANCE) (BYRSONIMA
CRASSIFALIA)
PALETO (DIALIUM GIANENSE)

SANGRE BLANCA (PTEROCARPUS
OFFICINALIS)

CEDRO ESPINO ((ZANTHOXYLUM BELISENSE)
CEIBA (CEIBA PENTANDRA)
CINCHO, CHAPERNO (LONCHOCARPUS
LATIFOLIUS)
CUERO DE TORO, MANTECO (CHAETOPTOLEA
MEXICANA)

CUMBILLO (NARUNJO) GUAYABO
(TERMINALIA AMAZONIA)
GUAYABON (TERMINALIA LUCIDA)
ZORRA (SCHIZOLOBIUM PARAHYBUM)

2. PROCESSED ELSEWHERE

CAIMITO
COCO-MAMA
COME NEGRO (NARANJILLO)
GUACIMO (YAYA)
HICHOSO
HUESO DE PAVA
KEROSEN
MANTECO
TAPA TAMAL
TONTOLO

CHRYSOPHYLLUM MEXICANUM
QUARARIBEA FIELDII
PERA BARBELLATA
LEUHEA SEEMANNII
BROSIMUM SPP.
ZUELANIA GUIDONIA
TETRAGASTRIS PANAMENSIS
AMPELOCERA HOTTLEI
ALCHORNEA AFF. LATIFOLIA
PROTIUM SESSILIFLORUM

CATEGORY B WOODS HAVING POTENTIAL FOR COMMERCIAL USE

ACHOTILLO
CACHO DE VENADO
GUAYABILLO
CAPULIN
CIRIN, MANAMPU
CIRUELO
HUESITO
JOCO MICO
LECHON
LECHOSO
LLORON
MAJAO, M. BLANCO
COLA DE PAVA
CUAJADA
CUCARACHO
CUPANIA
ENCINOS
FRUTA DE PAVA, GUATUSO

SLOANCA FAGINEA
EUGENIA SP.
PSIDIUM MOLLE
TREMA MICRANTHA
MICONIA SPP.
SPONDIAS PURPUREA
HOMALIUM RACEMOSUM
VITEX SP.
SAPIUM SP.

SAURAUIA LAEVIGATA

CESPEDESIA MACROPHYLLA
DENDROPANAX AFF. ARBOREUS
PITHECOLOBIUM SP.
CUPANIA SP.
QUERCUS SP.
HASSELLTIA SP.

FRUTA FUNI
GUAMA
GUARUMO, G. COLORADO
GUAYABILLO
MANCHADO
MANO DE LEON
QUIEBRA MUELA
RAMON
SALAMO (URRACO)
SELILLON
SOMBRA DE ARMADA
TEJO
TILIACEASE
UVA

? CHIMARRHIS
INGA SP.
POUROUMA ASPERA
PSIDIUM MOLLE
BILLIA HIPPOCASTANUM

TERNSTROEMIA AFF. MEGALOTYCHIA
TROPIS AFF. RACEMOSA
CALYCOPHYLLUM CANDIDISSIMUM
POUTERIA IZABALENSIS
SCHOEFFIA SCHOEBERI
ILEX GUIANENSIS
COCCOLOBA AFF. TUERCKHEIMII

APPENDIX 3

1

PREPARATION OF A PROJECT SPECIFIC MATRIX

FOR ACTUAL PROJECT PLANNING PURPOSES SEVERAL VERSIONS OF THE MATRIX SHOULD BE PREPARED, REFINING THE LEVEL OF DETAIL AT EACH SUCCESSIVE STEP.

THE FOLLOWING, SPECIFIC STEPS DESCRIBE THE RECOMMENDED PROCEDURES FOR COMPLETING THE IMPACT MATRIX:

1. AFTER THOROUGH REVIEW OF THE APPROPRIATE CHAPTERS AND APPENDICES OF THIS MANUAL, ALONG WITH OTHER LITERATURE FROM THE RECOMMENDED READINGS AND REVIEW OF THE PRELIMINARY PROJECT PLANS, SEVERAL MEMBERS OF THE PLANNING TEAM SHOULD BE ASSEMBLED TO COMPLETE THE PROJECT IMPACT MATRIX.
2. THE PLANNERS SHOULD FIRST DETERMINE THE MAJOR PROJECT COMPONENT DECISIONS THAT WILL HAVE TO BE MADE, SUCH AS ROUTING, SITE LOCATIONS, AND WATER RESOURCES TO BE USED, AND LIST THEM IN PROPER ORDER ON THE LEFT COLUMN OF THE IMPACT MATRIX. NOTE THAT THE PROJECT COMPONENTS SHOULD BE DIVIDED INTO THE THREE SEPARATE STAGES OF 1) PLANNING AND DESIGN, 2) CONSTRUCTION, AND 3) OPERATION.
3. USING APPROPRIATE PORTIONS OF THE "PLANNING CHECKLIST" (EXHIBIT 1) AS A GUIDE, DETERMINE, TO THE EXTENT POSSIBLE, THE POTENTIAL IMPACT OF EACH PROJECT COMPONENT DECISION ON THE APPLICABLE ENVIRONMENTAL COMPONENTS LISTED ACROSS THE TOP OF THE MATRIX (CHANGES OR ADDITIONS TO THE SUGGESTED ENVIRONMENTAL COMPONENTS SHOULD BE MADE AS NECESSARY). THE PLANNING CHECKLIST PROVIDES A CONVENIENT SCALE FOR DESIGNATING THE ESTIMATED IMPACT. THE ABBREVIATED SCALE IS INTERPRETED FROM LEFT TO RIGHT AS FOLLOWS:

2

ND - NOT DETERMINABLE

HA - HIGH ADVERSE

MA - MEDIUM ADVERSE

LA - LOW ADVERSE

O - NONE OR INSIGNIFICANT

LB - LOW BENEFICIAL

1/ SOURCE: USAID. 1980. ENVIRONMENTAL DESIGN CONSIDERATIONS FOR RURAL DEVELOPMENT PROJECTS. WASHINGTON, D. C. 20523

2/ NOT DETERMINABLE SHOULD BE CONSIDERED THE SAME AS HIGH ADVERSE UNTIL AN IMPROVED EVALUATION IS POSSIBLE.

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MB - MEDIUM BENEFICIAL

HB - HIGH BENEFICIAL

4. REPEAT THIS PROCESS UNTIL ALL POTENTIAL IMPACTS HAVE BEEN PRELIMINARILY ASSESSED. THE PROCESS IS MEANT TO BE REPEATED SEVERAL TIMES AS MORE INFORMATION BECOMES AVAILABLE, AND THE PLANNERS SHOULD NOT LET ANY ITEM OF UNCERTAINTY HOLD UP THE PROCESS. OTHER SPECIALISTS SHOULD BE CONSULTED, AS NECESSARY, TO ASSIST IN REMOVING "UNKNOWN" ANSWERS, DEVELOP PROJECT MODIFICATIONS IF REQUIRED, AND DETERMINE A FINAL IMPACT ESTIMATE.
5. WHEN THE BEST ESTIMATE OF ALL IMPACTS HAS BEEN MADE ON THE PLANNING CHECKLIST, ENTER AN APPROPRIATE SYMBOL ON THE IMPACT MATRIX.
6. WHEN THE IMPACT MATRIX IS COMPLETE, REVIEW THE ENTIRE PROJECT PLANS FOR FOCUSING IN ON THOSE IMPACTS CONSIDERED MOST ADVERSE. RELEVANT PROJECT DECISIONS SHOULD BE REVIEWED TO SEE IF EITHER THEY CAN BE MODIFIED OR IF ADDITIONAL MITIGATION ACTIONS CAN BE PLANNED TO REDUCE THE DEGREE OF THE ESTIMATED IMPACT TO AN ACCEPTABLE LEVEL.

MIND: IN ACCOMPLISHING THIS PROCESS, THE FOLLOWING POINTS SHOULD BE KEPT IN

- NO ONE MATRIX OR CHECKLIST CAN BE DESIGNED TO FIT ALL PROJECTS. REVISIONS AND MODIFICATIONS WILL BE REQUIRED TO FIT EACH SPECIFIC PROJECT.
- USE OF THE PLANNING CHECKLIST AND IMPACT MATRIX IS INTENDED TO BE AN AID TO THE PLANNING PROCESS RATHER THAN AN END IN ITSELF. THE ENTIRE PROCESS SHOULD BE REPEATED SEVERAL TIMES, ADDING NEW INFORMATION AS POSSIBLE. CHANGING THE COMPONENTS ENTERED IN THE MATRIX COLUMNS AND ROWS AND MODIFYING BASIC PROJECT CONCEPTS, AS HIGH IMPACT AREAS ARE IDENTIFIED, WILL RESULT IN THE MOST ENVIRONMENTALLY ACCEPTABLE PLANS.
- USE OF THE SYSTEM OF DOTS AND CIRCLES SHOWN IN THE MATRICES AT THE END OF EACH CHAPTER IS NOT MANDATORY. A SYSTEM OF PLUS AND MINUS SIGNS, VARIOUS DEGREES OF SHADING, COLORS OR OTHER METHODS MAY PROVE TO BE MORE USEFUL FOR YOUR SPECIFIC PURPOSES.
- THE COMPLETED PLANNING CHECKLISTS AND IMPACT MATRICES ARE NOT EXPECTED TO BE SUBMITTED TO A.I.D. THEY ARE ONLY INTENDED AS PERSONAL PLANNING GUIDES AND RECORDS FOR THE PROJECT PLANNERS' OWN USE.

JRB

HONDURAS

ENVIRONMENTAL PROFILE

CHAPTER IV

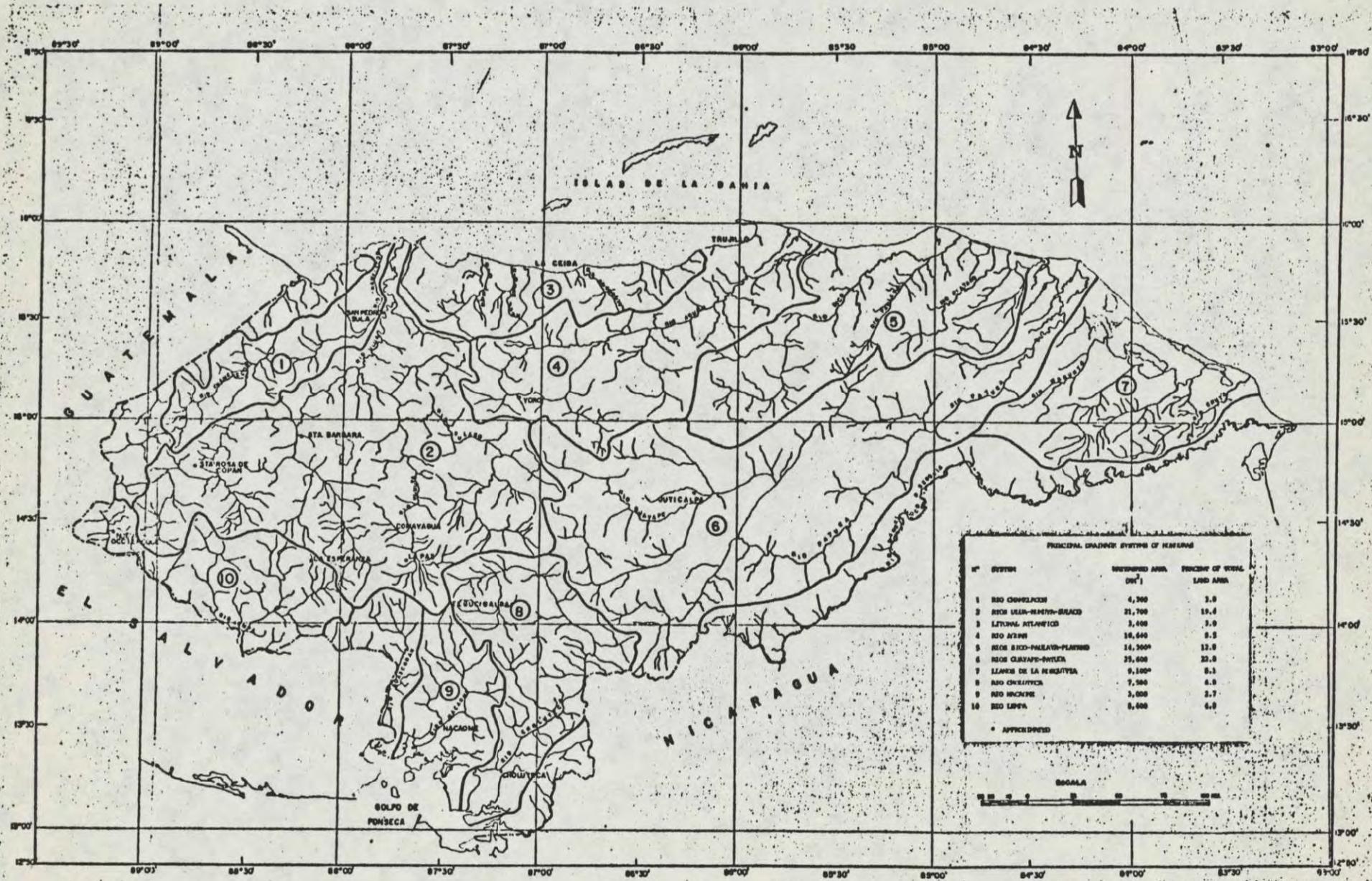
ENVIRONMENTAL CONSIDERATIONS IN
WATERSHED MANAGEMENT

PAUL DULIN
LAND USE SPECIALIST
CATIE
TURRIALBA, COSTA RICA

JRB ASSOCIATES

AID CONTRACT

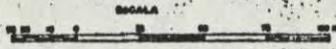
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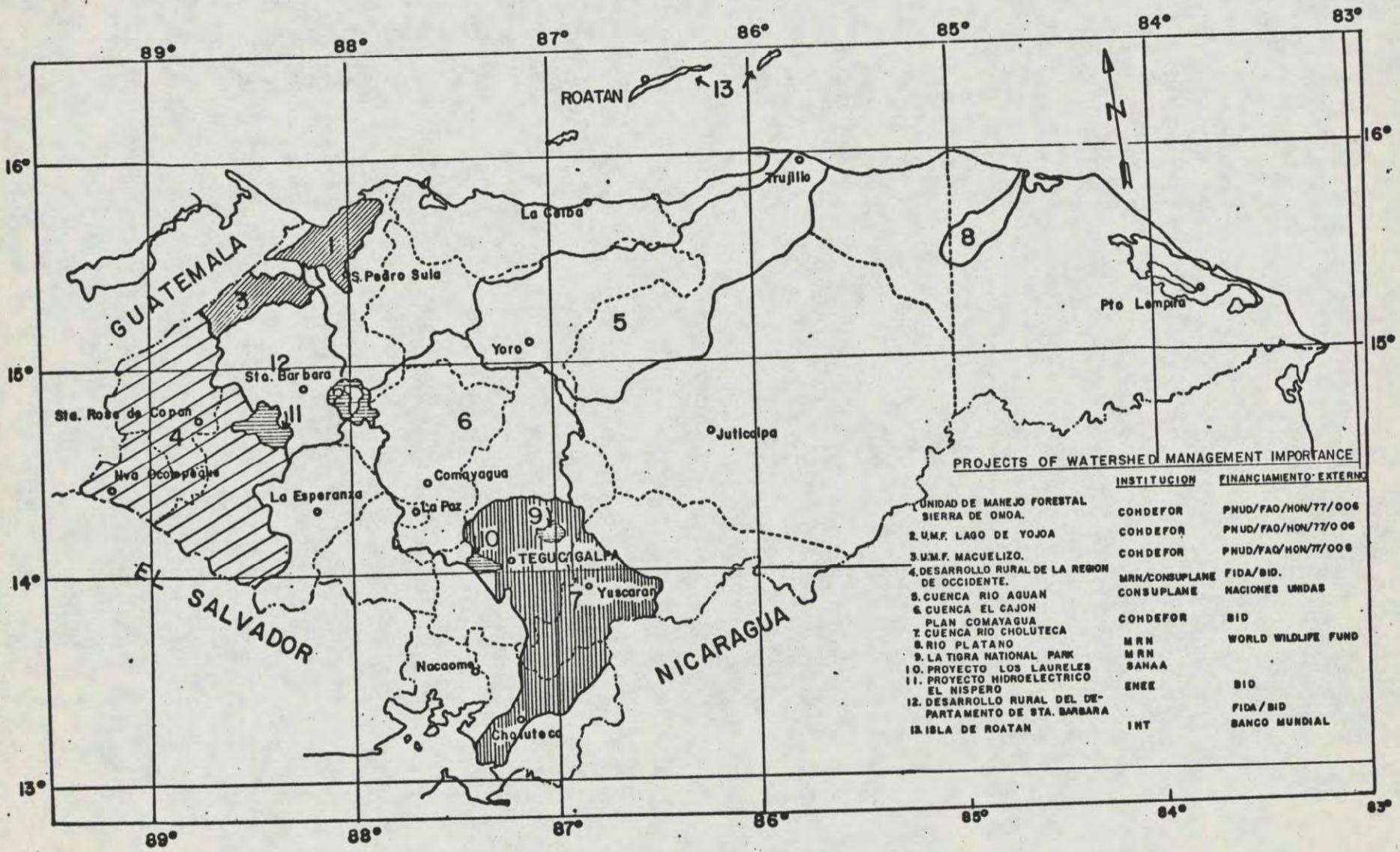
PRINCIPAL DRAINAGE SYSTEMS OF NICARAGUA

N ^o	SYSTEM	WATERSHED AREA SQ. MI.	PERCENT OF TOTAL LAND AREA
1	RIO CHONTALEN	4,300	3.0
2	RIO ULU-RENTIN-BRACO	21,700	19.4
3	LITORAL ATLANTICO	3,400	3.0
4	RIO AZUAR	14,640	13.0
5	RIO RICO-PALEAVI-PLANINO	14,500*	13.0
6	RIO CAYAPA-OMITA	25,600	23.0
7	LLANOS DE LA REGATIVERA	9,100*	8.1
8	RIO CHONTALEN	7,500	6.8
9	RIO MOCOME	2,000	1.8
10	RIO LEREA	8,400	7.6

* APPROXIMATED



Dahn



PROJECTS OF WATERSHED MANAGEMENT IMPORTANCE

	INSTITUCION	FINANCIAMIENTO EXTERNO
1. UNIDAD DE MANEJO FORESTAL SIERRA DE OMOA.	CONDEFOR	PNUD/FAO/HON/77/006
2. U.M.F. LAGO DE YOJOA	CONDEFOR	PNUD/FAO/HON/77/006
3. U.M.F. MACUELIZO.	CONDEFOR	PNUD/FAO/HON/77/006
4. DESARROLLO RURAL DE LA REGION DE OCCIDENTE.	MRN/CONSULANE	FIDA/BID.
5. CUENCA RIO AGUAN	CONSULANE	NACIONES UNIDAS
6. CUENCA EL CAJON PLAN COMAYAGUA	CONDEFOR	BID
7. CUENCA RIO CHOLUTECA	MRN	WORLD WILDLIFE FUND
8. RIO PLATANO	MRN	
9. LA TIGRA NATIONAL PARK	SAHAA	
10. PROYECTO LOS LAURELES		
11. PROYECTO HIDROELECTRICO EL NISPERO	ENEE	BID
12. DESARROLLO RURAL DEL DEPARTAMENTO DE STA. BARBARA		FIDA/BID
13. ISLA DE ROATAN	INT	BANCO MUNDIAL

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 - 2.4.1 CRITIQUE
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1.0 WATERSHED PROBLEMS AND RESILIANT CONSTRAINTS ON DEVELOPMENT

1.1 INTRODUCTION

THE IMPORTANCE OF GOOD WATERSHED MANAGEMENT TO SUPPLY THE DIVERSE NEEDS OF CITIES, INDUSTRY, HYDROELECTRIC PLANTS, AGRICULTURE, AND ESTUARINE PRODUCTION CANNOT BE UNDERESTIMATED.

AS DESCRIBED IN THE ENVIRONMENT SECTION, HONDURAS IS A MOUNTAINOUS COUNTRY. GEOMORPHIC PROCESSES HAVE CREATED A HEAVILY DISSECTED SYSTEM OF DRAINAGE ORIENTED PRIMARILY TO THE NORTH WITH APPROXIMATELY 85 PERCENT OF THE TOTAL LAND-AREA DRAINING INTO THE CARIBBEAN SEA. FIGURE 1 ILLUSTRATES THE MAJOR DRAINAGE SYSTEMS OF HONDURAS. POPULATION DENSITY AND THE RESULTING DEMAND FOR WATER IS NOT IN PROPORTION TO THE AVAILABLE WATER SUPPLY. WATER RATIONING IN TEGUCIGALPA, COMAYAGUA, SIGUATEPEQUE AND MOST CITIES IN SOUTHERN HONDURAS OCCURS AT LEAST SEVEN MONTHS OUT OF THE YEAR. BESIDES DOMESTIC USE, WATER IS EXTREMELY IMPORTANT IN HONDURAS FOR THE GENERATION OF HYDROELECTRICITY WHICH ACCOUNTS CURRENTLY FOR 90 PERCENT OF THE ELECTRICITY CONSUMED IN THE COUNTRY. IN THE MAJOR VALLEYS OF CHOLUTECA, TALANGA, COMAYAGUA, SULA, AGUAN AND ALONG THE ATLANTIC LITTORAL REGION THERE IS HEAVY DEMAND ON SURFACE WATERS FOR IRRIGATION OF COMMERCIAL CROPS SUCH AS BANANAS.

PRESSURE BY CAMPESINOS ON THE STEEPLY SLOPING UPPER WATERSHED AREAS HAS LED TO THEIR WIDESPREAD DEGRADATION. THE GOVERNMENT'S INABILITY TO EITHER CONTROL DEFORESTATION OR OFFER THE CAMPESINO VIABLE ALTERNATIVES IS LEADING TO THE LOSS OF SOIL PRODUCTIVITY THROUGH LEACHING AND EROSION, DOWNSTREAM SEDIMENTATION AND FLOODING, DECREASED WATER QUALITY AND LOSS OF AQUATIC ECOSYSTEM PRODUCTIVITY.

REVERSAL OF THIS TREND IN WATERSHED DETERIORATION IS ABSOLUTELY NECESSARY TO AVOID THE ENTRENCHMENT OF UNDERDEVELOPMENT AND A CLOSED CYCLE OF POVERTY IN HONDURAS.

1.2 CAUSES OF WATERSHED DEGRADATION

THE PRINCIPAL CAUSES OF WATERSHED DEGRADATION ARE HUMAN INDUCED, STEMMING FROM INAPPROPRIATE USE OF THE LAND RESOURCES. THE DIRECT CAUSES ARE DEFORESTATION AND UNCONTROLLED SLASH AND BURN AGRICULTURE ON MARGINAL LANDS. INDIRECT CAUSES ARE THE LACK OF AN EFFECTIVE LEGAL AND TECHNICAL BASIS FOR REGULATING THE USE OF LAND, THE LACK OF NATURAL RESOURCES INFORMATION, ABSENCE OF ATTRACTIVE ALTERNATIVES TO CURRENT AGRICULTURE PRACTICES, THE LACK OF TRAINED PERSONNEL TO IMPLEMENT REGULATIONS IF THEY EXISTED AND THE FAILURE OF RESEARCH AND EDUCATIONAL INSTITUTIONS TO FOCUS ON HUMAN AND TECHNICAL PROBLEMS OF WATERSHED MANAGEMENT.

1.3 DEFORESTATION AND SLASH AND BURN AGRICULTURE. - DEFORESTATION HAS BEEN WELL DOCUMENTED BY CONDEFOR (ROPER, 1980) AND USAID (CLIFF, 1980) AND ARE FURTHER EXPLAINED IN THE FORESTRY SECTION OF THIS REPORT. ROPER ATTRIBUTES A DEFORESTATION RATE OF 80,000 HECTARES PER YEAR TO SLASH AND BURN AGRICULTURE PRACTICES IN THE BROADLEAF FORESTS RESULTING IN AN EQUIVALENT GROSS COMMERCIAL

VALUE LOSS OF 680 MILLION LEMPIRAS ANNUALLY. CLIFF ESTIMATES THAT 50,000 TO 60,000 HECTARES OF PINE FORESTS ARE CUT OVER EACH YEAR THROUGH COMMERCIAL TIMBERING ACTIVITIES. NATURAL AND ARTIFICIAL REGENERATION OF PINE FORESTS IS IMPEDED DUE TO FOREST FIRES ON AN ESTIMATED 20,000 TO 2,000,000 HECTARES EACH YEAR (PERSONAL COMMUNICATION, MIGUEL SABILLON, CONDEFOR, JULY, 1981.) FUELWOOD IS BY FAR THE MOST IMPORTANT ENERGY SOURCE FOR DOMESTIC USE WITH 97 PERCENT OF HONDURAN HOUSEHOLDS USING FUELWOOD FOR COOKING (CONSULANE, 1980). ANNUAL CONSUMPTION OF FUELWOOD IS ESTIMATED BY CONSULANE AT 2,767,000 TONS PER YEAR OR THE EQUIVALENT OF GREATER THAN 22,500 HECTARES OF FOREST.

SHIFTING AGRICULTURE, THE TRADITIONAL CULTIVATION PRACTICE IS HONDURAS, IS USED IN FOOTHILL AND IN MOUNTAIN AREAS; AS THE MORE LEVEL LANDS OF THE VALLEYS ARE TAKEN UP FOR THE MORE INTENSIVE CULTIVATION OF COMMERCIAL CROPS SUCH AS BANANAS, SUGAR CANE, COTTON AND CATTLE. THE GROWING POPULATION AND AN INFLUX OF IMMIGRANTS FROM EL SALVADOR AND NICARAGUA HAVE RESULTED IN AN EVEN GREATER NUMBER OF CAMPESINOS MOVING INTO THE STEEP MOUNTAIN AREAS IN RESPONSE TO LAND PRESSURE, CLEARING VIRGIN AND SECONDARY FORESTS TO CULTIVATE BEANS AND CORN. DECLINING YIELDS DUE TO A COMBINATION OF WEED INVASION, INCREASING PESTS NUTRIENT LOSS AND EROSION RESULTS IN LAND BEING ABANDONED OR CONVERTED PASTURE AFTER TWO TO FIVE YEARS. CAMPESINOS OFTEN SELL PART OR ALL OF THEIR LAND PLANTED IN PASTURE TO CATTLEMEN. THE CAMPESINO THEN EITHER CONCENTRATES HIS FARMING ON REMAINING LAND OR MOVES ON TO CLEAR NEW FOREST AREAS. THE DECREASING AVAILABILITY OF LANDS TO THE INCREASING NUMBERS OF CAMPESINOS HAS LED TO GREATER DEFORESTATION AND SHORTER FALLOW PERIODS, RESULTING IN THE POOR REGENERATION OF FOREST VEGETATION AND SCRUB THE INVASION, HIGHER EROSION RATES, MASS MOVEMENTS, INCREASED RUNOFF, AND DOWNSTREAM FLOODING.

OF THE ESTIMATED 9.5 MILLION HECTARES OF LAND ACTUALLY SUITED FOR FOREST, 2.2 MILLION ARE DEFORESTED (USAID, 1980). SOIL EROSION RATES ON LANDS ONCE COVERED WITH FORESTS HAVE BEEN ACCELERATED TO THE POINT THAT ESTIMATED SOIL LOSSES AVERAGE FROM 100 TO AS MUCH AS 500 METRIC TONS PER HECTARE ANNUALLY (RECURSOS NATURALES, 1977). ERODED LANDS HAVE INCREASED FROM 3.5 PERCENT TO 6.8 PERCENT OF TOTAL LAND AREA IN THE 5-YEAR PERIOD FROM 1972 TO 1977 (USAID, 1980).

INCREASED RUNOFF FROM DEFORESTED LANDS CAN CAUSE GREATER THAN A TEN-FOLD INCREASE IN THE PEAK FLOWS IN STREAMS AFTER HEAVY RAINSTORMS (WOUTERS, 1980). ERODED SOIL CAUSE THE SEDIMENTATION OF STREAM CHANNELS, REDUCING THEIR CARRYING CAPACITY. THIS FACTOR COUPLED WITH INCREASED PEAK FLOWS RESULTS IN INCREASED FLOODING IN DOWNSTREAM VALLEY AREAS. THE FOLLOWING ARE SOME CALCULATIONS OF FLOODING ATTRIBUTED IN PART TO INAPPROPRIATE UPSTREAM LAND USE AND DEFORESTATION (SEE ALSO FIGURE 1):

- A. FLOODING IN THE SULA VALLEY (DRAINAGE OF THE ULUA AND CHAMALECON RIVERS) CAUSES AN ESTIMATED 67 MILLION LEMPIRAS DAMAGE ANNUALLY TO AGRICULTURE AND INFRASTRUCTURE OVER A GEOGRAPHICAL AREA OF 370 SQUARE KILOMETERS (SECOPT, 1979).

- B. RECURSOS NATUALES (1977) ESTIMATES THAT THE VALUE LOST TO EROSION AND LOSS OF SOILS AND FLOODING IN THE AGUAN RIVER AND ATLANTIC LITTORAL WATERSHEDS IS IN EXCESS OF 9 MILLION LEMPIRAS PER YEAR, A FIGURE WHICH IS CONSIDERED VERY LOW BECAUSE IT DOES NOT INCLUDE ALL WATERSHEDS.
- C. ANNUAL FLOODS IN THE CHOLUTECA RIVER VALLEY DAMAGE 3,400 HECTARES OF PRIME FARMLAND AND PASTURE (FAO, 1978).
- D. FLOODS IN THE ATLANTIC LITTORAL REGION IN 1976 CAUSED AN ESTIMATED 2.6 MILLION LEMPIRAS TO ROADS AND HOUSES IN THE LA CEIBA AREAS. THE SAME YEAR, FLOODS IN THE AGUAN RIVER VALLEY CAUSED 3.3 MILLION LEMPIRAS DAMAGE TO INFRASTRUCTURE AND AN UNKNOWN DESTRUCTION OF COMMERCIAL CROPS. (SECOPT, 1976).
- E. FLOODS RESULTING FROM THE HEAVY RAINS OF HURRICANE "FIFI" IN 1974 WERE THE WORSE ON RECORD THROUGHOUT THE COUNTRY, KILLING SOME 12,000 PEOPLE, PRIMARILY IN THE SIERRA DE OMOA AREA, CAUSING AN ESTIMATED 300 MILLION LEMPIRAS DAMAGE IN THE SULA VALLEY, AND FLOODING NEARLY 470 KM² IN THE CHOLUTECA RIVER VALLEY. (SECOPT, 1979 AND FAO, 1978).

1.4 LAND-USE POLICY

ALTHOUGH VARIOUS LAND-USE LAWS AND POLICIES EXIST IN HONDURAS, THEY HAVE BEEN INTERPRETED AMBIGUOUSLY, UNENFORCED, AND HAVE FAILED TO REGULATE INAPPROPRIATE LAND USE. MANDATES EXIST FOR COHDEFOR TO REGULATE THE USE OF LANDS SUITED FOR FORESTS, FOR THE NATURAL RESOURCES MINISTRY TO REGULATE USE OF AGRICULTURAL LANDS (SEE AGRICULTURE CHAPTER), AND TO THE NATIONAL AGRARIAN INSTITUTE (INA) TO CARRY OUT THE AGRARIAN REFORM LAW. BECAUSE OF THE AMBIGUITY BETWEEN MANDATES, POOR COMMUNICATION AMONG THE VARIOUS AGENCIES, AND THE ABSENCE OF A GOOD LAND USE PLANNING AND MANAGEMENT TOOL, CURRENT LAND USE ACTIVITIES ARE PRACTICED ON UNSUITABLE SITES - I.E. CATTLE AND AGRICULTURE STEEPLY SLOPING LANDS WHICH ARE SUITED ONLY FOR FORESTS.

ALTHOUGH SEVERAL LAWS AND DECREES HAVE BEEN PROMULGATED BY THE GOH IN ORDER TO PROTECT AND MAINTAIN WATERSHEDS, THEY ARE NOT EFFECTIVELY IMPLEMENTED. COHDEFOR WAS MANDATED TO MAINTAIN AND PROTECT WATERSHEDS AS PART OF THEIR FOREST MANAGEMENT ACTIVITIES. UNDER LAW DECREE NO. 85 -- FORESTRY LAW (FEB 10, 1972), ARTICLE 2, SECTION C MANDATES THE "...PROMOTION OF MULTIPLE USE ON FOREST AREAS, INCLUDING RECREATION, MAINTENANCE OF CERTAIN WILD FLORA AND FAUNA, REGULATION OF GRAZING AND PASTURES, WATER PRODUCTION, AND THE CONSERVATION, RESTORATION, AND STABILIZATION OF SOILS," AND FURTHER ESTABLISHED UNDER ARTICLE 138 PROTECTED FOREST RESERVES IN THE FOLLOWING AREAS: (1) THE MANGROVES OF THE GULF OF FONSECA, (2) MONTANA DEL CUZUCO, (3) GUANAJA ISLAND OF THE BAY ISLANDS, (4) THE PELO RIVER WATERSHED IN THE DEPARTMENT OF YORO, AND (5) THE WATERSHED OF LAKE YOJOA, (6) "LA TIGRA" MOUNTAIN NEAR TEGUCIGALPA. THIS LAW WAS PROMULGATED WHEN THE FORESTRY PROGRAM WAS UNDER THE MINISTRY OF NATURAL RESOURCES.

LAW DEGREE NO. 103 -- FOREST LAW (JAN 10, 1974) CREATED CONDEFOR AS THE HONDURAN FORESTRY AGENCY. UNDER ARTICLE 8, SECTIONS C AND D, CONDEFOR IS MANDATED TO "...EXECUTE PERMANENT AND SYSTEMATIC WORKS FOR THE PROTECTION OF THE FORESTS AGAINST FIRES, PLAGUES, INFIRMITIES, DESTRUCTION BY OVERGRAZING, AND TO PREVENT ACCELERATED EROSION OF SOILS," AND TO "...EXECUTE DIRECTLY, OR IN COLLABORATION WITH OTHER RELATED ORGANIZATIONS, THE INDESPENSIBLE WORK FOR THE PROTECTION OF WATERSHEDS." THIS LAW ALSO TRANSFERRED RESPONSIBILITIES UNDER LAW NO. 85 TO CONDEFOR. CONDEFOR IS THEREFORE THE LEGAL PRINCIPAL IN THE EXECUTION OF WATERSHED MANAGEMENT ACTIVITIES, PROTECTION AND MAINTENANCE OF FOREST RESERVES. UNFORTUNATELY, NEITHER OF THESE LAWS SPECIFIES THE NEED OR FRAMEWORK FOR MANAGEMENT PLANS. CONSEQUENTLY, CONDEFOR HAS TO DATE, NOT DEVELOPED A NATIONAL WATERSHED MANAGEMENT POLICY OR PLAN, NOR HAS IT FORMULATED MANAGEMENT PLANS FOR FOREST RESOURCES.

A MAJOR PROBLEM IN THE PROMOTION OF APPROPRIATE LAND USE IS THE ABSENCE OF AN ACCEPTABLE, ADAPTABLE LAND USE CAPACITY CLASSIFICATION FOR THE COUNTRY. WITHOUT THIS TOOL IT IS NEARLY IMPOSSIBLE TO DEVELOP PLANS FOR GOOD LAND MANAGEMENT, AGRARIAN REFORM ACTIONS, AGRICULTURAL DEVELOPMENT, AND FOREST MANAGEMENT. BASED ON PHYSICAL RESOURCE DATA (CLIMATE, SOILS, VEGETATIVE ASSOCIATIONS, SLOPE, ETC.) LAND SHOULD BE CLASSIFIED AS TO ITS CAPABILITY - I.E. CAPACITY TO SUPPORT CERTAIN USES. THIS INFORMATION IN ANNOTATED MAP FORM COULD THEN BE USED AS A BASIS FOR MAKING LAND USE/MANAGEMENT DECISION BY ALL AGENCIES CONCERNED. JURISDICTION OF EACH OF THE LAND MANAGEMENT AGENCIES WOULD THEN BE MANDATED ACCORDING TO APPROPRIATE USE.

1.5 LACK OF NATURAL RESOURCES INFORMATION

ANOTHER PROBLEM WITH WATERSHED RESOURCES MANAGEMENT IS THAT RESOURCES ARE BEING DEPLETED AT SUCH A RAPID RATE THAT FOREST INVENTORIES, FOR EXAMPLE, ARE OBSOLETE WHEN THEY ARE FINISHED, OVERESTIMATING THE DISAPPEARING RESOURCE AND BUILDING A FOREST INDUSTRY TOO LARGE TO UTILIZE THE REDUCED RESOURCE IN AN AREA. PRIORITIES FOR RESOURCES DEVELOPMENT AND CONSERVATION CANNOT BE FORMULATED WITHOUT AN APPROPRIATE, TIME-SENSITIVE, AND MAINTAINED DATA BASE. THE LACK OF SOILS INFORMATION HAS LED INA TO SITUATE CAMPESINO GROUPS IN AREAS OF UNPRODUCTIVE SOILS (USAID, 1980). BRIDGES ARE CONTINUALLY BEING DESTROYED IN THE ATLANTIC LITTORAL REGION, THEIR DESIGN BEING BASED ON POOR HYDROLOGIC INFORMATION. COMPLEMENTARY TO THE PROBLEM OF SCARCE INFORMATION IS THE COMMON FAILURE TO SEARCH OUT AND USE EXISTING DATA OR TO CONDUCT FIELD SURVEYS AND INTERVIEWS.

1.6 LACK OF ALTERNATIVES TO TRADITIONAL AGRICULTURE

THIS PROBLEM IS MORE CLOSELY EXAMINED IN THE AGRICULTURE SECTION; BUT DESERVES A RESTATEMENT HERE. GOH HAS BEEN UNSUCCESSFUL IN OFFERING SUBSISTENCE FARMERS ALTERNATIVES TO THEIR TRADITIONAL SLASH AND BURN, PRACTICES. DEVELOPMENT ASSISTANCE IN THE FORM OF CREDIT, FERTILIZER, IMPROVED SEED, AND AGRICULTURAL ASSISTANCE HAS BEEN DIRECTED MORE AT THE MEDIUM-SIZED FARMER WHO HAS GAINED TITLE ON LAND, AND MAY HAVE MORE THAN THE USED OF 1 OR 2 HECTARES WORKED BY THE SMALL SUBSISTENCE FARMER AVAILABLE FOR DIVERSIFYING AGRICULTURAL OPERATIONS. EVEN, IF THE SMALL FARMER COULD DIVERSIFY OR IMPROVE

AGRICULTURAL OUTPUT, PROBLEMS OF INFRASTRUCTURE, MARKET, AND CONTINUITY OF AGRICULTURAL EXTENSION WOULD PREVAIL. THE FAILURE TO PROPERLY ADDRESS THE PROBLEMS OF THE SMALL SUBSISTENCE FARMERS, HIS NEEDS AND HIS FARMING TECHNIQUES HAS CLOSED OFF MANY OPTIONS FOR THE CAMPESINO.

1.7 LACK OF TRAINED PERSONNEL AND EDUCATION

ALTHOUGH THERE ARE SEVERAL EDUCATIONAL INSTITUTIONS THAT DEAL WITH FORESTRY, AGRICULTURE, AND LAND MANAGEMENT, THEIR CAPACITY TO ADEQUATELY TRAIN THE PERSONNEL NECESSARY TO ADDRESS THE PROBLEMS OF WATERSHED MANAGEMENT IS LIMITED. THE FORESTRY SCHOOL IN SIGUATEPEQUE IS PRODUCING A NUMBER OF TECHNICIANS IN FOREST MANAGEMENT AND WOOD INDUSTRY, BUT NONE IN WATERSHED MANAGEMENT. THE UNIVERSITY CENTER OF THE ATLANTIC LITTORAL REGION (CURLA) HAS FORESTRY PROGRAM DESIGNED TO TURN-OUT FORESTRY MANAGEMENT AND WOOD PRODUCTS ENGINEERS WITH LITTLE WATERSHED MANAGEMENT EXPERTISE, AND AN AGRICULTURAL PROGRAM PRODUCING AGRONOMISTS ORIENTED AROUND COMMERCIAL PRODUCTION WITH NO EMPHASIS ON SMALL FARMER TECHNOLOGY (I.E. HILLSIDE FARMING). THE PAN-AMERICAN AGRICULTURAL SCHOOL IS ALSO GEARED TO COMMERCIAL AGRICULTURE. THUS THE REAL PROBLEMS OF WATERSHED DEGRADATION; THAT OF MIGRATORY SUBSISTENCE AGRICULTURE BY SMALL OR LANDLESS CAMPESINOS IS BEING IGNORED. ALTHOUGH VARIOUS PERSONS HAVE RECEIVED HIGHER EDUCATION IN OTHER COUNTRIES (U.S.A., BRAZIL, MEXICO, COSTA RICA), THE FOCUS OF MANY OF THE PROGRAMS ENCOUNTERED IN THESE UNIVERSITIES MAY NOT BE APPLICABLE TO THE HONDURAN SITUATION.

MID - AND UPPER-LEVEL ADMINISTRATORS AND DECISION MAKERS ALSO APPARENTLY LACK THE EXPERTISE AND UNDERSTANDING TO ADEQUATELY RESPOND TO WATERSHED MANAGEMENT PROBLEMS, RESULTING IN DECISIONS WHICH ADVERSELY IMPACT WATERSHED RESOURCES. EDUCATION AND CONSCIOUSNESS-RAISING IS NECESSARY IF THESE ADMINISTRATORS ARE TO EFFECTIVELY FORMULATE PRIORITIES AND MAKE DECISIONS WHICH CAN SUCCESSFULLY ADDRESS WATERSHED PROBLEMS.

FINALLY, THE CAMPESINO IS POORLY EDUCATED IN TERMS OF THE ACTUAL RAMIFICATIONS OF TRADITIONAL SLASH AND BURN, SHIFTING AGRICULTURE. EXTENSION, ALTHOUGH INCORPORATED INTO ALL LAND MANAGEMENT AGENCIES' ACTIVITIES, HAS BEEN GIVEN LITTLE PRIORITY AND POOR SUPPORT, AND HAS AS OF YET TO HAVE AN IMPACT ON EXPANDING SHIFTING AGRICULTURE.

1.8 CONSTRUCTION OF ROADS

ALTHOUGH CONSIDERED THE "MEANS" RATHER THAN THE END, THE CONSTRUCTION OF ROADS CAN HAVE A GREAT IMPACT ON WATERSHED RESOURCES. A DIRECT IMPACT OF ROAD CONSTRUCTION IS THAT OF SEDIMENTATION. POORLY CONSTRUCTED ROADS ON STEEP SLOPES WITHOUT REGARD FOR NATURAL DRAINAGE OR DIFFERING SOIL AND GEOLOGIC CHARACTERISTICS CAN CAUSE INORDINATE LEVELS OF ACCELERATED EROSION, SLUMPING AND LANDSLIDES. ERODED SOILS CAUSE THE SEDIMENTATION OF LOCAL STREAMS, FOULING WATER SUPPLIES, SILTING UP RESERVOIRS, AND INCREASING THE POTENTIAL FOR DAMAGING FLOODS.

A SECONDARY IMPACT, YET PERHAPS MORE SERIOUS IN THE LONG-TERM, IS THAT ROADS PROVIDE INCREASED ACCESS TO PREVIOUSLY INACCESSIBLE AREAS, CREATING

A MEDIUM FOR EXPANSION OF SHIFTING AGRICULTURE INTO NEW AREAS, AS IN HAPPENING IN THE CASE OF THE SAN ESTEBAN TO BONITO ORIENTAL ROAD IN NORTHERN HONDURAS. SLASH AND BURN AGRICULTURE IS NOW BEING CARRIED OUT ON THE SIDES OF THE ROADS AS MORE AND MORE CAMPESINOS MOVE INTO THE AREA. AS STILL MORE CAMPESINOS ARRIVE, THEY WILL MOVE DEEPER AND DEEPER INTO THE FOREST, CLEARING AS THEY GO.

2.0 WATERSHED MANAGEMENT IN HONDURAS

2.1 INTRODUCTION

THE FOLLOWING SECTION PRESENTS A SUCCINCT DESCRIPTION OF RECENT WATERSHED MANAGEMENT PROJECTS AND PROGRAMS IN HONDURAS. ALSO COVERED ARE PROJECTS AND ORGANIZATIONS WHICH HAVE (OR WILL HAVE) AN IMPACT ON WATERSHEDS. A CRITIQUE FOLLOWS THE DESCRIPTION OF EACH PROJECT AND SERVES TO FURTHER DEFINE PROBLEM AREAS, WEAKNESSES, OR SUCCESSES OF THE PROJECTS. FIGURE 2 SHOWS THE AFFECTED AREA OF PROJECTS MENTIONED. WATERSHED MANAGEMENT AS AN IMPORTANT PART OF ACTIVE FOREST MANAGEMENT (E.G. - GOOD ROAD CONSTRUCTION, APPROPRIATE HARVESTING TECHNIQUES, ETC.) IS COVERED IN THE FORESTRY CHAPTER. THE SOCIAL PROBLEMS OF WATERSHED MANAGEMENT (SHIFTING AGRICULTURE) ARE COVERED HERE.

2.2 INTEGRATED WATERSHED MANAGEMENT PROJECT IN THE NORTHWEST

THIS PROJECT IS AN OUTGROWTH OF THE UNITED NATIONS DEVELOPMENT PROGRAM - FAO - COHDEFOR PROJECT: "PLANNING AND IMPLEMENTATION OF THE CORRECTION OF WATERSHEDS AFFECTED BY HURRICANE FIFI." THIS PILOT PROJECT WAS CONCEIVED WITH THE OBJECTIVE OF STIMULATING A CHANGE FROM THE INAPPROPRIATE LAND USES ON STEEPLY SLOPING LAND OF THE SIERRA DE OMOA MOUNTAIN RANGE EAST OF SAN PEDRO SULA (NO. 1 IN FIGURE 2). DAMAGES AND DEATH FROM THE HURRICANE IN THE AREA WERE MUCH HIGHER BECAUSE OF THE EXTENSIVE DEFORESTATION THE HIGHER MOUNTAIN SLOPES AND RESULTING INCREASED FLOODING AND LANDSLIDES. PROJECT ACTIVITIES WERE LATER EXPANDED TO THE LAKE YOJOA WATERSHED IN 1978 AND MACUELIZO IN 1978 (NO. 2 AND 3 IN FIGURE 2). STARTING IN 1976, THE PROJECT INVOLVED MULTILATERAL TECHNICAL AND FINANCIAL SUPPORT TO COHDEFOR FROM THE UNITED NATIONS FOOD AND AGRICULTURAL ORGANIZATION. PRINCIPAL ACTIVITIES INVOLVED SOIL CONSERVATION PROJECTS ON 361 HECTARES, AGRICULTURAL EXTENSION FROM CROP IMPROVEMENT AND DIVERSITY, REFORESTATION OF ESSENTIALLY FUELWOOD SPECIES ON 467 HECTARES, AND FORESTRY PROTECTION (FIRE PREVENTION AND CUTTING PERMITS) OVER THE THREE MANAGEMENT AREAS IN THE PROJECT - SIERRA DE OMOA, LAKE YOJOA AND MACUELIZO. THE PROJECT GAVE STRONG EMPHASIS ON SOCIAL ACTION AND DEVELOPMENT A COMMUNICATION AND INFORMATION SYSTEM WELL ADAPTED TO THE 1834 CAMPESINOS IN 70 ALDEAS (COUNTIES) IN THE PROJECT AREAS (MICHAELSEN, 1981). THE PROJECT PRODUCED 11 USEFUL MANUALS AND PUBLICATIONS DEVELOPED DURING THE 5-YEAR PROJECT LIFE (UNTIL FEB. 1981). THESE PUBLICATIONS PROVIDE A TECHNOLOGY PACKAGE INCLUDING SOCIAL ACTION AND COMMUNICATION, SOIL CONSERVATION, AGRICULTURAL EXTENSION, REFORESTATION, ECONOMIC ANALYSIS, AND WATERSHED MANAGEMENT PLANNING (SEE LIST OF PUBLICATIONS IN TABLE 1). THE PROJECT IS STILL BEING SUPPORTED BY COHDEFOR IN ITS NORTHWEST FOREST DISTRICT WHERE THE PROJECT TEAMS INCLUDE 25 PERSONS DISTRIBUTED OVER THE THREE MANAGEMENT AREAS, WITHOUT INTERNATIONAL ASSISTANCE. DUE TO CURRENT FISCAL PROBLEMS AT COHDEFOR, THE FUTURE OF THE PROJECT IS QUESTIONABLE.

2.2.1 CRITIQUE

THIS PROJECT'S MOST IMPORTANT CONTRIBUTION TO WATERSHED MANAGEMENT IN HONDURAS IS THAT IT ADDRESSED THE OVERRIDING WATERSHED PROBLEM, SLASH AND BURN SHIFTING AGRICULTURE, AT ITS SOURCE -- THE SMALL SUBSISTENCE FARMER. IT MADE IMPORTANT ADVANCES IN THE INTRODUCTION OF MANAGEMENT TECHNIQUES ON HILL LANDS THAT APPROACHED AN ECONOMICAL ALTERNATIVE TO MIGRATORY AGRICULTURE. ITS DEVELOPMENT OF A SIMPLE YET EFFECTIVE SOCIAL ACTION - COMMUNICATION PROGRAM SERVES AS A MODEL THAT IS BEING FOLLOWED (AND SHOULD BE) BY OTHER PROMOTION PROGRAMS IN THE COUNTRY. THE TRANSFER OF THE TECHNOLOGY TO TECHNICIANS IN COHDEFOR, BUT ESPECIALLY TO CAMPESINOS, HAS BEEN AT LEAST marginally EFFECTIVE AND REPRESENTS AN IMPORTANT FIRST STEP INTO ARRIVING AT A SOCIAL ACTION SCHEME FOR WATERSHED MANAGEMENT ACTIVITIES.

THE LIMITATIONS OF THE PROJECT WERE RELATED TO ITS FAILURE TO CONVINCe COHDEFOR ADMINISTRATOR OF THE IMPORTANCE OF PROJECT ACTIVITIES TO ITS MANAGEMENT OF FOREST LANDS. ADMINISTRATORS WERE NOT CONVINCED OF THE PROJECT'S WIDESPREAD APPLICABILITY. THE PROJECT PERHAPS "OVERKILLED" ITS OBJECTIVES. TERRACE CONSTRUCTION REQUIRES AN INORDINATE AMOUNT OF TIME AND WORK FOR THE AMOUNT OF WATERSHED PROTECTION ACQUIRED. HILLSIDE DITCHES IN MOST CASES ARE JUST AS VALUABLE FOR PROTECTION BUT INVOLVE LESS WORK. THE PROJECT ALSO TRIED TO INTRODUCE NEW CROPS IN AREAS WHERE CAMPESINOS SUBSIST ON CORN AND BEANS. IN MOST CASES THE CAMPESINO SELDOM ATE THE CROPS (VEGETABLE) AND WERE UNABLE TO DEVELOP A MARKET FOR THEM. ALSO, THE "INCENTIVES SYSTEM" USED IN THE PROJECT (FOOD-FOR-WORK) IS ONLY TEMPORARY, AND UNLESS THE RESULTS OF PROJECT ACTIVITIES YIELD A NET ECONOMIC GAIN TO THE CAMPESINO (I.E. IMPROVED CROPS, DIVERSITY, OR MONEY), HE WILL RETURN TO HIS TRADITIONALLY "EASIER" SLASH AND BURN PRACTICES (AS HAS HAPPENED IN MANY CASES IN THE PROJECT AREA).

TABLE_1

PUBLICATIONS LIST OF INTEGRATED WATERSHED MANAGEMENT PROJECT

DOCUMENTO DE TRABAJO NO.		
1	MICHAELSEN, T.	UN SISTEMA DE CLASIFICACION DE LA TIERRA POR CAPACIDAD DE USO PARA TIERRAS MARGINALES
2	CAMINO, V.	ESTIMACION DE COSTOS Y BENEFICIOS DE LA REFORESTACION Y LA CONSERVACION DE LOS SUELOS EN EL NOROESTE DE HONDURAS
3	MICHAELSEN, T.	MANUAL DE CONSERVACION DE SUELOS PARA TIERRAS DE LADERA
4	RODRIGUEZ, E.	MANUAL DE CULTIVOS MULTIPLES EN OBRAS DE CONSERVACION DE SUELOS
5	BAUER, J.	GUIA DE REFORESTACION EN COMUNIDADES RURALES
6	DONGELMANS, L.	ANALISIS FINANCIERO DE REFORESTACION PARA LENA Y DE CULTIVO EN TERRAZAS.
7	BAUER, J.	PLAN DE MANEJO, SIERRA DE OMOA
8	GONZALES, L.	GUIA PARA EL USO DE FILMINAS
9	RODRIGUEZ, E.	EL CULTIVO DE FRUTALES EN OBRAS DE CONSERVACION DE SUELOS
10	WIFF, M.	MANUAL DE COMUNICACION PARA EL DESARROLLO RURAL EN TIERRAS DE LADERA
11	MICHAELSEN, T.	INFORME FINAL DEL PROYECTO DE LA ORDENACION INTEGRADA DE CUENCAS HIGROGRAFICAS.

2.3 WATERSHED EXPERIMENTS IN THE LOS LAURELES WATERSHED

THE "LOS LAURELES" WATERSHED SUPPLIES THE CAPITAL CITY OF TEGUCIGALPA WITH 60 PERCENT OF ITS DOMESTIC AND INDUSTRIAL WATER (NO. 10 IN FIGURE 2). CONDEFOR, WITH ASSISTANCE FROM U.S. PEACE CORPS, BEGAN A SERIES OF WATERSHED MANAGEMENT EXPERIMENTS AND PILOT MANAGEMENT PROJECTS IN ORDER TO ASSESS THE POTENTIAL OF RESERVOIR SEDIMENTATION. THESE EXPERIMENTS WERE THE FIRST IN THE COUNTRY TO ESTIMATE THE IMPACTS OF DIFFERENT LAND USES ON WATERSHEDS, ASSESS IMPACTS OF EROSION AND RUN-OFF CHARACTERISTICS FROM ROADS

AND LANDS UNDER DIFFERENT LAND USES, AND SEDIMENTATION RATES OF STREAMS. THE MOST IMPORTANT CONTRIBUTION OF THE PROJECT WAS PROVIDING SCIENTIFIC EVIDENCE IN HONDURAS THAT INAPPROPRIATE LAND USES AND ROAD CONSTRUCTION LEAD TO INCREASED EROSION AND DEGRADATION OF SOIL RESOURCES, INCREASED RUN-OFF, SEDIMENTATION OF STREAMS AND RESERVOIRS, AND INCREASED FLOODING (WOUTERS, 1980).

2.3.1 CRITIQUE

EVEN THOUGH THE EXPERIMENTS AT LOS LAURELES ILLUSTRATED THE NEED FOR GOOD WATERSHED MANAGEMENT PRACTICES IN ORDER TO INSURE THE QUALITY AND QUANTITY OF WATER GOING INTO THE MUNICIPAL RESERVOIR AND TO INSURE ITS USEFUL LIFE (I.E. PREVENT SEDIMENTATION), THE GOM HAS FAILED TO HEED THE INFORMATION AND HAS TO DATE DONE LITTLE TO MANAGE THE LOS LAURELES WATERSHED. SILTATION OF THE RESERVOIR CONTINUES MAKING ITS ECONOMIC LIFE QUESTIONABLE. NUTRIENT BUILD-UP IN THE RESERVOIR HAS ACCELERATED THE SPREAD OF WATER HYACINTHS AND OTHER AQUATIC PLANTS.

2.4 INTEGRATED RURAL DEVELOPMENT PROGRAM OF THE WEST (PRODERO)

PRODERO WAS CREATED THROUGH COOPERATION AND FUNDING OF THE INTER-AMERICAN FUND FOR AGRICULTURAL DEVELOPMENT AND THE INTER-AMERICAN DEVELOPMENT BANK AND WITH TECHNICAL ASSISTANCE THROUGH THE ORGANIZATION OF AMERICAN STATES (NO. 4 IN FIGURE 2). THE PROGRAM BEING CARRIED OUT BY THE MINISTRY OF NATURAL RESOURCES (MNR) BEGAN IN 1979 WITH A FORESTRY COMPONENT INVOLVING CONDEFOR. INITIALLY, 400 HECTARES OF PINE WERE REFORESTED IN THE SANTA ROSA DE COPAN AREA; BUT WERE EVENTUALLY LOST BECAUSE OF A FAILURE IN THE COLLABORATIVE EFFORT BETWEEN (CONDEFOR) AND THE TARGET GROUP - THE CAMPESINOS. THE ACTUAL PROJECT OBJECTIVES AS ADMINISTERED BY MNR ARE TO FOMENT THE RURAL DEVELOPMENT OF THE AREA WITH THE FORMULATION OF "AGRICULTURAL COMMITTEES" AT THE ALDEA AND ASEMIANIENIQ (CAMPESINO COOPERATIVES) LEVEL AS THE LOCAL ADMINISTRATIVE AND IMPLEMENTATION BODIES. THE PROGRAM HAS A COMPLETELY INTEGRATED APPROACH INVOLVING NEARLY ALL ASPECTS OF DEVELOPMENT INCLUDING: AGRICULTURAL EXTENSION, REFORESTATION WITH FUELWOOD, SOIL CONSERVATION, SOCIAL ACTION, HEALTH, NUTRITION, INFRASTRUCTURE, MARKETS, ETC. THE INTEGRATED RURAL DEVELOPMENT PROGRAM OF SANTA BARBARA (NO. 12 IN FIGURE 2) IS BEING DEVELOPED ON THE SAME LINES WITH THE SAME FUNDING ORGANIZATIONS FOR THE DEPARTMENT OF SANTA BARBARA USING CONSUPLANE AS THE PROGRAM EXECUTOR/ADMINISTRATOR. ALL OTHER GOVERNMENT AGENCIES ARE PROJECTED FOR PARTICIPATION.

2.4.1 CRITIQUE

ALTHOUGH IT IS TOO EARLY TO CRITIQUE THE OPERATION OF PRODERO, THE ORGANIZATION OF GROUPS AT THE LOCAL LEVEL FOR PURPOSES OF INTEGRATED DEVELOPMENT INVOLVING ALL ASPECTS OF THE LOCAL SOCIOECONOMY APPEARS TO BE AN EXCELLENT APPROACH TO THE PROBLEMS OF UNDERDEVELOPMENT. THE PROOF WILL BE IN THE SUCCESSFUL COLLABORATION BY THE VARIOUS GOVERNMENT AGENCIES, A PROCESS THAT HAS NOT OCCURED TO DATE.

2.5 INTEGRATED RURAL DEVELOPMENT OF THE BAJO AGUAN VALLEY REGION.

THIS PROJECT BEGUN IN 1979, IS PRIMARILY FUNDED AND EXECUTED BY THE UNITED NATIONS INVOLVING CONSUPLANE AS THE COUNTERPART EXECUTOR. THE OBJECTIVES OF THE PROJECT ARE TO:

1. INCREASE KNOWLEDGE OF THE NATURAL AND HUMAN RESOURCES OF THE AREA;
2. ESTABLISH A REGIONAL PLANNING SYSTEM FOR PURPOSES OF THE STUDY AND DEVELOPMENT OF THE REGION;
3. COORDINATION OF GOVERNMENT AGENCIES WORKING IN THE AREA AS DICTATED BY THE REGIONAL AND NATIONAL PLAN, AND;
4. INCREASE INVESTMENTS IN THE REGION WITHIN THE FRAMEWORK OF THE PLAN, THEREBY ASSURING PRODUCTIVITY OF THE PROGRAM (UNITED NATIONS, 1978).

SPECIFIC PROJECTS INCLUDE: STUDIES FOR A SYSTEM OF DIKES FOR FLOOD CONTROL; DAMS FOR FLOOD CONTROL, IRRIGATION, AND ELECTRICAL ENERGY PRODUCTION; REGIONAL AND URBAN DEVELOPMENT STUDIES AND PLANS; AND WATERSHED MANAGEMENT PLAN (SOIL AND WATER RESOURCES MANAGEMENT). THE PROJECT AREA INCLUDES THAT OF THE AGUAN VALLEY, THE LOCATION OF THE LARGEST AGRARIAN REFORM PROJECT COORDINATED BY INA (NO. 5 IN FIGURE 2). THE WATERSHED MANAGEMENT COMPONENT HAS INVOLVED THE PREPARATION OF DRAINAGE, LAND USE, TOPOGRAPHY, AND LAND USE CAPACITY ACTUAL LAND USE COMPARISON MAPS. A DIAGNOSIS FOR FUTURE STUDIES AND MANAGEMENT PLANS ARE ALSO INCLUDED.

2.5.1 CRITIQUE

THE PROJECT HAS A SOMEWHAT JUXTAPOSED PRIORITIES. EMPHASIS ON THE PROJECT HAS BEEN GIVEN PRIMARILY TO THE CONTROL OF FLOODS WITHIN THE VALLEY INSTEAD OF WITHIN THE UPSTREAM AREAS OF THE WATERSHED WHERE SHIFTING AGRICULTURE AND DEFORESTATION ARE EXACERBATING AN ALREADY SERIOUS FLOODING SITUATION. IT MAKES LITTLE SENSE TO SPEND MILLION ON PLANNING FOR URBAN AND REGIONAL DEVELOPMENT IN THE VALLEY IF SERIOUS FLOODS COULD DESTROY ANY SUCH DEVELOPMENT. THE WATERSHED MANAGEMENT COMPONENT SHOULD BE GIVEN AN EQUAL IF NOT HIGHER EMPHASIS IN THE PROJECT.

2.6 NATURAL RESOURCES MANAGEMENT PROJECT

THIS PROJECT IS BEING CARRIED CUT THROUGH A SERIES OF LOANS AND GRANTS PROVIDED BY USAID AND GOM CONTRIBUTIONS. THE PROJECT HAS TWO MAJOR OBJECTIVES:

1. TO STRENGTHEN HONDURAN INSTITUTIONS' CAPACITY TO BETTER MANAGE THE COUNTRY'S NATURAL RESOURCES, AND;

2. TO IMPLEMENT A WATERSHED MANAGEMENT PROGRAM IN SELECTED SUBWATERSHEDS OF THE CHOLUTECA RIVER TO INCREASE FARMERS INCOME THROUGH THE DEVELOPMENT OF IMPROVED AGRICULTURE AND FORESTRY PRACTICES DESIGNED TO CONSERVE SOIL AND WATER RESOURCES (USAID, 1980).

SPECIFIC TO THE FIRST OBJECTIVE, THE PROJECT AIMS TO DEVELOP A NATURAL RESOURCE MANAGEMENT POLICY BASED ON A POTENTIAL LAND USE CLASSIFICATION AND AN IMPROVED RESOURCE DATA BASE WHICH IS CURRENTLY BEING DEVELOPED AS A RESULT OF ANOTHER USAID SUPPORTED PROJECT - THE NATIONAL CADASTER PROGRAM (DESCRIBED IN SECTION 3.1). THE KEY TO THIS OBJECTIVE IS THE ESTABLISHMENT OF AN EFFECTIVE RESOURCE DEVELOPMENT ORGANIZATION WHICH WOULD:

1. BRING TOGETHER THE VARIOUS RESOURCE MANAGEMENT AGENCIES;
2. STUDY AND COLLATE EXISTING LAND USE POLICIES AND RESOURCE MANAGEMENT LAWS INTO A COMPREHENSIVE AND EFFECTIVE PACKAGE;
3. DEVELOP AND PROPOSE NEW AND NEEDED LAWS AND REGULATIONS, AND;
4. TO ADMINISTER THE NATURAL RESOURCE MANAGEMENT INSTITUTIONS.

THE SECOND OBJECTIVE WOULD BE USED AS AN EXPERIMENT FOR TESTING MANAGEMENT APPROACHES BEFORE DEVELOPING A NATIONAL POLICY. PRINCIPAL COMPONENTS OF THE "MANAGEMENT OF THE CHOLUTECA RIVER WATERSHED" PROJECT WILL FOCUS ON ACTIVITIES TO REDUCE SLASH AND BURN HILLSIDE FARMING AND GRAZING PRACTICES AND ENCOURAGE RATIONAL USE OF THE LAND (NO. 7 IN FIGURE 2). THE PROJECT INTENDS TO REFOREST 13,000 HECTARES WITH PINE AND FUELWOOD SPECIES, PROMOTE SOIL CONSERVATION PRACTICES AND STRUCTURES AND IMPROVED CULTIVATION ON 18,000 HECTARES, AND IMPROVE PASTURES ON 5,000 HECTARES, ALL WITHIN 5 YEARS.

2.6.1 SUMMARY

THE OVERALL DESIGN OF THE NATURAL RESOURCES POLICY AND PLANNING OBJECTIVES SHOWS A WELL THOUGHT OUT APPROACH TO THE PROBLEMS OF RESOURCE MANAGEMENT IN THE COUNTRY. THE SUPPORT INTENDED FOR THE NATIONAL AGRICULTURAL PLANNING COMMISSION IS THE MOST POSITIVE STEP TAKEN BY AN INTERNATIONAL AID ORGANIZATION TO DATE TO IMPROVE UPPER LEVEL PLANNING AND DECISION MAKING. THE DEVELOPMENT AND EVENTUAL PROMULGATION OF THE LAND POTENTIAL CLASSIFICATION SYSTEM SHOULD PROVIDE A VALUABLE TOOL FOR INSTITUTIONS INVOLVED IN THE MANAGEMENT OF LAND.

THE WATERSHED MANAGEMENT PLAN HOWEVER OVERSTATES THE GOVERNMENT INSTITUTIONS' CAPACITY FOR SUCH DEVELOPMENT ACTIVITIES. AS WAS SHOWN IN THE FAO/CONDEFOR INTEGRATED WATERSHED MANAGEMENT PROJECT, ONLY 361 HECTARES WERE TREATED WITH SOIL CONSERVATION PRACTICES AND 467 HECTARES REFORESTED DURING THE FIVE-YEAR PROJECT LIFE. THE GOAL OF REFORESTING 13,000 HA AND IMPROVING 23,000 HA. IN THE CHOLUTECA PROJECT SEEMS IMPLAUSIBLE AT BEST. FURTHERMORE, THE PROJECT DOCUMENT SUPPLEMENT ON WATERSHED MANAGEMENT FAILS TO DESCRIBE IN SUFFICIENT DETAIL THE COORDINATION NEEDED FOR PROJECT

IMPLEMENTATION. WITH THE PROJECT FAR BEHIND SCHEDULE AFTER STARTING ONE YEAR AGO, IT SEEMS THAT THIS IS AN OBVIOUS EXAGGERATION OF THE GOH'S AND THE USAID'S TECHNICAL ABILITIES TO MEET SUCH AMBITIOUS GOALS.

2.7 COMAYAGUA FOREST MANAGEMENT PLAN AND MANAGEMENT OF THE "EL CAJON" WATERSHED.

THE OBJECTIVES OF THE COMAYAGUA FOREST MANAGEMENT PLAN ARE MORE FULLY DISCUSSED IN THE FORESTRY CHAPTER OF THIS REPORT. OF INTEREST IN THIS SECTION IS HOW THE COMAYAGUA PLAN, WHOSE MANAGEMENT AREA INCLUDES NEARLY ALL OF THE WATERSHED (NO. 6 IN FIGURE 2) OF THE "EL CAJON" HYDROELECTRIC PROJECT, INTENDS TO DEAL WITH WATERSHED MANAGEMENT PROBLEMS. FIRST HOWEVER, A LITTLE HISTORY IS NEEDED TO EMPHASIZE THE PREVIOUS EFFORTS AT WATERSHED MANAGEMENT IN THE AREA.

THE 650 MILLION DOLLAR HYDROELECTRIC PROJECT IS BEING FUNDED THROUGH LOANS PROVIDED BY A CONSORTIUM OF DEVELOPMENT BANKS LED BY THE INTERAMERICAN DEVELOPMENT BANK (IDB). AS A CONDITION TO THE IDB LOANS, THE BANK REQUIRED THE DEVELOPMENT OF WATERSHED CONSERVATION PLAN THAT WOULD INSURE THE LIFE OF THE PROJECT. THE COHDEFOR WATERSHED MANAGEMENT UNIT BEGAN THE BACKGROUND WORK ON A MANAGEMENT PLAN FOR THE 8,320 KM² WATERSHED AND A CLEANING PLAN FOR THE 90 KM² RESERVOIR AREA IN 1978. A PRE-FEASIBILITY PLAN WAS DRAWN UP AND SUBMITTED TO IDB IN MARCH OF 1979. IDB APPARENTLY WAS PLEASED WITH THE PLAN AND CIRCULATED IT IN WASHINGTON FOR APPROVAL. IN THE MEANTIME, AN INTERINSTITUTIONAL WORKGROUP WAS FORMED IN 1978 AS DIRECTED BY THE CHIEF OF STATE, TO HANDLE PROBLEMS OF INFRASTRUCTURE, AGRICULTURAL EXTENSION, FORESTRY, HEALTH, RELOCATION OF FAMILIES WITHIN THE RESERVOIR AREA, ECOLOGICAL STUDIES, ETC. THIS COMMITTEE WAS TO ADDRESS THE COMPLEX PROBLEMS OF DEVELOPMENT THAT WOULD BE BROUGHT ABOUT BY THE CONSTRUCTION AND OPERATION OF THE HUGE HYDROELECTRIC FACILITY. THE COMMITTEE HAS NOT MET IN OVER A YEAR. NO PLANS HAVE BEEN MADE FOR RELOCATION, NO PLANS HAVE BEEN MADE FOR THE CLEARING OF THE RESERVOIR, AND NO ENVIRONMENTAL OR SOCIO-ECONOMIC IMPACT STUDIES OF APPROPRIATE SCALE HAVE BEEN PERFORMED. AS FOR THE WATERSHED MANAGEMENT PLAN THAT WOULD PROMOTE THE APPROPRIATE USE OF LAND, SOIL CONSERVATION TECHNIQUES, REFORESTATION, AND SOCIAL PROMOTION AND CONSCIOUSNESS-RAISING, AN EFFORT WAS MADE TO EXTEND THE MARGINALLY SUCCESSFUL INTEGRATED WATERSHED MANAGEMENT PROJECT (FAO/COHDEFOR) INTO THE WATERSHED OF THE EL CAJON PROJECT, THEREBY TAKING ADVANTAGE OF TECHNIQUES ALREADY DEVELOPED OVER A FIVE-YEAR PERIOD IN HONDURAS. THIS WOULD BE DONE CONCURRENTLY WITH ONGOING STUDIES OF WATERSHED CHARACTERISTICS, BOTH PHYSICAL AND SOCIOECONOMIC, AS STIPULATED IN THE PRE-FEASIBILITY PLAN PREPARED BY COHDEFOR AND PRESENTED TO IDB. IN THE MEANTIME THE PLAN COMAYAGUA, A FOREST MANAGEMENT PLAN THAT WOULD PROVIDE FOR REFORESTATION OF OVER 40,000 HECTARES OF PINE LANDS WITHIN THE WATERSHED AS WELL AS HARVEST OF EXISTING MATURE TIMBER AND ALSO FUNDED BY A 10 MILLION DOLLAR LOAN FROM IDB, OFFERED TO COMBINE EFFORTS WITH THE PROPOSED WATERSHED MANAGEMENT STRATEGY TO FACILITATE AN OVERALL ORGANIZATION EFFORT. IDB SENT TO MISSION TO HONDURAS TO MAKE A FINAL RECOMMENDATION. THEIR RECOMMENDATION WAS THAT THE WATERSHED PLAN WAS NOT NEEDED, AND DROPPED A PREVIOUS OFFER TO FUND IT.

AS IT SITS NOW, THE PLAN COMAYAGUA HAS NO SOCIOECONOMIC PLAN OF ACTION WRITTEN INTO THEIR ACTIVITIES ALTHOUGH THEY ARE "THINKING" OF SOME AGROFORESTRY PROJECTS FOR POSSIBLE IMPLEMENTATION IN THE MANAGEMENT AREA. REGARDLESS, THERE IS NO MONEY ALLOCATED AT THIS TIME FROM COHDEFOR OR IDB TO PROVIDE FOR MANAGEMENT OF THE WATERSHED THAT DRAINS 8% OF THE TOTAL LAND AREA OF HONDURAS, AND IS THE MEDIUM FOR WATER SUPPLY TO THE EL CAJON HYDROELECTRIC PROJECT.

2.7.1 CRITIQUE

THE FIRST AND OBVIOUS QUESTION: WHY RISK 650 MILLION DOLLARS ON A HYDROELECTRIC PROJECT WHEN THE WATERSHED IS BEING DEGRADED BY ACTIVITIES OF DEFORESTATION, SHIFTING AGRICULTURE, AND EROSION AND SEDIMENTATION? THE ANSWER IS LESS OBVIOUS. OVER THE LAST CENTURY, HUNDREDS OF SUCH HARD LESSONS HAVE BEEN LEARNED AS RESERVOIRS HAVE BEEN SILTED UP OR EUTROPHICATED AS A RESULT OF ACTIVITIES IN UPSTREAM WATERSHEDS. IT IS AN ACT OF COMPLETE NEGLIGENCE ON THE PART OF THE FUNDING AGENCIES TO IGNORE THE VERY REAL PROBLEMS OF WATERSHED MANAGEMENT IN THE EL CAJON WATERSHED. CONSTRUCTION OF THE DAM BEGAN IN 1980 AND THE GATES ARE DUE TO CLOSE AND THE DAM TO BEGIN FILLING IN 1985. AS OF YET NO PLANS HAVE BEEN MADE FOR THE RELOCATION OF FAMILIES, THE CLEANING OF THE RESERVOIR AREA (SOMETHING THAT WOULD TAKE TWO YEARS TO DO), OR THE HANDLING OF THE INFLUX OF PEOPLE INTO THE WATERSHED AREA AND RESULTING RESOURCE MANAGEMENT PROBLEMS. THE HARD LESSON MAY BE SOME DECADES DOWN THE ROAD, BUT IT MAY COME BEFORE THE ECONOMIC LIFE OF THE DAM HAS BEEN FULFILLED AND LOANS ARE DUE IN FULL (50 YEARS).

2.8 GENERAL WATERSHED-RELATED ACTIVITIES UNDER COHDEFOR

AS EXPLAINED EARLIER, COHDEFOR HAS THE PRINCIPAL RESPONSIBILITY OF DIRECTING WATERSHED MANAGEMENT ACTIVITIES IN HONDURAS AS DIRECTED UNDER FOREST LAWS 85 AND 102, THOSE DEALING WITH LANDS SUITED FOR FORESTS (I.E. LANDS WITH SLOPES OF GREATER THAN 15%). COHDEFOR CURRENTLY HAS FIVE PROGRAMS UNDER ITS FORESTS DEPARTMENT WHICH ARE WATERSHED MANAGEMENT-RELATED AND ARE BRIEFLY DESCRIBED BELOW (THESE FUNCTIONS ARE ALSO DESCRIBED IN THE FORESTRY CHAPTER:

2.8.1 WATERSHED MANAGEMENT SECTION

THE WATERSHED MANAGEMENT SECTION WAS CREATED IN 1976 TO DEAL DIRECTLY WITH LAND-MANAGEMENT RELATED PROBLEMS OF SOIL AND WATER RESOURCES. THE SECTION WAS RESPONSIBLE FOR THE LOS LAURELES WATERSHED MANAGEMENT PROJECT AND THE INTEGRATED WATERSHED MANAGEMENT PROJECT OF THE NORTHWEST. THE FOCUS OF THE SECTION IS PRIMARILY ON SOCIAL PROBLEMS AND LAND USE - SMALL FARMER AGRICULTURE AND RELATED DEFORESTATION - A RESULT OF THE INTEGRATED WATERSHED MANAGEMENT PROJECT. THE NORTHWEST DISTRICT IS IN CHARGE OF THE ONGOING INTEGRATED PROJECT WITH 25-30 TECHNICIANS WORKING IN SOCIAL ACTION, SOIL CONSERVATION, AND REFORESTATION WITH FUELWOOD SPECIES. THE CENTRAL OFFICE HAS FOUR TECHNICIANS WHO WERE EDUCATED OUT OF COUNTRY TO HANDLE MID-LEVEL MANAGEMENT RESPONSIBILITIES AND WHO ARE CURRENTLY WITHOUT MAJOR PROJECTS. THE SECTION HAS NOT TO DATE WORKED ON FOREST MANAGEMENT PLANS AT THE VARIOUS DISTRICTS TO INCORPORATE WATERSHED CONCEPTS INTO SUCH PLANS.

2.8.2 FUELWOOD AND ALTERNATIVE ENERGY SOURCES PROJECT

THIS COOPERATIVE PROJECT BETWEEN CONDEFOR AND THE CENTER FOR TROPICAL AGRONOMIC RESEARCH AND TRAINING (CATIE) BEGAN IN 1980 AND HAS TO DATE COLLATED EXISTING GROWTH RATE INFORMATION ON EXISTING NATIVE AND EXOTIC TREE PLANTATIONS (FUELWOOD SPECIES) AND IS CURRENTLY FINISHING A DOMESTIC FUELWOOD USE SURVEY TO DETERMINE AREAS OF CRITICAL FUELWOOD SHORTAGES. THE OBJECTIVES ARE TO DEVELOP TECHNIQUES AND PLANS FOR SMALL AND LARGE SCALE FUELWOOD PLANTATIONS FOR CRITICAL FUELWOOD AREAS IN HONDURAS, THEREBY PROVIDING A RENEWABLE ENERGY SOURCE AND AVOIDING CONTINUING DEFORESTATION ASSOCIATED WITH FUELWOOD COLLECTION. SEVERAL PILOT PLANTATIONS USING ESSENTIALLY EXOTIC SPECIES WILL BE PLANTED IN THE CRITICAL AREAS AND WILL BE MONITORED FOR GROWTH RATES AND ACCEPTABILITY TO THE CONSUMER. THE PROJECT TO DATE, CONSISTS OF TWO FOREST ENGINEERS AND HAS HAD ONLY LIMITED SUPPORT FROM CONDEFOR.

ANOTHER ELEMENT OF THIS PROJECT IS BEING CARRIED OUT WITH SUPPORT OF THE CENTRAL AMERICAN INSTITUTE FOR INDUSTRIAL TECHNOLOGY (ICAITI) THROUGH THE CENTER FOR INDUSTRIAL DEVELOPMENT (CDI) IN HONDURAS. THIS ELEMENT WILL DISSEMINATE INFORMATION CONCERNING MORE EFFICIENT FUELWOOD (LORENA) STOVES AND CARRY OUT WORKSHOPS AND DEMONSTRATION PROJECTS TO STIMULATE THEIR USE IN THE RURAL AREAS.

2.8.3 SOCIAL FORESTRY SYSTEM

SINCE ITS BEGINNING IN 1975, THE SOCIAL FORESTRY SYSTEM HAS ORGANIZED 127 GROUPS OF CAMPESINOS CONSISTING OF SOME 4,500 FAMILIES IN PROJECTS OF RESINATION, GUM AND CHICLE EXTRACTION, ARTESAN PIT SAWING OF HARDWOODS AND PINE, AND HONEY PRODUCTION. RECENTLY THE SYSTEM IS PROMOTING THE USE OF THE "LORENA STOVE" IN RURAL AREAS IN ORDER TO REDUCE THE AMOUNT OF WOOD USED IN DOMESTIC COOKING. A SPECIAL PROGRAM CO-SPONSORED BY THE EUROPEAN ECONOMIC COMMISSION IS THE "INDIGENOUS PROGRAM" INVOLVING FIVE TRIBES OF THE JICAQUE INDIANS IN THE DEPARTMENT OF YORO. THE ORIENTATION OF THE SYSTEM IS ONE OF SOCIAL ACTION FOR THE INTEGRATION OF THE PEOPLE LIVING IN THE FORESTS INTO LOCAL FOREST MANAGEMENT PLANS.

2.8.4 FOREST PROTECTION UNIT

THE HISTORICAL FOCUS OF THE PROTECTION UNIT HAS BEEN ON EXTINGUISHING FOREST FIRES AND RELATED PROTECTION ACTIVITIES. NOT UNTIL RECENTLY HAS THE UNIT BEGUN TO ATTACK THE PROBLEM AT ITS ROOTS -THE CAMPESINO WITH THE MATCH. NEARLY ALL FIRES ARE HUMAN-CAUSED, ORIGINATING WITH SLASH AND BURN ACTIVITIES, BURNING FOR PASTURE CLEARANCE, OR ARSON. THE UNIT IS NOW USING COMMUNICATION PACKETS DEVELOPED BY THE INTEGRATED WATERSHED MANAGEMENT PROJECT IN AN ATTEMPT TO CONVINCE THE CAMPESINO NOT TO START FOREST FIRES.

2.8.5 BROADLEAF FORESTRY PROJECT

THIS PROJECT WAS BEGUN IN 1978 WITH THE SUPPORT OF THE CANADIAN INTERNATIONAL DEVELOPMENT AGENCY (CIDA) WITH THE PRINCIPAL OBJECTIVE OF CONTROLLING THE ADVANCE OF MIGRATORY AGRICULTURE INTO THE BROADLEAF FORESTS

LOCATED IN THE NORTHEASTERN PART OF THE COUNTRY FROM THE SOUTHEAST OF CATACAMAS, NORTH TO THE DEPARTMENTS OF OLANCHIC AND COLON, PRIMARILY TO INSURE THE EXISTENCE OF THE WOOD RESOURCE FOR COMMERCIALIZATION AT CONDEFOR'S SAWMILL AT BONITO ORIENTAL (CORFINO PROJECT).

ACTIVITIES OF THE PROJECT INCLUDE SOCIAL ACTION AMONG THE CAMPESINOS OF THE REGION TO PROMOTE ALTERNATIVES TO SLASH AND BURN INCLUDING AGRICULTURAL EXTENSION, ALTERNATIVE EMPLOYMENT OPPORTUNITIES (CRAFTS, PIT-SAWING OF TIMBER), REFORESTATION WITH PLANTATIONS OF FUELWOOD SPECIES, THE INTRODUCTION OF "LORENA STOVES", AND THE PRODUCTION OF CHARCOAL.

A UNIQUE FEATURE OF THE PROJECT IS ITS ESTABLISHMENT OF "BREECH-LINES" OR BORDERS TO DELINEATE THE LIMITS OF THE FOREST RESERVES. THESE LINES, PLANTED WITH CEDAR AND MAHOGANY, ARE A VISIBLE BORDER AND ARE INTENDED TO KEEP CAMPESINOS OUTSIDE OF THE RESERVES. THOSE ALREADY LIVING WITHIN THE RESERVES ARE INCORPORATED INTO THE PROJECT THROUGH SOCIAL ACTION (SEE ABOVE), WHILE NO MORE ARE ALLOWED IN. A SERIES OF PATROL ROADS FACILITATE THE VIGILANCE OF THE RESERVE BY FOREST GUARDS. ANY VIOLATIONS ARE DEALT WITH THROUGH "DIPLOMATIC" OR "STRONG ARM" CHANNELS AS NEEDED.

2.8.6 NATIONAL FORESTRY SCIENCES SCHOOL

THOUGH SEMI-AUTONOMOUS, THE SCHOOL IS ACTUALLY SUBSIDIZED BY CONDEFOR. BEGAN IN 1969 WITH THE ASSISTANCE OF FAO, THE SCHOOL OFFERS PROGRAMS OF FOREST MANAGEMENT AND FOREST INDUSTRY. ALTHOUGH NO FORMAL WATERSHED MANAGEMENT PROGRAM EXISTS AT THE SCHOOL, COURSES ARE A ROUTINE PART OF THE TWO PROGRAMS AND THE SCHOOL IS CURRENTLY WORKING WITH THE CITY OF SIGUATEPEQUE IN A PROGRAM TO RESOLVE PROBLEMS OF MUNICIPAL WATER SUPPLY CAUSED BY THE DETERIORATION OF WATERSHEDS THAT SUPPLY THE CITY'S WATER.

THE SCHOOL HAS OFFERED A NUMBER OF NATIONAL AND REGIONAL WATERSHED MANAGEMENT SHORT COURSES AND SEMINARS, PROVIDING A FORUM FOR THE DISSEMINATION OF WATERSHED MANAGEMENT INFORMATION AND EXPERTISE.

SINCE 1979 WHEN THE SCHOOL PREPARED A PROPOSAL FOR A WATERSHED MANAGEMENT CURRICULUM AS THE THIRD BASIC PROGRAM, IT HAS BEEN TRYING TO OBTAIN FUNDING. THE PROGRAM WOULD CONTAIN BOTH A FOREST MANAGEMENT-RELATED FOCUS AND A SMALL FARMER FOCUS (SOCIAL FORESTRY).

2.9 OTHER ORGANIZATIONS AND ACTIVITIES RELATING TO WATERSHED MANAGEMENT

2.9.1 NATIONAL CADASTER PROGRAM (PCN)

THIS PROGRAM WAS BEGUN IN 1976 WITH A SERIES OF LOANS AND GRANTS FROM USAID. ITS OBJECTIVES ARE TO: (1) ESTABLISH A "REGISTRY SYSTEM" TO HELP THE GOVERNMENT ISSUE CLEAR LAND TITLES; (2) ESTABLISH AN EFFICIENT "PROPERTY-TAX ADMINISTRATION" TO ASSESS TAXES AND INCREASE GOV OPERATING INCOME; AND (3) PERFORM AN "AGRICULTURAL RESOURCES INVENTORY" INVOLVING THE COLLECTION, ANALYSIS, AND ORGANIZATION OF ACCURATE RESOURCES INFORMATION

CONCERNING SOILS, WATER RESOURCES, VEGETATION, ETC., OVER A 71,746 KM2 PROJECT AREA IN THE COUNTRY. A SECONDARY ACTIVITY OF THE PROJECT IS TO PREPARE A LAND-USE POTENTIAL CLASSIFICATION FOR THE COUNTRY BASED ON THE USDA SOILS CLASSIFICATION. THIS CLASSIFICATION WOULD SERVE AS THE PRIMARY TOOL IN LAND PLANNING AND COULD FURTHER SERVE AS A TAX ASSESSMENT TOOL (I.E. PAYING LESS TAXES FOR MORE APPROPRIATE USES). IN 1980, USAID EXTENDED ITS SUPPORT OF THE PROGRAM WITH APPROXIMATELY 3.3 MILLION DOLLARS AS PART OF THE "HONDURAS NATURAL RESOURCES MANAGEMENT PROJECT" (PROJECT NO. 522-0168).

PRINCIPAL CONTACTS IN THE ORGANIZATION ARE:

- ING. RIVERA CACERES, DIRECTOR
- ING. SCOTT LOVERNE, PRINCIPAL CONSULTANT
- ING. SALOMON GIRON, HEAD OF NATURAL RESOURCES DEPARTMENT

2.9.2 SECRETARIAT FOR COMMUNICATION, PUBLIC WORKS, AND TRANSPORTATION (SECOPT)

SECOPT HAS PRIMARY RESPONSIBILITY FOR THE PLANNING, CONSTRUCTION, AND MAINTENANCE OF ROADS AND HIGHWAYS WITHIN ITS ROADS DIVISION (DIRECCION GENERAL DE CAMINOS). WITHIN THE ROADS DIVISION ARE VARIOUS EXECUTION UNITS AFFILIATED WITH SEVERAL INTERNATIONAL ASSISTANCE PROGRAMS. USAID HAS SUPPORTED SECOPT SINCE THE MID-1960S WITH LOANS AND GRANTS AIDING IN THE CONSTRUCTION OF VARIOUS FEEDER AND ACCESS ROADS IN ESSENTIALLY RURAL AREAS. THE CURRENT USAID/SECOPT ROAD RECONSTRUCTION PROJECT (NO. 035) IS INTENDED TO WIDEN AND IMPROVE EXISTING ROADS IN THE EASTERN PART OF THE COUNTRY (DEPARTMENTS OF COPAN, SANTA BARBARA, LEMPIRA, INTIBUCA AND OCOTEPEQUE).

ALTHOUGH ENGINEERING IS BASIC TO ROAD CONSTRUCTION IN HONDURAS, ENVIRONMENTAL ENGINEERING IS NOT. SECOPT DOES NOT PERFORM OR REQUIRE IMPACT ASSESSMENTS (ENVIRONMENTAL NOR SOCIOECONOMIC) BEFORE BUILDING ROADS. THE RESULT HAS BEEN ROADS OF POOR CONSTRUCTION REQUIRING CONTINUAL AND EXPENSIVE MAINTENANCE, THAT CAUSE A CONCENTRATION OF WATER CREATING A GREATER EROSIONAL FORCE, HIGH EROSION, WASH-OUTS, LANDSLIDES, AND EXCESSIVE SEDIMENTATION OF STREAMS AND RIVERS. USAID'S ROAD RECONSTRUCTION PROJECT IS THE FIRST TO REQUIRE AN ENVIRONMENTAL ASSESSMENT BEFORE CONSTRUCTION. THIS REQUIREMENT, HOWEVER, ONCE CARRIED OUT BY A PEACE CORPS VOLUNTEER (RECENTLY LEFT COUNTRY), IS LEFT UP TO SECOPT WHICH HAS NO EXPERIENCE IN THE FIELD.

THE PRINCIPAL CONTACT FOR THE USAID PROJECT IS ING. CARLOS CARCAMO.

ANOTHER IMPORTANT FUNCTION OF SECOPT IS THE PRODUCTION AND DISTRIBUTION OF MAPS THROUGH THE NATIONAL GEOGRAPHIC INSTITUTE (INSTITUTO GEOGRAFICO NACIONAL).

2.9.3 NATIONAL ELECTRIC ENERGY COMPANY (ENEE)

ENEE IS MANDATED TO PROVIDE ELECTRIC ENERGY SERVICES TO THE COUNTRY. AMONG ITS PARTICULAR FUNCTIONS ARE THE PLANNING AND EXECUTION OF PROJECTS TO MEET PRESENT AND FUTURE ELECTRICAL ENERGY DEMAND. THE COMPANY IS CONSTANTLY UPGRADING SERVICE FACILITIES AND EXTENDING ELECTRICAL SERVICE TO RURAL AREAS. TWO HYDROELECTRIC PROJECTS ARE NOW UNDER CONSTRUCTION THAT, WHEN FINISHED, SHOULD SATISFY ELECTRICAL ENERGY DEMAND THROUGH THE YEAR 2000: "EL CAJON" (DESCRIBED PREVIOUSLY WITH THE PLAN COMAYAGUA) AND "EL NISPERO". AS FAR AS COULD BE DETECTED, ENEE HAS NO MANAGEMENT PLANS FOR WATERSHED OF EL NISPERO (NO. 11 IN FIGURE NO. 2). THE RESULTS OF DEFORESTATION AND SHIFTING AGRICULTURE -INCREASED EROSION, SEDIMENTATION, AND EUTROPHICATION- COULD INTERFERE WITH THE OPERATION OF THE DIVERSION DAM AND TUNNEL AND INTERFERE WITH THE TURBINES. THE LAGO DE YOJOA -RIO LINDO HYDROELECTRIC SYSTEM USES THE 330 KM2 WATERSHED (NO. 2 IN FIGURE 2) FOR THE COLLECTION AND THE 90 KM2 LAKE YOJOA FOR WATER STORAGE IN GENERATING PRESENTLY 90% OF HONDURAS' ELECTRIC ENERGY. EVEN THOUGH THE WATERSHED HAS BEEN DECLARED A FOREST PRESERVED THERE HAS ONLY BEEN A NOMINAL EFFORT FOR ITS PROTECTION BY COHDEFOR (INTEGRATED WATERSHED MANAGEMENT).

BASED ON AN ESTIMATED 2800 MEGAWATTS OF TOTAL HYDROELECTRIC POTENTIAL, ENEE HAS PROJECTED OTHER LARGE AND SMALL HYDRO DEVELOPMENTS TO TAKE CARE OF FUTURE DEMAND. DEVELOPMENT OF THESE AND PAST PROJECTS HAS BEEN CARRIED OUT WITH LOANS PROVIDED BY INTERNATIONAL DEVELOPMENT ASSISTANCE BANKS AND THE PROJECT PLANNING AND CONSTRUCTION CARRIED OUT BY INTERNATIONAL CONTRACTORS. AN EXPLANATION OF EXISTING ELECTRICAL ENERGY PROJECTS AND THOSE BEING DEVELOPED, IS DESCRIBED IN THE ENVIRONMENT CHAPTER.

TABLE 3 PRESENTS A SIMPLIFIED ORGANIZATIONAL CHART OF ENEE FEATURING THE CURRENT ENERGY PROJECT, THE LAGO YOJOA -RIO LINDO HYDROELECTRIC PROJECT. PRINCIPAL CONTACTS ARE

- ING. ARMANDO DIAZ, EL CAJON PROJECT MANAGER
- ING. ARMANDO BERLIOZ, EL CAJON INTERINSTITUTIONAL WORKGROUP COORDINATOR
- ING. MARIO VILLACORTA, EL NISPERO PROJECT MANAGER
- ING. MARCO MASS, DIRECTOR OF SPECIAL PROJECTS

2.9.4 U.S. PEACE CORPS

THE PEACE CORPS HAS BEEN WORKING WITH COHDEFOR SINCE ITS INCEPTION IN 1974. APPROXIMATELY 25 VOLUNTEERS HAVE BEEN WORKING IN VARIOUS WATERSHED MANAGEMENT-RELATED PROJECTS WITH COHDEFOR INCLUDING THE LOS LAURELES, INTEGRATED WATERSHED MANAGEMENT, AND SOCIAL FORESTRY SYSTEM, PROVIDING INVALUABLE SERVICE IN WATERSHED EXPERIMENTATION, SOIL CONSERVATION, REFORESTATION, SOCIAL PROMOTION, AND AGRICULTURAL EXTENSION. SOME TEN PEACE CORPS VOLUNTEERS ARE NOW WORKING WITH COHDEFOR IN SOCIAL FORESTRY PROJECTS INVOLVING ALTERNATIVE ACTIVITIES FOR CAMPESINOS (PIT-SAWS, APICULTURE, ALTERNATIVE AGRICULTURE, AGROFORESTRY, CONSTRUCTION OF EFFICIENT FUELWOOD STOVES, AND ENVIRONMENTAL EDUCATION.

SEVEN PEACE CORPS VOLUNTEERS ALSO WORKED WITH THE NATIONAL CADASTER PROGRAM IN THE COLLECTION OF NATURAL RESOURCES DATA. ALTHOUGH MARGINALLY SUCCESSFUL, SUCH PROGRAMS WERE LATER DROPPED FROM PEACE CORPS PROGRAMMING BECAUSE OF THE LACK OF IMMEDIATE VILLAGE-LEVEL IMPACT.

PEACE CORPS' PROGRAMMING FOR THE FUTURE WILL FOCUS ON CONTINUING SUPPORT FOR INTEGRATED SOCIAL FORESTRY PROJECT.

2.9.5 UNIVERSITY CENTER OF THE ATLANTIC LITORAL REGION (CURLA)

THE PROGRAMMING FOCUS OF CURLA IS ON COMMERCIAL PRODUCTION OF AGRICULTURE AND FORESTRY PRODUCTS. USAID IS SUPPORTING THE UNIVERSITY WITH GRANTS FOR INFRASTRUCTURE AND EQUIPMENT IMPROVEMENTS AND HAS PROVIDED SCHOLARSHIPS TO FOREIGN UNIVERSITIES. USAID IS STUDYING THE POSSIBILITY OF HIRING AN ADMINISTRATIVE AIDE FOR THE CENTER AND HAS RECENTLY APPROVED FUNDS FOR THE HIRING OF A HONDURAN MASTER'S-LEVEL SOCIOLOGIST AND AGRICULTURAL ECONOMIST TO REINFORCE THOSE EDUCATIONAL ASPECTS. USAID IS CURRENTLY OFFERING NEARLY 50 SCHOLARSHIPS TO FOREIGN UNIVERSITIES IN VARIOUS NATURAL RESOURCE AND AGRICULTURAL FIELDS. THESE ARE ADMINISTERED THROUGH CURLA.

WATERSHED MANAGEMENT IS NOT A FORMAL PART OF THE CURRICULUM BUT REPRESENTS A PART OF THE OTHER PROGRAMS (FOREST MANAGEMENT, FOREST INDUSTRY, AGRONOMY) AS A MULTIPLE-USE, FOCUS ON SOILS, ECOLOGY, HYDROLOGY, AND REFORESTATION. THERE IS NO PROGRAMMING GEARED TO THE SMALL FARMER. ACCORDING TO SCHOOL OFFICIALS (JORGE SOTO M., DIRECTOR OF CURLA, JULY, 1981), THERE IS VERY LITTLE COLLABORATION WITH CONDEFOR IN THE SCHOOLS FORESTRY PROGRAM.

2.9.6 LA TIGRA NATIONAL PARK

SITUATED NORTHEAST OF TEGUCIGALPA, HONDURAS' FIRST NATIONAL PARK HAS A MULTIPLE FUNCTION (NO. 9 IN FIGURE 2). BESIDES PROVIDING A RECREATIONAL/EDUCATIONAL SERVICE TO THE COMMUNITY, IT ALSO INCLUDES THE CLOUDFORESTED WATERSHED THAT SUPPLIES 30% OF TEGUCIGALPA'S DOMESTIC WATER NEEDS. THE DIRECTORATE OF RENEWABLE NATURAL RESOURCES IS MAINTAINING THE PARK WITH A BARE-BONES BUDGET. THE WATERSHED IS DEMARCATED WITH FENCE AND GUARDS; HOWEVER POPULATION GROWTH HAS VIRTUALLY ENCLOSED THE AREA.

2.9.7 LAGO DE YOJOA MULTIPLE-USE AREA

THE LAGO DE YOJOA WATERSHED (NO. 2 IN FIGURE 2) HAS LONG BEEN CONSIDERED AS A VALUABLE NATIONAL RESOURCE, BOTH FOR ITS RECREATIONAL POTENTIAL AND ITS HYDROELECTRIC ENERGY PRODUCTION. IN 1975, AN EFFORT WAS BEGUN TO DEVELOP A MULTIPLE-USE MANAGEMENT SCHEME FOR THE LAKE AND CONTRIBUTING WATERSHED. IN 1978, THE "LAGO DE YOJOA MULTIPLE-USE MANAGEMENT PLAN" (BETANCOURT AND DULIN) WAS PUBLISHED. IT INCLUDED ACTION PLANS TO BE CARRIED OUT BY THE VARIOUS RESOURCE MANAGEMENT AGENCIES OF THE GOH. ONLY CONDEFOR HOWEVER, INITIATED A PROGRAM UNDER THE PLAN, THROUGH THE EXPANSION OF ITS PROJECT "INTEGRATED WATERSHED MANAGEMENT OF THE NORTHWEST" TO THE LAGO DE YOJOA WATERSHED. THE PLAN STANDS AS THE FIRST MULTIPLE-USE MANAGEMENT PLAN IN CENTRAL AMERICA; IT AWAITS IMPLEMENTATION BY THE VARIOUS RESOURCE AGENCIES.

2.9.8 BOATIAN TOURISM DEVELOPMENT PROJECT

THE WORLD BANK APPROVED LOANS TO THE HONDURAN INSTITUTE OF TOURISM SO THAT LINES OF CREDIT COULD BE EXTENDED TO PROSPECTIVE HOTEL DEVELOPERS ON THE ISLAND (SEE COASTAL RESOURCES CHAPTER). THE ISLAND (NO. 13 IN FIGURE 2) REPRESENTS ONE OF THE MOST IMPORTANT TOURIST ATTRACTIONS IN THE COUNTRY, CONTRIBUTING MILLIONS OF DOLLARS TO THE ECONOMY ANNUALLY. WATER SUPPLY IS A LIMITING FACTOR ON THE ISLAND. THAT COUPLED WITH THE IMPORTANCE OF MAINTAINING THE MAIN TOURIST FEATURE - THE 48 KILOMETER-LONG BARRIER REEF EMPHASIZED THE NECESSITY OF WATERSHED MANAGEMENT ON THE ISLAND. THE ONCE FOREST-COVERED ISLAND IS BEING DEFORESTED AT A RAPID RATE FOR PURPOSES OF LIVESTOCK RAISING AND SHIFTING AGRICULTURE, RESULTING IN HIGHER PEAK RUNOFF AND CONSEQUENT INCREASED EROSION AND SEDIMENTATION WITH POTENTIAL DETRIMENTAL EFFECTS ON THE CORAL REEFS. RAPID RUNOFF ALSO HAS DECREASED AQUIFER RECHARGE AS EVIDENCED BY THE DRYING UP OF SPRINGS AND WELLS (DULIN, 1979).

2.9.9 RIO PLATANO BIOSPHERIC RESERVE

WHILE CREATED FOR THE PRESERVATION OF ITS UNIQUE ECOLOGICAL RELATIONSHIPS, THE PLATANO RESERVE (NO. 8 IN FIGURE 2) SERVES AS A WATERSHED MANAGEMENT BY MAINTAINING THE QUALITY AND QUANTITY OF WATER AS WELL AS THE OTHER LAND RESOURCES IN THE RIO PLATANO WATERSHED (SEE WILDLANDS CHAPTER).

3.0 CONCLUSIONS AND RECOMMENDATIONS

THE GOVERNMENT OF HONDURAS HAS THE INSTITUTIONAL INFRASTRUCTURE TO ADDRESS WATERSHED MANAGEMENT PROBLEMS IN THE COUNTRY. ITS ORGANIZATIONAL CAPABILITIES, HOWEVER, ARE WEAK AND INADEQUATE TO REVERSE THE CURRENT TREND OF A DEGRADING RESOURCE BASE. AMBIGUITY IN ACTUAL LAWS DEALING WITH WATERSHED MANAGEMENT HAS LED TO JURISDICTIONAL CONFLICTS BETWEEN THE LAND-MANAGING AGENCIES. THE ABSENCE OF A LAND-USE CAPABILITY CLASSIFICATION ACCEPTABLE TO ALL LAND-MANAGEMENT ORGANIZATIONS, AND MADE APPLICABLE TO ALL LAND DEVELOPMENT PLANS AND ACTIVITIES HAS LED TO UNCONTROLLED, INAPPROPRIATE USES ON LANDS INCAPABLE OF SUPPORTING THEM. INAPPROPRIATE LAND USE IS CAUSING THE RAPID DETERIORATION OF THE PRINCIPAL WATERSHEDS OF THE COUNTRY RESULTING IN A LOSS OF PRODUCTIVITY AND PHYSICAL DISAPPEARANCE OF SOILS, LOSS OF VALUABLE WOODLANDS, FLOODS AND RESULTANT DAMAGES, DESERTIFICATION, AND LOWERING OF THE QUALITY AND QUANTITY OF WATER RESOURCES.

THE FOLLOWING ARE GENERAL RECOMMENDATIONS DERIVED FROM THE OVERVIEW OF THE PRESENT STATE OF WATERSHED MANAGEMENT IN HONDURAS. AGAIN, IT IS EMPHASIZED THAT WATERSHED MANAGEMENT IS AN INTEGRAL PART OF GOOD FOREST MANAGEMENT, BUT THESE ASPECTS ARE COVERED IN THE FORESTRY CHAPTER OF THIS REPORT. THE FOLLOWING RECOMMENDATIONS ARE DIRECTED AT THE MAJOR PROBLEMS OF WATERSHED MANAGEMENT: ACTIVITIES OF THE SMALL FARMER (CAMPESENO) - THOSE OF DEFORESTATION AND INAPPROPRIATE MIGRATORY AGRICULTURE PRACTICES, AND THE WEAKNESSES OF THE GOH TO DEAL WITH THEM. SOME OF THE RECOMMENDATIONS ARE GENERAL IN NATURE AND APPLY TO THE GOH AND THE WATERSHED MANAGEMENT PROBLEMS AT LARGE, WHILE THE OTHERS ARE DIRECTED SPECIFICALLY AT USAID AS A WAY TO IMPROVE DEVELOPMENT ASSISTANCE TO GOH.

- A LAND-USE POLICY BASED ON AN "ACROSS-THE-BOARD" ACCEPTABLE LAND CAPABILITY OR LAND POTENTIAL CLASSIFICATION MUST BE DEVELOPED AS A BASIS FOR LAND RESOURCE PLANNING, UTILIZATION, AND MAINTENANCE. THE CLASSIFICATION MUST BE RATIFIED BY LAW AS THE PLANNING AND PROJECT BASE TO BE USED BY RESOURCE AGENCIES -ESPECIALLY CONDEFOR, INA, AND THE MINISTRY OF NATURAL RESOURCES. THE USAID NATURAL RESOURCES MANAGEMENT PROJECT INCLUDES A PROGRAM OF STRENGTHENING THE LAND USE POLICIES AND DECISION-MAKING CAPACITY OF THE GOH CONCERNING RESOURCES MANAGEMENT. THIS PROGRAM IN THEORY IS ON THE RIGHT TRACK AND SHOULD BE PURSUED WITH INCREASING VIGOR.
- A REFOCUS OF PRIORITIES AND PROGRAMS IS NEEDED TO ATTACK THE ROOT OF WATERSHED MANAGEMENT PROBLEMS -THAT OF THE SMALL FARMER. PROGRAMS SHOULD BE DEVELOPED TO PRESENT ECONOMICALLY VIABLE ALTERNATIVES FOR THE CAMPESINO. TO DO THIS, A MARKET ORIENTATION APPROACH SHOULD BE DEVELOPED THAT WOULD PRESENT A DEMAND FOR A CERTAIN AGRICULTURAL PRODUCTS OR BY-PRODUCTS THAT COULD BE PRODUCED BY THE CAMPESINO. SUCH PRODUCTS COULD ONLY BE PRODUCED BY METHODS WHICH INCORPORATE APPROPRIATE LAND USES. (E.G. FRUIT TREES, BROOM GRASSES, CRAFTS, TREE CROPS SUCH AS MACADEMIA, COFFEE, AND CACAO, FUELWOOD, HERBS AND SPICES, ETC.) THESE ACTIVITIES WOULD BE GEARED TO (OR POSSIBLY AWAY FROM) HILLSIDE AGRICULTURE. PERNNIAL CROPS ARE SEEN AS THE BEST AVENUE OF DEVELOPMENT.
- AS EXPLAINED IN THE AGRICULTURE CHAPTER, THE FLATTER ALLUVIAL LANDS SHOULD BE MORE INTENSIVELY CULTIVATED, EMPLOYING BETTER TECHNIQUES AND MORE MANUAL LABORERS FROM THE SUBSISTENCE FARMER SECTOR.
- UNDER CURRENT LAWS AND REGULATIONS, CONDEFOR IS THE PRIMARY GOVERNMENT AGENCY CONCERNED WITH WATERSHED MANAGEMENT ON HILL LANDS. IF CONDEFOR INTENDS TO ADDRESS THE PROBLEM SUCCESSFULLY, ITS CAPABILITY TO DEAL WITH THE CAMPESINO MUST BE INCREASED. THIS MAY REQUIRE CERTAIN AMENDMENTS (REGLAMENTOS) TO EXISTING LAWS WHICH MORE CLEARLY POINT OUT OBJECTIVES AND METHODOLOGIES IN DELAING WITH THE PROBLEM. FOREST LAWS 85 AND 103 ARE OVERLY GENERAL AND AMBIGUOUS IN THEIR INTENT AND SHCULD BE AMENDED TO THIS POINT.
- CONDEFOR SHOULD COMBINE AND COORDINATE THE EFFORTS OF THE VARIOUS DIVISIONS UNDER ITS FOREST DEPARTMENT THAT DEAL WITH SOCIAL ACTION AND THE CAMPESINO. THE SOCIAL FORESTRY SYSTEM, WATERSHED MANAGEMENT SECTION, FUELWOOD PROJECT, BROADLEAF FORESTS PROJECT, AND THE SOCIAL ACTION PORTION OF THE FORESTS PROTECTION UNIT SHOULD BE COMBINED INTO ONE ENTITY TO TAKE ADVANTAGE OF A MULTIFACETED APPROACH TO SOCIAL ACTION. ALL OF THESE PROJECTS AND PROGRAMS DEAL WITH SOCIAL ACTION AT THE CAMPESINO LEVEL, YET ALL ARE WORKING ESSENTIALLY INDEPENDENT OF EACH OTHER AND "PREACHING" SOMEWHAT DIFFERENT "SERMONS". YET THEIR TARGET GROUP IS THE SAME. BY COMBINING THE OPERATIONS, SOCIAL ACTION AND COMMUNICATION STRATEGIES COULD BE STANDARDIZED, ALL ASPECTS CF FOREST MANAGEMENT AND PROTECTION COULD BE INCLUDED IN ONE PROMOTICN EFFORT, AND HUMAN RESOURCES COULD BE

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BEST ALLOCATED TO SOLVING THE PROBLEM. AS IT NOW STANDS NEITHER OF THE VARIOUS PROGRAMS MEETING WITH SUCCESS BECAUSE THEY ARE SCATTERED BOTH GEOGRAPHICALLY AND CONCEPTUALLY. USAID SHOULD EXAMINE THE POSSIBILITIES OF SUPPORTING SUCH A SOCIAL ACTION EFFORTS WITH A COMMUNICATION SPECIALIST AND INSTRUCTIONAL RESOURCES.

- A NATURAL RESOURCES MONITORING PROGRAM SHOULD BE DEVELOPED TO PERIODICALLY (6 MONTHS) ASSESS THE EXTENT AND DYNAMICS OF ENVIRONMENTAL DEGRADATION IN HONDURAS. USING REMOTE SENSING TOOLS (LANDSAT), LAND USE, FOREST COVER, WATER RESOURCES, AND EROSION LEVELS COULD BE MONITORED FOR QUALITATIVE OR QUANTITATIVE CHANGES. SUCH A PROGRAM WOULD PROVIDE A BASIS FOR THE GEOGRAPHIC PRIORITIZATION OF PROBLEM SOLVING (E.G. THE AREAS OF SERIOUS DEFORESTATION OR THE ADVANCE OF MIGRATORY AGRICULTURE COULD BE MONITORED AND RESOURCE AGENCIES COULD RESPOND IMMEDIATELY WITH SOCIAL ACTION ETC.) THIS PROGRAM WOULD PROVIDE NEEDED RESOURCE INFORMATION BEFORE THE RESOURCES IN AN AREA ARE SERIOUSLY DEGRADED. SUCH A PROGRAM SHOULD BE SET-UP IN THE NATIONAL GEOGRAPHIC INSTITUTE, THEREBY PROVIDING ACCESS TO ALL LAND-MANAGEMENT AGENCIES. LANDSAT DATA MAY BE OBTAINED FROM 1972 TO THE PRESENT TO DISCERN THE LOCATION AND CHARACTER OF THE MOST SERIOUS RESOURCES DEGRADATION. IT SHOULD BE POINTED OUT THAT THIS METHODOLOGY WOULD PROVIDE AN INEXPENSIVE, COMPREHENSIVE, AND CONTINUAL OVERVIEW OF WATERSHED CONDITIONS IN THE COUNTRY.
- THE MISUNDERSTANDING OF WATERSHED MANAGEMENT PROBLEMS AT THE MID AND DECISION-MAKING LEVELS IS AT LEAST PARTLY RESPONSIBLE FOR THE LUKEWARM RESPONSE TO CORRECTIVE PROGRAMS. USAID SHOULD BE MORE ACTIVE IN ORGANIZING SHORT COURSES AND SEMINARS TARGETED AT THE PERSONNEL OF LAND MANAGEMENT AGENCIES AT THESE LEVELS TO RAISE THEIR CONSCIOUSNESS OF THESE PROBLEMS AND POSSIBLE WAYS TO DEAL WITH THEM. SUCH AN APPROACH COULD STIMULATE DISCUSS AND COLLABORATION AMONG THOSE INVOLVED.
- CURRENT EDUCATIONAL AND TRAINING ACTIVITIES IN EXISTING INSTITUTIONS ARE INADEQUATE TO ADDRESS WATERSHED MANAGEMENT PROBLEMS. GOH SHOULD PROMOTE ENVIRONMENTAL EDUCATION BEGINNING AT THE COLEGIO (HIGH SCHOOL) LEVEL AND OFFER INTENSIFIED AND SPECIALIZED EDUCATIONAL ACTIVITIES AT HIGHER LEVELS. THE NATIONAL FORESTRY SCIENCES SCHOOL (ESNACIFOR) IN SIGUAPEQUE HAS BEEN SEEKING FUNDING FOR A WATERSHED MANAGEMENT PROGRAM THAT THEY HAVE DEVELOPED SINCE 1979. USAID SHOULD EXAMINE THE POSSIBILITIES OF BOTH MONETARY AND PERSONNEL SUPPORT. THE UNIVERSITY CENTER OF THE ATLANTIC LITTORAL REGION (CURLA) OFFERS PROGRAMS IN FORESTRY AND AGRONOMY, BUT IS WEAK IN BOTH AREAS. USAID SHOULD REEVALUATE ITS SUPPORT OF CURLA AND CONSIDER PROMOTING A REORIENTATION OF ITS PROGRAMMING TO EMPHASIZE WATERSHED MANAGEMENT AND SMALL FARMER AGRICULTURE. THE PINE FORESTRY PROGRAM IS ILLOGICAL IN THE CONTEXT THAT THE CENTER IS LOCATED IN A BROADLEAF FOREST AREA. IT WOULD MAKE MUCH BETTER SENSE TO PROMOTE A PROGRAM OF WATERSHED MANAGEMENT IN THE BROADLEAF FORESTS

INCORPORATING ASPECTS OF FLOOD CONTROL, SOIL CONSERVATION, CONTROL OF SHIFTING AGRICULTURE, REFORESTATION WITH FUELWOOD SPECIES, ETC. USING THE WATERSHEDS OF THE RIO AGUAN AND THE ATLANTIC LITTORAL AS STUDY AREAS.

-- USAID SHOULD SCALE DOWN ITS SCHOLARSHIP PROGRAM (50 SCHOLARSHIPS FOR 1982) AT CURLA SO AS NOT TO "DRAIN" ALL AVAILABLE HUMAN RESOURCES AT THE SAME TIME. IT IS BEST THAT MOST SCHOLARSHIP CANDIDATES HAVE VARIOUS YEARS OF EXPERIENCE WORKING IN HONDURAS BEFORE THEY SEEK FURTHER EDUCATION OUTSIDE OF THE COUNTRY. THIS WAY THEY WOULD BE BETTER ORIENTED TO CONCENTRATE ON AN EDUCATION THAT WOULD BEST APPLY TO PROBLEMS IN THEIR OWN COUNTRIES.

-- GOH SHOULD LEGALLY DECLARE AND ACTIVELY PROTECT A PROGRAM OF MULTI-PURPOSE FOREST RESERVES. THESE AREAS COINCIDE ESSENTIALLY WITH BROADLEAF FORESTS ABOVE 1,200 TO 1,400 METERS OF ELEVATION. THE PRIMARY PURPOSE OF THESE FOREST RESERVES WOULD BE FOR WATER PRODUCTION AND FLOOD CONTROL. SECONDARY REASONS WOULD BE FOR PROTECTION OF POTENTIAL (AND PRESENT) RECREATION AND WILDLIFE RESOURCES, SPECIES DIVERSITY, AND CLIMATIC REGULATION (PREVENT ADVERSE CLIMATIC CHANGES). FIGURE 3 ILLUSTRATES THOSE AREAS DESERVING SUCH FOREST RESERVE STATUS. AREAS SHOULD BE STUDIED AND GIVEN PRESERVATION STATUS ON A PRIORITY BASIS, I.E., SELECT AREAS IMPORTANT TO MUNICIPAL AND/OR RURAL CENTER SUPPLIES, IRRIGATION, AND FLOOD CONTROL; THEN SELECT AREAS OF FUTURE OR SECONDARY PRIORITIES. THE STATUS OF THESE RESERVES WOULD BE THAT OF A "HANDS-OFF" OR "EXTENSIVE USE ONLY" POLICY, CLOSELY REGULATED BY COHDEFOR IN COLLABORATION WITH SANAA, THE VARIOUS MUNICIPALITIES AND VILLAGES, AND THE MINISTRY OF NATURAL RESOURCES. MANY OF THESE AREAS COINCIDE AND WOULD COMPLEMENT THOSE AREAS SUGGESTED FOR "WILDLANDS" DESIGNATION IN THE WILDLANDS CHAPTER OF THIS REPORT. SEVERAL OF THE AREAS PROPOSED HERE ARE ALREADY DECLARED AS LEGAL FOREST RESERVES UNDER FOREST LAW 85 (SEE THE "WATERSHED PROBLEMS" DISCUSSION UNDER "LAND-USE POLICY" OF THIS SAME SECTION). USAID COULD TAKE A SUPPORTIVE ROLE IN THE CLASSIFICATION AND DESIGNATION OF THESE RESERVES BY PROVIDING PERSONNEL FOR TECHNICAL ASSISTANCE.

-- USAID'S EFFORTS AT NATURAL RESOURCE DATA COLLECTION WITH ITS SUPPORT OF THE NATIONAL CADASTER PROGRAM (PCN) IS VIEWED HERE AS A VERY IMPORTANT FACTOR IN INCREASING BADLY NEEDED DATA FOR WATERSHED MANAGEMENT PLANNING. THE PROGRAM SHOULD BE CONTINUED WITH FULL SUPPORT FROM USAID, AND PARTICIPANTS COMMENDED FOR THE EXCELLENT JOB DONE SO FAR. ALTHOUGH RECENT POLITICAL PROBLEMS HAVE HALTED FIELD STUDY, IT IS HOPED THAT THESE CAN BE OVERCOME AND WORK RESUMED AT THE LEVEL OF WORKMANSHIP THAT HAS BEEN SHOWN TO DATE.

-- USAID IN COLLABORATION WITH THE MINISTRY OF NATURAL RESOURCES SHOULD RETHINK THE OBJECTIVES OF THE CHOLUTECA RIVER WATERSHED MANAGEMENT PROJECT. THE GOALS OF SOIL CONSERVATION, REFORESTATION, AND PASTURE IMPROVEMENT ARE OVERAMBITIOUS CONSIDERING THE CAPACITY OF THE GOH'S

LAND MANAGEMENT INSTITUTIONS AND THE ATTITUDES OF THE TARGET SECTOR (SMALL FARMER). MORE IMPACT COULD BE ACHIEVED WITH SMALLER-SCALE MODEL PROJECTS AT THE FARMER LEVEL, AND THEN DISSEMINATING THE INFORMATION AND TECHNIQUES TO OTHERS ON THE BASIS OF LOCAL CAMPESINOS INITIATIVES.

- THE FOCUS OF THE NATURAL RESOURCE MANAGEMENT PROJECT ON USING THE COMMISSION FOR AGRICULTURAL PLANNING IS HERE VIEWED AS THE BEST CURRENTLY AVAILABLE MECHANISM FOR COORDINATING THE WATERSHED MANAGEMENT PRIORITIES AND ACTIVITIES OF THE VARIOUS LAND MANAGEMENT ORGANIZATIONS. USAID SHOULD VIGOROUSLY SUPPORT THIS PROGRAM ALONG THE LINES DEFINED IN THE PROJECT PAPER.

- FULLY INTEGRATED, MULTIPLE-USE PROJECTS ARE STILL VIEWED AS THE ONLY VIABLE MEANS FOR ALLEVIATING THE SOCIOECONOMIC PROBLEMS IMPEDING THE RATIONAL USE OF NATURAL RESOURCES IN HONDURAS. SUCH PROGRAMS SHOULD BE DEVELOPED USING WATERSHEDS AS THE NATURAL PROJECT BOUNDARIES. THEY SHOULD INCLUDE FULL PARTICIPATION OF THE TARGET POPULATION SECTOR (I.E., SMALL FARMER) AS WELL AS THE IMPLEMENTING ORGANIZATIONS IN BOTH THE PLANNING AND IMPLEMENTATION PHASES. SUCH PROGRAMS SHOULD INCLUDE, AMONG OTHERS, THE FOLLOWING ELEMENTS:
 - (1) LAND USE CLASSIFICATION
 - (2) ECONOMICALLY ATTRACTIVE ALTERNATIVES TO PRESENT ACTIVITY
 - (3) MARKET AND POTENTIAL COMMODITY STUDIES
 - (4) ENVIRONMENTAL EDUCATION
 - (5) AGRICULTURAL EXTENSION
 - (6) ENERGY POLICIES AND MANAGEMENT WITH EMPHASIS ON RENEWABLE FORMS SUCH AS FUELWOOD PLANTATIONS
 - (7) RELATED INFRASTRUCTURE IMPROVEMENTS
 - (8) HEALTH AND NUTRITION
 - (9) FORUMS FOR FEEDBACK FROM TARGET POPULATION
 - (10) ACCURATE MONITORING OF SOCIO-ECONOMIC AS WELL AS ENVIRONMENTAL FEEDBACK
 - (11) APPROPRIATE TECHNOLOGY ON ALL LEVELS
 - (12) VILLAGE LEVEL SEMI-AUTONOMY OF PROJECT ACTIVITIES.

- USAID SHOULD PROVIDE MORE TECHNICAL STAFFING RELATED TO PROJECT MONITORING, TAKING A MORE ACTIVE ROLE IN THE DIRECTION OF A PROJECT TO INSURE THAT STATED OBJECTIVES ARE AT LEAST marginally MET. ADMITTEDLY, EACH PROJECT IS EXPERIMENTAL IN NATURE, BUT MORE TIME AND MONEY WOULD BE SAVED AND MORE PROGRESS MADE IF MORE SCRUTIN WERE GIVEN TO THE IMPLEMENTATION STAGE OF PROJECTS. THIS WOULD ALSO PROVIDE FEEDBACK FOR MORE ACCURATE PROGRAMMING IN THE FUTURE. USAID SHOULD ALSO INCLUDE ENVIRONMENTAL IMPACT CRITERIA (I.E., MITIGATING MEASURES) AS PART OF A LOAN OR GRANT AGREEMENT. THIS WOULD PROVIDE IMPETUS FOR RATIONAL USE OF WATERSHED RESOURCES AND AVOID POSSIBLE IRREVERSIBLE DAMAGES (I.E., ENVIRONMENTALLY SOUND ROAD CONSTRUCTION).

FINALLY, USAID SHOULD TAKE A MORE ACTIVE ROLE IN PROMOTING INTERCHANGE AND FEEDBACK WITH THE OTHER BILATERAL AND MULTILATERAL ASSISTANCE ORGANIZATIONS. WITH OVER 600 MILLION DOLLARS IN ASSISTANCE FUNDS BEING POURED INTO THE COUNTRY ANNUALLY, PROGRAMS OF THE VARIOUS ASSISTANCE ORGANIZATIONS ARE IN COMPETITION TO OVERCOME UNDERDEVELOPMENT IN HONDURAS. IT WOULD BE VALUABLE TO SET UP SEMI-ANNUAL OR QUARTERLY "SUMMIT CONFERENCES" BY SECTOR INCLUDING ALL RELATED ASSISTANCE ORGANIZATIONS (USAID, EEC, ODA, FAO, UN, SAVE THE CHILDREN, OAS, CARE, WORLD BANK, INTERAMERICAN DEVELOPMENT BANK, THE VARIOUS FOREIGN GOVERNMENTS' ASSISTANCE ORGANIZATIONS, ETC.), AND THE GOH REPRESENTATIVES. THIS CONFERENCE COULD PROVIDE THE NECESSARY FEEDBACK THAT WOULD FACILITATE THE BETTER IDENTIFICATION OF UNDERDEVELOPMENT PROBLEMS, INCLUDING WATERSHED MANAGEMENT, AND COULD PROVIDE A FORUM FOR THE DEVELOPMENT OF COMPLEMENTARY STRATEGY FOR SOLVING THESE PROBLEMS WHEREIN EACH ORGANIZATION'S ACTIVITIES WOULD COMPLEMENT THE OTHERS, BOTH IN SCOPE AND OBJECTIVES.

4.0 REFERENCES

1. BETANCOURT, J. A., AND P. DULIN. 1978. PLAN DE USO MULTIPLE DEL LAGO DE YOJOA (SEGUNDA FASE). PROYECTO INTERINSTITUCIONAL. COMDEFOR. TEGUCIGALPA, HONDURAS.
2. CLIFF, E. P. 1980. ASSESSMENT OF FOREST RESOURCE DEVELOPMENT IN HONDURAS. USAID. TEGUCIGALPA, HONDURAS.
3. DULIN, PAUL. 1979. NATURAL RESOURCES CONSERVATION AND WATERSHED MANAGEMENT IN ROATAN - BAY ISLANDS, HONDURAS. COMDEFOR. TEGUCIGALPA, HONDURAS.
4. FAO. 1979. ANUARIO DE PRODUCCIONES FORESTALES. ROME.
5. FAO. 1978. PROYECTO DE DEFENSA CONTRA INUNDACIONES Y RIEGO EN EL SUR DE HONDURAS. INFORME FINAL. VOLS. 1 AND 2. PROYECTO TCD/HON/03/1. TEGUCIGALPA, HONDURAS.
6. KRAMER, J. M. AND J. ARCALEO. 1980. MANAGEMENT OF THE CHOLUTECA RIVER WATERSHED. SUPPLEMENT TO THE NATURAL RESOURCES MANAGEMENT PROJECT PAPER (PROJECT NO. 522-0168). USAID. TEGUCIGALPA, HONDURAS.
7. MICHAELSEN, T. 1981. ORDENACION DE CUENCAS HIDROGRAFICAS Y CONTROL DE LA EROSION. INFORME AL GOBIERNO DE HONDURAS. PNUD-FAO. ROME.
8. PROGRAMA DE CATASTRO NACIONAL. 1979. MANUAL DE USO TRIENIAL DE LA TIERRA. CONVENIO USAID/CONSUPLANE NO. 522-T-024. TEGUCIGALPA, HONDURAS.
9. ROPER, JOHN. 1980. DEPARTAMENTO DE BOSQUES, PROYECTO DE BOSQUES LAIIFOLIADOS. COMDEFOR (UNPUBLISHED), TEGUCIGALPA, HONDURAS.
10. SECOPT. 1979. INFORME DEL PLAN MAESTRO PARA EL DESARROLLO INTEGRAL Y CONTROL DE INUNDACIONES EN EL VALLE DE SULA. INFORME PRINCIPAL. HARZA-CINSA. SAN PEDRO SULA, HONDURAS.
11. SECRETARIA DE RECURSOS NATURALES. 1979. ESTIMACIONES ECONOMICAS ANUALES RELACIONADAS CON LA EROSION DE LOS TERRENOS INCLINADOS DE LA REGION DEL LITORAL ATLANTICO Y LA CEIBA Y CON LAS INUNDACIONES PROVOCADAS POR EL EXCESO DE LLUVIAS DE NOVIEMBRE DE 1974. TEGUCIGALPA, HONDURAS.
12. UNITED NATIONS DEVELOPMENT PROGRAM. 1978. DESARROLLO INTEGRAL DE LA REGION DEL VALLE DEL AGUAN. PROJECT NO. HON/77/005/A/01/DI. PROJECT PAPER. TEGUCIGALPA, HONDURAS.
13. USAID. 1975. NATIONAL CADASTER PROGRAM. PROJECT PAPER (PROJECT NO. 522-T-024). WASHINGTON, D.C.
14. USAID. 1980. ASSESSMENT OF FOREST RESOURCE DEVELOPMENT IN HONDURAS. USAID. TEGUCIGALPA, HONDURAS.

15. USAID. 1979. REGIONAL OFFICE FOR CENTRAL AMERICAN PROGRAMS.
FUELWOOD AND ALTERNATIVE ENERGY SOURCES PROJECT. WASHINGTON, D.C.
16. WOUTERS, RIK. 1980.
RESULTS OF AN EROSION RESEARCH PROJECT IN THE WATERSHED "LOS LAURELES".
CONDEFOR. TEGUCIGALPA, HONDURAS.

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TABLE NO. 3

ORGANIZATIONAL CHART
 EMPRESA NACIONAL DE ENERGIA ELECTRICA

JUNTA
 DIRECTIVA

GERENTE
 GENERAL

GRUPO CONSULTOR
 (MOTOR COLUMBUS)

DIRECTOR

DIRECTOR

PROYECTO EL CAJON
 (ENEE)

PROYECTO EL CAJON
 (MOTOR-COLUMBUS)

SUB GERENCIA
 GERENCIA
 ADMINISTRACION
 Y

SUB GERENCIA
 OPERACIONES

SUB
 COORDINADOR
 INGENIERIA
 GRUPO TRABAJO

CONSTRUCCION

INTERINSTITUCIONAL

PROYECTOS

DIVISION
 C I M C D
 ELECTRO-
 O N O A I
 MECANICA

DIVISION
 S I M
 INGENIERIA
 H O

DIVISION
 CONSTRUCCION

ESPECIALES

CIVIL

H A H T G C A E

D A E O H
 E S R P
 F T E
 O R N
 R O A
 R
 E

PROYECTO

LAGO YOJOA

PTA. LINDA

PROYECTO

EL NISPERO

JRB

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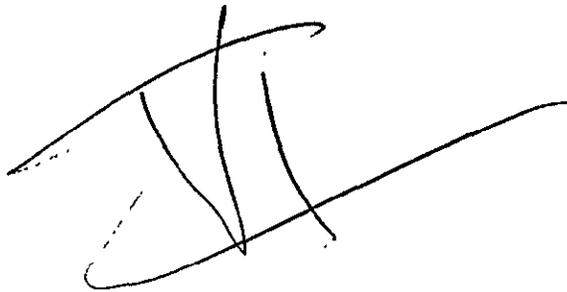
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HONDURAS
ENVIRONMENTAL PROFILE

CHAPTER VI
THE UTILIZATION AND MANAGEMENT OF
COASTAL ZONE AND NEARSHORE MARINE RESOURCES

RANDOM DUBOIS

WASHINGTON, D.C. 20009

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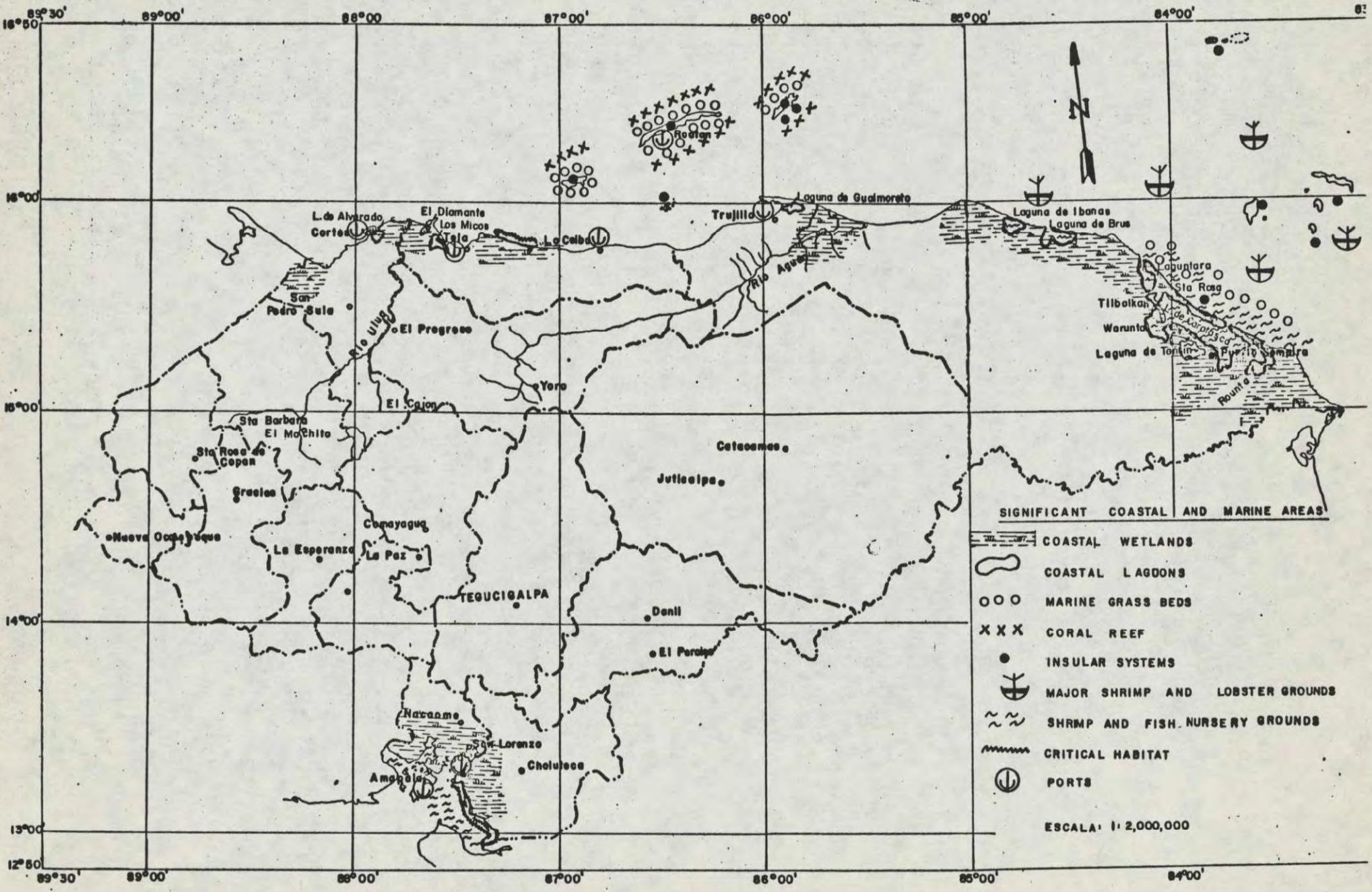
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SIGNIFICANT COASTAL AND MARINE AREAS

-  COASTAL WETLANDS
-  COASTAL LAGOONS
-  MARINE GRASS BEDS
-  CORAL REEF
-  INSULAR SYSTEMS
-  MAJOR SHRIMP AND LOBSTER GROUNDS
-  SHRIMP AND FISH NURSERY GROUNDS
-  CRITICAL HABITAT
-  PORTS

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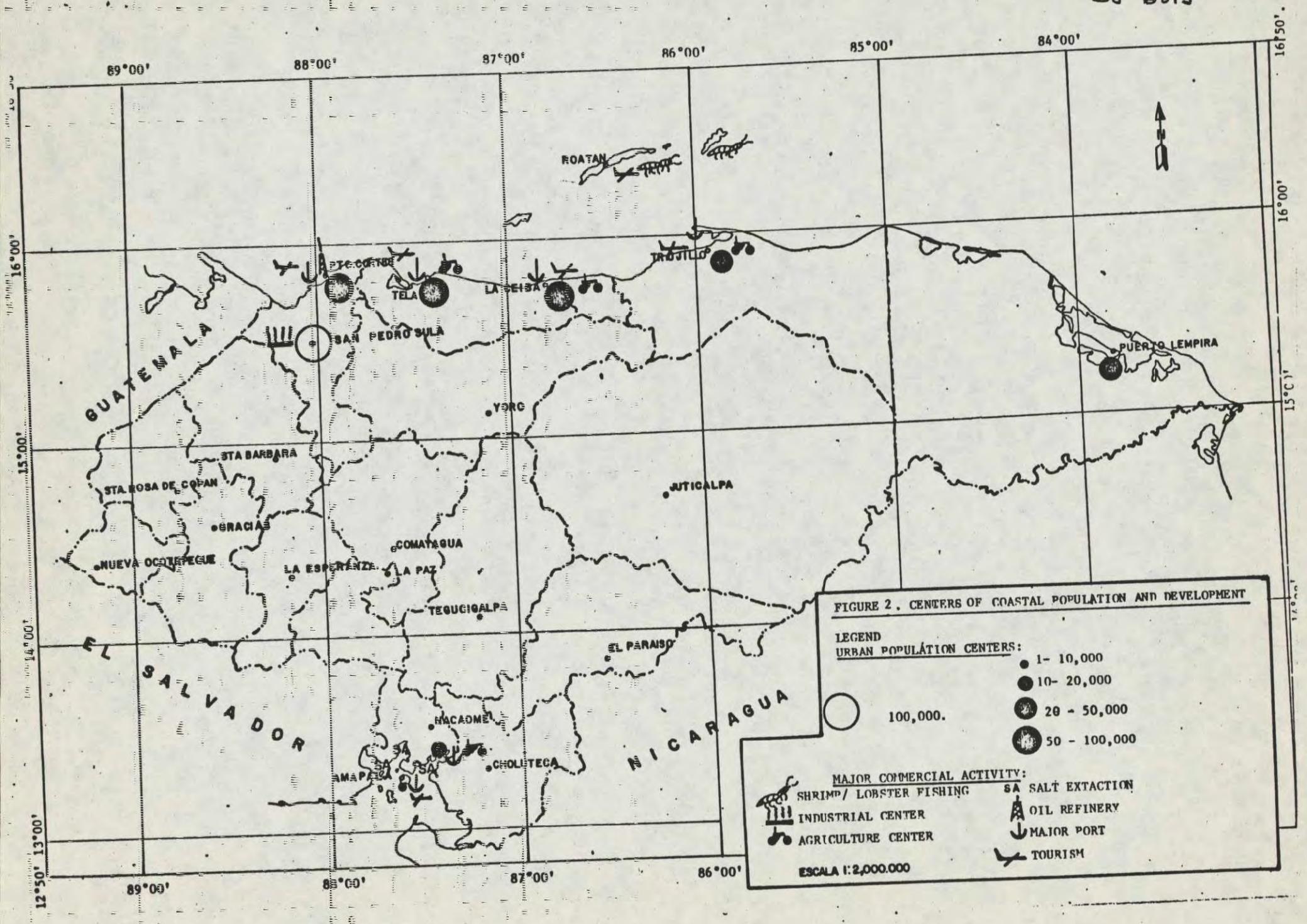


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FIGURE 2 CENTERS OF COASTAL POPULATION ON DEVELOPMENT

1.0 THE COASTAL ENVIRONMENT

1.1. PHYSICAL BASE AND CLIMATIC PATTERNS

1.1.1. THE CARIBBEAN COAST

HONDURAS A MOUNTANIOUS COUNTRY WITH AN ESTIMATED AREA OF 120,000 KM² BENEFITS FROM WIDE COASTAL PLAINS ON BOTH THE PACIFIC AND CARIBBEAN COASTS. THE CARIBBEAN COASTAL PLAIN WITH AN AVERAGE ESTIMATED WIDTH OF 125 KM AND TOTAL COASTLINE LENGTH OF 680 KM IS CHARACTERIZED BY ALLUVIAL DEPOSITS INTERSPERSED WITH LONG STRECHES OF SAND BEACHES. COASTAL HEADLANDS OCCUR IN A ZONE FROM LA CEIBA TO TRUJILLO AND IN AN AREA BETWEEN THE SICO AND PAULAYA RIVERS. MAJOR RIVER SYSTEMS THAT DRAIN APPROXIMATELY 83% OF THE COUNTRY INCLUDE THE CHAMELECON, ULUA, AGUAN, SICO, PAULAYA, PATUCA AND COCO (CABALLERO 1976). IN ADDITION TO THESE FEATURES NUMEROUS COASTAL FRESH AND BRACKISH WATER LAGOONS ARE CHARACTERISTIC OF THE NORTHERN COAST. THESE INCLUDE LAGUNA ALVARADO, MICOS, GUAYMORETO, IBANS, BRUS ARAPTA, TATA, CARATASCA, TIBALACA AND TANSIN. OFFSHORE THE CONTINENTAL SHELF EXTENDS AN AVERAGE WIDTH OF 19-28 KILOMETERS FROM PUNTA SAL TO PUNTA PATUCA FROM WHERE IT OPENS OUT INTO A MUCH WIDER PLATFORM MEASURING APPROXIMATELY 240 KILOMETERS FROM SHELF'S EDGE TO CABO GRACIAS A DIOS, ITS WIDEST POINT. GIUDICELL (1979) ESTIMATED THAT THE TOTAL

CONTINENTAL SHELF AREA MEASURED L 9,000 KM². THE PLATFORM IS CHARACTERIZED BY MANY SUBMERGED BANKS AND CAYS MOST NOTABLE BETWEEN PUERTO CORTES AND TRUJILLO AND FROM PUNTA PATUCA EAST. THE MAJOR FEATURES INCLUDE THE LARGE SUBMERGED ROSALIND AND GORDA BANKS, THE CARATASCA AND ASSOCIATED CAYS, THE COCHINOS CAYS AND THE BAY AND CISNE ISLANDS.

THE BAY ISLANDS CONSIST OF EIGHT ISLANDS AND 65 CAYS WITH A TOTAL LAND

AREA OF 238 KM² (DAVIDSON 1979). THE THREE MAJOR ISLANDS ROATAN, GUANAJA AND UTILA WERE FOUND TO BE A PART OF A DISCONTINUOUS SUBMERGED RIDGE SYSTEM (THE BONACCA RIDGE) EXTENDING FROM THE MAINLAND. THIS SYSTEM REPRESENTS THE UPTHURST SECTION FROM THE MEETING OF THE CARIBBEAN AND NORTH AMERICAN TECTONIC PLATES (MCBIRNEY AND BASS 1979). THE ISLANDS ARE "HIGH" ISLANDS WITH ONLY UTILA HAVING MORE THAN 4% OF LAND CLASSIFIED AS FLAT (DEFINED AS HAVING A SLOPE OF LESS THAN FIVE PER CENT, DAVIDSON 1979).

THE CLIMATIC REGIME IS DOMINATED BY THE LOCATION OF THE BERMUDA HIGH RESULTING IN PREVAILING EASTERLY AND SOUTHEASTERLY TRADE WINDS. THESE WINDS MAY SHIFT AS WINTER COLD FRONTS MOVE ACROSS THE COAST RESULTING IN NORTH AND WESTERLY WINDS ACCOMPANIED BY RAINFALL. THE WET SEASON EXTENDS APPROXIMATELY FROM MID-APRIL TO OCTOBER WITH AN AVERAGE ACCUMULATIVE RAINFALL OF 1800-2500 MM/YEAR (HONDURAS 1971). THOUGH THE SOUTHWEST CARIBBEAN SEA IS NOT KNOWN FOR A HIGH INCIDENCE OF HURRICANES IN THE LAST CENTURY THE NORTH COAST AND BAY ISLANDS HAVE BEEN HIT BY 13 HURRICANES AND 8 TROPICAL STORMS (DAVIDSON 1979). THE MOST RECENT HURRICANE FIFI, RESULTED IN 8-10,000 TOTAL DEATHS AND AN ESTIMATED LOSS OF PROPERTY OF 75 MILLION DOLLARS (NATURAL DISASTERS 1980).

THE CURRENT REGIME IS DOMINATED BY AN OFFSHORE WESTERLY OCEANIC CURRENT AVERAGING .8 CM/SEC (DATA ATLAS DRAFT). A NEARSHORE COUNTER CURRENT HAS

BEEN DETECTED THAT MAY BE PART OF A SEASONAL ANTI-CYCLONIC RING IN THE GULF OF HONDURAS. TIDES ARE SEMIDIURNAL WITH A SPRING RANGE OF .45 METERS.

1.1.2. THE PACIFIC COAST

ON THE PACIFIC COAST, HONDURAS SHARES THE GULF OF FONSECA WITH THE NEIGHBORING COUNTRIES EL SALVADOR AND NICARAGUA DESPITE THIS SHARED SOVEREIGNTY THE PHYSICAL GEOGRAPHY IS SUCH THAT THE RECOGNIZED TERRITORIAL WATERS OF EL SALVADOR AND NICARAGUA PRECLUDE ANY HONDURAN CLAIM TO WATERS OUTSIDE OF THE INNER PART OF THE GULF. THUS, ACCORDING TO STANDARD OF INTERNATIONAL LAW, HONDURAS' RIGHTS TO EXTERNAL WATERS ARE RESTRICTED TO FREEDOM OF TRANSIT.

THE GULF CAN BEST BE DESCRIBED AS A LARGE SHALLOW DEPRESSION BORDERED BY A BROAD COASTAL PLAIN AVERAGING 40KM IN WIDTH WITH A COASTAL ZONE EXTENDING 162 KM IN LENGTH (CABALLERO, 1976). THE COASTAL PLAIN IS DOMINATED BY MANGROVES AND ASSOCIATED WETLANDS FED BY FIVE MAJOR RIVER SYSTEMS DRAINING APPROXIMATELY 13% OF THE COUNTRY. THEY ARE THE COASCORAN, NACAOME, CHOLUTECA, SAMPILA AND NEGRO. AN ESTIMATED 50,000 HA IS CLASSIFIED AS MANGROVES AND WETLANDS IN THE GULF OF FONSECA (ECONOMIST INTELLIGENCE UNIT, 1977).

THE HONDURAN PORTION OF THE GULF BASIN IS CHARACTERIZED BY A SHALLOW FINE SILT AND SAND BOTTOM WITH MANY SHOALS. THE FINE SEDIMENTS CHARACTERISTIC OF THE UPPER ESTUARY GRADE INTO A FINE TO MEDIUM SAND IN THE OUTER GULF (NEDECO, 1970).

AS IN THE NORTH COAST TROPICAL CLIMATE IS CHARACTERISTIC WITH A RANGE IN TEMPERATURE FROM 28-31C. THE WET SEASON OCCURS DURING THE PERIOD MAY-OCTOBER WITH PEAK PERIODS IN JUNE AND SEPTEMBER. ANNUAL RAINFALL IS ONLY NOMINALLY LESS THAN THAT ENCOUNTERED ON THE CARIBBEAN COAST AVERAGING 1500-2000 MM/YEAR.

VERY LITTLE IS KNOWN CONCERNING THE GULF CURRENT REGIME. STUDIES BY NEDECO (1970) INDICATED THAT IN THE EASTERN PART OF THE GULF A SURFACE CURRENT VELOCITY OF 1 METER/SEC. WAS TYPICAL DURING A SPRING TIDE WITH THE POTENTIAL OF 1.5 METERS/SEC. ESTIMATED FOR EBB TIDES (ALLOWING HEAVY RAINS). TIDAL CURRENTS ARE PROBABLY VERY STRONG RESULTING IN SHIFTING BOTTOM AS THE PACIFIC TIDE IS DIURNAL WITH AN AVERAGE RANGE OF THREE METERS.

1.2. SIGNIFICANT COASTAL AND MARINE ECOSYSTEMS

HONDURAS BENEFITS FROM THE DIVERSE RANGE OF PRODUCTIVE TROPICAL MARINE ECOSYSTEMS DESCRIBED BELOW (FIG. 3).

1.2.1. COASTAL WETLANDS AND MANGROVES.

THESE ARE FOUND IN ABUNDANCE ON BOTH COASTS AND OCCUPY AN ESTIMATED 3,000 KM² (FAO, 1965). WETLANDS REPRESENT ONE OF THE MOST PRODUCTIVE OF COASTAL ECOSYSTEMS IN TERMS OF SOURCES OF NUTRIENTS, PRIMARY PRODUCTIVITY, NURSERY AREAS FOR MANY SPECIES INCLUDING COMMERCIALY VALUABLE SPECIES OF FIN AND SHELL FISH, PROVISION OF HABITAT FOR A DIVERSE RANGE OF FLORA AND

FAUNA, AND SERVE TO TRAP SEDIMENTS AND NUTRIENTS TRAPS FROM UPLAND AREAS. ON THE CARIBBEAN COAST THE DOMINANT MANGROVE SPECIES ARE RHIZOPHORA MANGLE AND LAGUNECCLARIA SACEMOSA. BEHIND THE MANGROVE SWAMPS THE AREA IS DOMINATED BY SPECIES OF PALM ERYTHRINA CRISTAGALL AND PACHIRA AQUATICA (RIO PLATANO DBAEI). ON THE PACIFIC COAST DOMINANT MANGROVE SPECIES ARE R. MANGLE, R. SAMOENSIS, LONDIAREPLUS ERECTA, L. SACEMOSA, AVICENNIA BICOLOR, AND A. GEBINANS (NEDECO 1970). MAJOR WETLANDS INCLUDE AREAS ADJACENT TO THE BAY OF OMOA, RIVER ULUA, A ZONE FROM TELA TO LA CEIBA, RIO AGUAN AND THE EASTERN LAGOONS ON THE CARIBBEAN COAST AND ALL OF THE PACIFIC COAST.

1.2.2. COASTAL LAGOONS.

THESE FRESH AND BRACKISH WATER AREAS CHARACTERISTIC OF THE NORTH COAST IN MANY WAYS SERVE THE SAME FUNCTIONS AS WETLANDS. ² THOUGH AN INVENTORY OF THESE AREAS DOES NOT YET EXIST A CRUDE ESTIMATE OF SURFACE AREA IS 1382 KM (SEE GLICK). MANY LAGOON SYSTEMS WITH NO PERMANENT OPENING TO THE SEA OBTAIN SEASONAL OPENINGS RESULTING FROM FLOODING IN THE WET SEASON. THESE OPENING ALLOW FOR THE ENRICHING OF COASTAL WATERS WITH NUTRIENTS AS WELL AS PROVIDE ENTRY TO COASTAL SPECIES FOR PURPOSES OF FEEDING AND REPRODUCTION. TURBID LAGOONS, SPECIFICALLY BETWEEN THE RIVERS SALADO AND CUERO REPRESENT EXCELLENT HABITAT FOR THE ENDANGERED WEST INDIAN MANATEE TRICHECHUS MANATUS (FIG 1) (RATHBUN AND POWELL 1979). THESE AND OTHER LAGOONS REPRESENT CRITICAL HABITAT FOR SEVERAL SPECIES OF MIGRATORY BIRDS, BROWN CAYMAN AND FISH SUCH AS CUYAMEL JOIUBUS RICHARDI, GUAPOTE CICHLASOMA MOTAGUENSE, SARDINE ASTYANAX SP., DORMILON AMADUS AND FRESHWATER SHRIMP MACROBRACHIUM (RIO PLATANO DENNIS). FROM A COMMERCIAL PERSPECTIVE THESE LAGOONS REPRESENT CRITICAL NURSERY AREAS TO THE THREE SPECIES OF SHRIMP THAT COMPRISE A \$25 MILLION/YEAR FISHERY IN HONDURAS (SEE BELOW). PREDOMINANT VEGETATION INCLUDES CARIBBEAN MANGROVE SPECIES AND THE WATER HYACINTH EICHHORNIA CRASSIPES

1.2.3. MARINE GRASS BEDS.

THESE SUBMERGED GRASS FLATS ARE CHARACTERISTIC OF SHALLOW CLEAR CALM WATER MARINE AREAS SUCH AS FOUND IN PROTECTED COVES, LAGOONS AND BEHIND THE MORE EXPOSED OUTER REEFS. GRASS BEDS REPRESENT THE GREATEST SOURCE OF NUTRIENTS AND PRIMARY PRODUCTION OF TROPICAL SHALLOW WATER MARINE ECOSYSTEMS. CHARACTERIZED BY MARINE GRASSES SUCH AS ZOSTERA THIS SYSTEM AS ARE THE OTHERS PREVIOUSLY MENTIONED PROVIDE HABITAT FOR A VARIED FLORA AND FAUNA. GRASS BEDS PROVIDE NURSERY AND FEEDING GROUNDS FOR MANY REEF FISH AS WELL AS PRIMARY HABITAT FOR THE COMMERCIALY VALUABLE QUEEN CONCH STROMBOS GIGAS. THESE AREAS ARE PREVALENT ON THE CARIBBEAN COAST OF HONDURAS MOST NOTABLY INSIDE THE BARRIER REEF OF THE BAY ISLANDS. ON THE NORTH COAST, A PATCHY DISTRIBUTION OCCURS WITH MORE EXTENSIVE DEVELOPMENT ON THE EASTERN PORTION OF THE HONDURAN PLATFORM (IVAN DRAFT).

1.2.4. CORAL REEFS.

THOUGH SOME QUESTIONS REMAIN WHETHER CORAL REEFS REPRESENT NET ON NEUTRAL PRODUCTION SYSTEMS, THERE IS LITTLE DOUBT THAT THEY REPRESENT THE MOST DIVERSE OF TROPICAL MARINE ECOSYSTEMS. REEF DISTRIBUTION, TYPE AND

COMPONENT SPECIES DEPEND ON A HOST OF ENVIRONMENTAL FACTORS INCLUDING CLARITY OF WATER, TEMPERATURE AND SALINITY REGIMES, NATURE AND DEPTH OF SUBSTRATE AND DEGREE OF EXPOSURE TO HIGH WEATHER CONDITIONS. AMONG THE MANY SPECIES ASSOCIATED WITH REEF SEVERAL SPECIES OF FISH, THE SERRANIDS, LUTJANIDS, SCIAENIDS AND SPIN LOBSTER *PANULINUS ANGUS* ARE OF COMMERCIAL IMPORTANCE. REEF DISTRIBUTION ON THE NORTH COAST IS PATCHY OUTSIDE THE INFLUENCE OF RIVER SYSTEMS. THE BETTER DEVELOPED REEF SYSTEMS ARE OFFSHORE IN CLEAR WATER ADJACENT TO HONDURAS' NUMEROUS ISLANDS AND CAYS. THESE REEF REACH THEIR GREATEST DEVELOPMENT IN THE FRINGING BARRIER REEF OFF THE NORTHWESTERN COASTS OF THE BAY ISLANDS. RANGING IN DEPTH FROM 1-2 METERS FROM THE SURFACE TO 30+ METERS BEFORE GRADING INTO THE INSULAR SHELF EDGE, THE REEF REPRESENTS ONE OF THE FEW TRUE BARRIER REEFS IN THE CARIBBEAN.

1.2.5. INSULAR SYSTEMS.

THE ISLANDS AND CAYS PREVALENT OFF THE NORTH COAST OF HONDURAS REPRESENT UNIQUE AND FRAGILE ECOSYSTEMS COMBINING A TERRESTRIAL COMPONENT THAT OFTEN PROVIDES HABITAT FOR INDIGENOUS SPECIES WITH ONE OR MORE OF THE ECOSYSTEMS DESCRIBED PREVIOUSLY, THEY HAVE BEEN PROTECTED FROM PAST DEGRADATION BY THEIR ISOLATION. THIS ISOLATION IS RAPIDLY BEING BREACHED AS THESE AREAS ARE INCREASING EXPOSED TO HUMAN MIGRATION AND SETTLEMENT, AGRICULTURE, TOURISM AND COMMERCIAL DEVELOPMENT AND RECREATIONAL ACTIVITY.

1.3. COASTAL DEMOGRAPHICS AND DEVELOPMENT

LARGELY AS A RESULT OF PHYSICAL CONSTRAINTS HONDURAS IS AN ANOMALY AMONG OTHER CENTRAL AMERICAN COUNTRIES IN FOCUSING ITS MAJOR DEVELOPMENT EFFORTS TOWARD THE CARIBBEAN RATHER THAN THE PACIFIC COAST. GEO POLITICALLY THE NORTH COAST IS DIVIDED INTO 5 DEPARTMENTS. CORTES, ALTANTIDA, COLON, GRACIAS A DIOS AND THE BAY ISLANDS. THE COMBINED POPULATION OF THE DEPARTMENTS IS AN ESTIMATED 903,000. ON THE SOUTH COST THE TWO DEPARTMENTS VALLE AND CHOLUTECA POSSESS APPROXIMATELY 382,000 INHABITANTS. DEMOGRAPHIC DATA (ON THE INDIVIDUAL DEPARTMENTS AND THEIR RESPECTIVE MAJOR CITIES ARE FOUND IN TABLE 1.

SAN PEDRO SULA IS THE MAJOR INDUSTRIAL CITY IN THE COUNTRY PROVIDING ALL FORMS OF GOODS AND SERVICES (FIG. 2). PUERTO CORTES SERVES AS THE COUNTRY'S PRINCIPLE PORT AS WELL AS THE LOCATION OF THE ONLY FREE PORT AND REFINERY IN HONDURAS. TO THE EAST BETWEEN TELA AND TRUJILLO COASTAL DEVELOPMENTS HAVE AND CONTINUE TO SERVE THE INTEREST OF THE MAJOR BANANA AND LESSER IMPORTANT AFRICAN PLAM PLANTATIONS THAT DOMINATE THE REGION. ONLY LA CEIBA HAS BEGUN TO DIVERSIFY ITS ECONOMIC BASE. OTHER DEVELOPMENTS INCLUDE TOURISM IN TELA AND ROAD AND PORT DEVELOPMENT IN PUERTO CASTILLA. FURTHER EAST THE REMAINDER OF COLON AND GRACIAS A DIOS DEPARTMENTS ARE STILL RELATIVELY INACCESSIBLE, INHABITED MOSTLY BY THE INDIGENOUS MISKITOS, PAYA, SUMO AND SOME LADINOS. THE BAY ISLANDS PROVIDE A BASE FOR THE COMMERCIAL FISHING INDUSTRY OF THE COUNTRY AND TOURISM THUS FAR PLAYS ONLY A SECONDARY ROLE IN THE ECONOMIC SECTOR.

IN THE SOUTH THE MAJOR ECONOMIC EMPHASIS IS IN AGRICULTURE WITH RICE, SUGAR CANE AND COTTON THE DOMINANT CROPS IN THE COASTAL PLAIN. THE COUNTRY'S PRIMARY SOURCE OF SALT PRODUCTION OCCURS TO THE WEST OF SAN LORENZO.

INDIVIDUAL COASTAL DEVELOPMENT SECTORS ARE ELABORATED ON IN THE FOLLOWING SECTION. AGRICULTURE DEVELOPMENT ACTIVITIES ARE DESCRIBED IN CHAPTER II.

1)

TABLE 1 COAST DEMOGRAPHIC DATA FOR HONDURAS
1) FIGURES BASED ON CONSUPLANE PROJECTIONS FROM 1974 CENSUS

CARIBBEAN DEPARTMENTS AND RESPECTIVE MAJOR COASTAL CITIES

COCHILE	542,581
SAN PEDRO SULA	303,434
PUERTO CORTES	64,621
ATLANTIDA	214,080
TELA	67,736
LA CEIBA	81,771
COLON	114,052
TRUJILLO	30,157
PUERTO CASTILLA (NUEVA)	1,600
GRACIAS_A_DIOS	31,005
PUERTO LEMPIRA	21,863
ISLAS_DE_LA_BAHIA	12,325

PACIFIC DEPARTMENTS

VALLE	117,744
SAN LORENZO	18,976
AMAPALA	6,868
CHOLWIESA	264,278

2 SECTOR ANALYSES

2.1. MARINE FISHERIES

2.1.1. THE FISHERY.

THE DISTINCTION BETWEEN THE INDUSTRIAL AND ARTESANAL FISHERING SECTORS IS EASILY DISCERNED. THE INDUSTRIAL EFFORT LOCATED PRIMARILY IN THE CARIBBEAN IS FOCUSED ON THE LOBSTER AND SHRIMP RESOURCES ADJACENT TO THE CARIBBEAN COAST. THE RICHEST SHRIMP GROUNDS ARE LOCATED ON THE WIDE CONTINENTAL PLATFORM OFF THE NORTHEAST COAST IN WATERS OF 40 METERS OR LESS IN DEPTH. FIG. 1. THREE SHRIMP SPECIES ARE EXPLOITED COMMERCIALY, THE WHITE SHRIMP *PENAEUS SCHMIDTII*, THE SPOTTED PINK SHRIMP *P. BRASILIENSIS* AND THE BROWN SHRIMP *P. DUROBRANUM*. THESE THREE SPECIES LIVE AS ADULTS OFF THE OUTER CONTINENTAL SHELF. SPAWNING MAY BE YEAR AROUND WITH SEASONAL PEAKS ONCE EGGS HATCH THE POST LARVAE MIGRATE TO ESTUARIES WHERE THEY FEED AND PASS THE JUVENILE LIFE STAGES BEFORE RETURNING TO OFFSHORE GROUNDS FOR FEEDING AND SPAWNING PURPOSES. THE MAJOR JUVENILE SHRIMP GROUNDS APPEAR TO BE THE LAGUNA DE CARATASCA AND ITS SUBSEQUENT ADJACENT LAGOONS.

THE LOBSTER FISHERY EFFORT IS CONCENTRATED ON THE MANY OFFSHORE CAYS AND SUBMERGED BANKS ON THE NORTHEAST COAST. AREAS OF PRIMARY IMPORTANCE ARE ROSALIND AND GORDA BANKS AND VIVORILLO CAYS. IN ADDITION TO THESE AREAS ILLEGAL FISHING OF COLOMBIAN AND NICARAGUAN CLAIMED AREAS APPEARS COMMON NOTABLY QUITA SUENO AND SERRANA BANKS. THE FISHERY IS BASED ON THE SPINY LOBSTER *PANULIUS ARGUS* WITH ONLY MINOR EXPLOITATION OF *P. INELAIUS* AND *P. INTERBUPIUS* OCCURRING (NMFS 1976).

THE ARTESANAL FISHERY ON THE NORTH COAST IS CONCENTRATED ON THE NEARSHORE WATERS AND COASTAL LAGOONS. THE RESOURCE IS MAINLY FINFISH INCLUDING SERRANIDS, LUTIIDIS, SCIARNIDS AND MUGILIDS. IN ADDITION TO FINFISH, SHELLFISH SUCH AS *OCTOPUS OCTOPUS VULGARIS* SQUID *LOLIGO PEALE*, BLUE CRAB *CALINECIDS* SP. ARE OCCASIONALLY EXPLOITED.

THE EXPLOITATION OF CONCH *STROMBIS GIGAS* COMMERCIAL OR OTHERWISE HAS LARGELY CEASED AS POPULATIONS HAVE BEEN OVEREXPLOITED. DUE TO THE POLITICAL AND GEOPHYSIOGRAPHY OF THE GULF, THERE ARE NO MAJOR FISHERIES ON THE PACIFIC COAST. THE HONDURAN ESTUARIES HOWEVER, DO PROVIDE CRITICAL HABITAT FOR THE LARGE OFFSHORE SHRIMP POPULATIONS EXPLOITED BY NICARAGUA AND EL SALVADOR (*P. OCCIDENTALIS*, *P. VANNAMEI* AND *P. STYLIOSIRIS*). POPULATIONS OF SHRIMP AND LOBSTER DO NOT REACH COMMERCIAL SIZE IN HONDURAN WATERS. THE MAJOR RESOURCES EXPLOITED AT THE ARTESANAL LEVEL ARE A DIVERSE NUMBER OF FINFISH, TWO SPECIES OF ARCSHELLS, *ANADARA TUBERCULOSA* AND *A. SIMILIS* (HU, 1978) AND THE MANGROVE OYSTER *CRASSOSTREA MANGLE*. THE LATTER THREE SPECIES APPEAR TO BE UNDER INTENSE EXPLOITIVE PRESSURE. IN ADDITION, JUVENILE WHITE SHRIMP ARE CAUGHT USING CAST NETS.

2.1.2. THE FISHERMAN

THE INDUSTRIAL SECTOR IS DOMINATED BY SEVEN SHRIMP AND LOBSTER COMPANIES SIX OF WHICH ARE LOCATED ON THE TWO BAY ISLANDS OF GUANAJA AND ROATAN, THE SEVENTH IN PUERTO CASTILLO. EACH COMPANY HAS THEIR OWN PROCESSING PACKAGING AND FREEZING FACILITY CAPABLE OF HANDLING BOTH LOBSTER AND SHRIMP. AT PRESENT THERE IS A CLOSED FISHERY FOR BOTH SHRIMP AND LOBSTER WITH COMMERCIALY

LICENSED BOATS FIXED AT 217 DOWN FROM A PEAK OF 275 IN 1977 (NMFS 1981). SHRIMP BOATS ACCOUNT FOR APPROXIMATELY 2/3 OF THE FLEET. OF THE 217 BOATS APPROXIMATELY 35 ARE INDEPENDENT, SELLING THEIR CATCH TO THE HIGHEST BIDDER (HYDES, PERSONAL COMMUNICATION). WHEREAS THE SHRIMPERS USE SEINE NETS THE LOBSTER FISHERY IS SOMEWHAT EQUALLY DIVIDED BETWEEN DIVERS AND POTS. CATCH IS LANDED HEADS OFF AND SUBSEQUENT BY-CATCH IS THROWN BACK. THE INDUSTRY IS ESTIMATED TO EMPLOY 3100 BETWEEN THE PRIMARY AND SECONDARY SECTOR.

THE ONLY COMMERCIAL VENTURE ON THE PACIFIC COAST IS PENO MAR LOCATED IN AMAPALA. IT IS A PROCESSING AND PACKAGING PLANT THAT BUYS SHRIMP FROM FOREIGN BOATS PERMITTED TO FISH EXTERNAL WATERS.

INFORMATION ON THE ARTESANAL SECTOR IS UNCERTAIN. FAO (1980) ESTIMATED THAT THERE EXIST APPROXIMATELY 4,000 FISHERMEN OF WHICH 3,000 ARE FOUND ON THE CARIBBEAN COAST THE REMAINDER IN FONSECA. THE FLEET CONSISTS OF APPROXIMATELY 1,500 SMALL VESSELS MOSTLY DUGOUT CANOES OR CAYUCOS OF WHICH ONLY 1/4 ARE OUTFITTED WITH MOTORS. TYPICAL GEAR UTILIZED ARE CAST NETS, FISH HOOKS, GILL AND TRAMMEL NETS.

2.1.3. THE MARKET

THE INDUSTRIAL EXPLOITATION OF SHRIMP AND LOBSTER BEGAN IN THE EARLY 1960S TO SERVE THE US MARKET. THE INDUSTRY GREW AT AN ACCELERATING RATE UNTIL 1978 WHEN AFLEET SIZE OF 275 WAS REACHED. IN THE SAME YEAR APPROXIMATELY, 5,108 M TONS OF FISH AND SHELL FISH WERE CAUGHT (TABLE 3). IN 1978 FISHERY EXPORTS ACCOUNTED FOR \$24.8 MILLION DIVIDED ALMOST EQUALLY BETWEEN SHRIMP AND LOBSTER EXPORTS. THIS ACCOUNTED FOR 3.6% OF THE TOTAL COUNTRY'S EXPORTS AND 4.7% OF THE TOTAL AGRICULTURAL EXPORTS (PLAN OPERATIVO ANUAL 1980). THERE ARE INDICATIONS THAT THE LOBSTER RESOURCE HAS BEEN OVEREXPLOITED AS REPORTED LANDINGS HAVE DECLINED BY APPROXIMATELY 50% EACH YEAR SINCE 1978 WITH RELATIVELY EQUAL LEVEL OF EFFORT AS MEASURED BY LICENSED BOATS. THIS TREND IS CONTINUING INTO 1981 AS LANDINGS FOR THE FIRST SIX MONTHS WERE ONE HALF OF LAST YEARS' (HYDES, PERSONAL COMMUNICATION). SIMILARLY AFTER THE DISASTROUS YEAR FOR SHRIMP IN 1979 CONCERN HAS BEEN EXPRESSED FOR THE STATUS OF STOCKS. A MORATORIUM ON NEW ENTRIES INTO THE FLEET WAS SET IN 1979 AND THE SHRIMP SEASON CLOSED BETWEEN THE MONTHS OF MARCH TO JUNE 15. OTHER FACTORS EFFECTING THE INDUSTRY ARE INCREASED FUEL COSTS AND INTEREST RATES.

THE ARTESANAL MARKET SUPPLIES DOMESTIC DEMAND AND ONLY A FEW DISTRIBUTION SYSTEMS ARE REQUIRED TO SATISFY THE MORE DISTANT TEGUCIGALPA AND SAN PEDRO SULA MARKETS.

2.1.4. FISHERY POTENTIAL

BASED ON PREVIOUS FAO SPONSORED EXPLORATORY FISHING SURVEYS THERE ARE FOUR POTENTIAL RESOURCES CAPABLE OF SUSTAINING COMMERCIAL EXPLOITATION: SHARKS, A RED SNAPPER AND GROUPER COMPLEX ASSOCIATED WITH THE CONTINENTAL SHELF EDGE, A PELAGIC RESOURCE INCLUDING TUNA, BARRACUDA, AND WAHOO, AND DEEP WATER CRUSTACEAN RESOURCE (WFCF 1975, GIUDICELL, 1979). TO DETERMINE IF THESE RESOURCES IN FACT CAN SUSTAIN COMMERCIAL FISHING EFFORTS THE CORPORACION NACIONAL DE INVERSIONES IS PROPOSING TO BID AN EXPLORATORY FISHING SURVEY TO BE INITIATED IN 1982.

TABLE 2. FISHERIES CATCH AND NUMBER OF REGISTERED FISHERMAN BY ZONE IN THE ARTESANAL SECTOR (M TONS)

ZONE AND SPECIES ¹⁾		NUMBER OF ARTESANAL FISHERMAN ²⁾ REGISTERED BY DEPARTMENTS IN ZONE	
		DEPARTAMENT	FISHERMEN
GUAY DE EQNSECA	722	CHOLUTECA	132
SHRIMP	69	VALLE	384
FISH	540		
OTHER	113		
LAGO DE YOLQA	84	SANTA BARBARA	78
FISH	84	COMAYAGUA	394
PUEBLO COBIES	154	PUERTO CORTES	490
LOBSTER	21		
FISH	152		
OTHER	2		
ATLANTIDA	134	ATLANTIDA	480
SHRIMP	1		
LOBSTER	1		
FISH	107		
OTHER	26		
COLON	64	COLON	188
SHRIMP	10		
LOBSTER	1		
FISH	54		
GRACIAS A DIOS	67	GRACIAS A DIOS	96
LOBSTER	1		
FISH	67		
TOTAL	1,226		2,247

1) FROM ESTADISTICAS PESQUERAS 1978

2) MORRILLO PERSONAL COMMUNICATION 1980

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TABLE 3 FISHERIES CATCH TRENDS SINCE 1960 FOR INDUSTRIAL AND ARTESANAL SECTORS (M. TONS)

	1,2) 1960	1,2) 1970	1) (SIZE OF FLEET)3) 1978	4) 3) 1979	5) 3) 1980
INDUSTRIAL					
SHRIMP	191	2,243	2,288 (170)	516 (149)	1,643 (137)
LOBSTER	105	1,225	2,547 (98)	1,138 (96)	732 (75)
FISH	298	274	171 (3)	187 (2)	129 (3)
OTHER	141	166	102	367 (8)	33 (7)
SUBTOTAL	735	3,908	5,108 (271)	2,208 (246)	2,537 (222)
ARTESANAL					
SHRIMP	-	-	124	57	128
LOBSTER	-	-	3	3	2
FISH	-	-	1,002	901	948
OTHER	-	-	143	127	154
SUBTOTAL	-	-	1,272	1,088	1,232
TOTAL	735	3,908	6,380	3,296	3,769

- 1) FROM ESTADISTICAS PESQUERAS 1978
- 2) INCLUDES ARTESANAL CATCH
- 3) FROM NMFS 1981, MULTI-PURPOSE VESSELS HAVE BEEN DIVIDED BETWEEN SHRIMP AND LOBSTER CATEGORIES
- 4) FROM ESTADISTICAS PESQUERAS 1979 (DRAFT)
- 5) FROM ESTADISTICAS PESQUERAS 1980 (DRAFT)

A SECOND MAJOR RESOURCE IS THE VAST AREA OF LAGOONS THAT OCCUR ON THE NORTHERN COASTS. LIN (1956) ESTIMATED THAT THE COMBINED AREA OF THESE BODIES AT 154,000 HA. AS PREVIOUSLY MENTIONED THESE SYSTEMS SERVE A MULTITUDE OF FUNCTIONS INCLUDING AS SOURCES OF PROTEIN. A RESOURCE INVENTORY OF NORTH COAST LAGOONS SHOULD BE COMPLETED TO INCLUDE A STUDY OF LAGOON DYNAMICS. ONCE COMPLETED DEVELOPMENT AND MANAGEMENT STRATEGIES SHOULD BE DESIGNED TO EFFECTIVELY UTILIZE THESE NATURAL RESOURCES.

ADDITIONAL AREAS WITH POTENTIAL FOR DEVELOPMENT INCLUDE THE UTILIZATION OF THE SHRIMP AND LOBSTER HEADS REMOVED AND DISCARDED AT SEA AS WELL AS AN UNKNOWN QUANTITY OF FISH BY-CATCH ALSO DISCARDED AT SEA.

2.1.5. MARICULTURE

THE ONLY LARGE SCALE EFFORT IN MARICULTURE IN HONDURAS IS THE CULTURE OF A SPECIES OF PACIFIC SHRIMP BY A U.S. CONCERN, SEA FARMS. THE EFFORT FIRST BEGAN IN 1973 WITH THE OBJECT OF DEVELOPING A COMPLETELY INTEGRATED FACILITY WITH HATCHERY AND 800 HA. OF PONDS. DUE TO SEVERAL DIFFICULTIES INCLUDING THE LACK OF AVAILABILITY OF GRAVID FEMALES THE EFFORT HAS BEEN REDUCED TO A GROW OUT FACILITY. AT PRESENT THERE ARE 100 HA. UNDER WATER WITH AN ESTIMATED PRODUCTION OF 90 M TONS/YEAR (TAILS ONLY). SHRIMP JUVENILES ARE TRAPPED AT HIGH TIDE AND THEN PLACED IN PONDS UNTIL MARKETABLE SIZE IS REACHED BEFORE HARVEST.

2.1.6. FISHERY ADMINISTRATION AND EXISTING LEGISLATION.

SEE APPENDIX 1

2.1.7. MARINE RESEARCH

THERE ARE NEITHER FACILITIES OR HUMAN RESOURCES TO CONDUCT A MARINE RESEARCH PROGRAM IN HONDURAS. THE DEPARTMENT OF BIOLOGY AT THE UNAH CONSIST OF 22 PROFESSORS OF WHICH ONLY 2 HAVE ADVANCED DEGREES OF SPECIALIZATION IN MARINE SCIENCES. A THIRD HAS A M.S. IN AQUACULTURE. DIRENARE, THE AGENCY RESPONSIBLE FOR MANAGING AQUATIC AND MARINE RESOURCES, IS COMPOSED LARGELY OF BACHELOR AND LICENCIATURA LEVEL BIOLOGISTS WITHOUT SPECIALIZATION IN THE MARINE SCIENCES. THE MARINE STATION IN LA CEIBA WHILE LOCATED IN A SUITABLE LOCATION IS ONLY A HOUSE WITHOUT EQUIPMENT OR A BUDGET TO SERVE ITS DESIGNATED FUNCTION.

2.1.8. MAJOR AREAS OF CONCERN

- A. THE INDUSTRIAL SECTOR IS LARGELY SELF REGULATORY RESPONSIBLE FOR ITS OWN CATCH DATA. THIS SYSTEM APPEARS TO BE INADEQUATE AS SHRIMP AND LOBSTER STOCKS ARE DECLINING. INCREASED SURVEILLANCE, MORE STRINGENT ENFORCEMENT OF EXISTING LEGISLATION AND SHORESIDE DATA COLLECTION SYSTEM TO INCLUDE SPECIES, SIZE AND EFFORT IS REQUIRED BY DIRENARE TO RECTIFY THE SITUATION.

- B. DEGRADATION OF NORTHERN LAGOONS DERIVES FROM SEVERAL SOURCES SUCH AS IRRIGATION RETURN WATER AND CITY SEWAGE (L. ALVARADO), IRRIGATION RETURN WATER AND OVEREXPLOITIVE FISHING PRESSURE (L. MICOS) AND CONSTRUCTION ACTIVITIES (GUAYMORETO).
- C. INCREASING STRESS ON THE GULF OF FONSECA ECOSYSTEM FROM PESTICIDES AND SEDIMENT DUMPING FROM THE CHOLUTECA WATERSHED AND MANGROVE DESTRUCTION ASSOCIATED WITH SALT PRODUCTION, OVER FISHING OF SHELLFISH SPECIES, INCREASED SEDIMENT LOADS AND DREDGE SPOILAGE ASSOCIATED WITH MAINTENANCE OF PUERTO SAN LORENZO NAVIGATION CHANNEL.
- D. DESPITE THE POSSESSION OF TWO COASTLINES, THE PRESENCE OF EXISTING AND POTENTIAL HIGH VALUE MARINE RESOURCES AND A VAST AREA OF OCEAN AND CONTINENTAL PLATFORM RECENTLY CLAIMED THROUGH DECLARATION OF A 200 NM EEZ, THE LACK OF HUMAN, FINANCIAL AND INFRASTRUCTURE CAPABILITIES TO CONDUCT BASIC RESEARCH.

2.2.1 THE FISHERY

THE TOTAL FRESHWATER SURFACE AREA IN HONDURAS IS AN ESTIMATED 43,000 HA WHICH INCLUDES RIVERS, LAKES AND FRESHWATER LAGOONS (LIN 1956). THE MAJOR RIVER SYSTEMS INCLUDE RIO PATUCA, AGUAN, YORUGA, HUMAYA, ULUA, CHAMELECON, CUYAMEL AND OMOA IN THE NORTH AND THE CHOLUTECA, GOASCORAN AND NACAOME IN THE SOUTH. THE MAJOR LAKE IN THE COUNTRY IS LAGO YOJOA WHICH IS SITUATED

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APPROXIMATELY 600 METERS ABOVE SEA LEVEL AND MEASURES 300 KM² WITH AN AVERAGE DEPTH OF 20 METERS (LIN 1956). THE LAKE IS FED BY THE RIVER YURE, VARSOVIA AND THE CREEKS CACAO, RAICES, JUTAL NOVILLO AND THE QUEBRADA. DEPENDENT ON SEASON AND WATER AVAILABILITY, THE LAKE LEVEL MAY VARY IN A RANGE UP TO 5.5 METERS (CRUZ 1980). IN ADDITION TO THESE FRESH WATER BODIES THERE ARE NUMEROUS SMALL LAGOONS THE BIGGEST OF WHICH ARE LAGUNA DE PESCADO, AMAPALA DN IMITA.

THERE IS LITTLE INFORMATION AVAILABLE ON THE ICTHOFAUNA OF THE FRESHWATER RIVERS. LIN (1956) AND CARR ET AL (1950) DESCRIBED 24 SPECIES OF FISH IN THE CHOLUTECA RIVER SYSTEM. IN THE CARIBBEAN WATERSHED HOWEVER, GOLDMAN (1972) DESCRIBED 48 SPECIES REPRESENTING 32 GENERA IN THE RIVER ULUA. INDIGENOUS SPECIES THAT ARE CONSUMED LOCALLY INCLUDE THE SARDINE *ASIYANAX FASCIATUS*, THREE SPECIES OF CICHLIDS OF WHICH THE GUAPOTE *CICHLASOMA MQIAQUENSE* IS OF GREATEST IMPORTANCE, THE ENDANGERED CUYAMEL *JOIURUS PICHANDII* AND 2 SPECIES OF FRESHWATER SHRIMP. IN ADDITION TO THESE SPECIES THERE HAVE BEEN SEVERAL OTHERS THAT HAVE BEEN INTRODUCED. THESE INCLUDE THE BLACK BASS *MICROPTERUS SALMOIDES* INTRODUCED INTO LAGO YOJOA IN 1954 AND *ILABIA WILQIICA* AND *I. MOZAMBICA* INTRODUCED INTO THE LAKE AND RIVERS SUBSEQUENT TO THAT DATE.

2.2.2. THE FISHERMAN

THERE ARE AN ESTIMATED 300 REGISTERED INLAND FISHERMEN THE MAJORITY LOCATED ADJACENT TO LAGO YOJOA (FAO 1978). THIS FIGURE SHOULD BE DOUBLED TO ACCOUNT FOR THE REMAINING INLAND FISHERMEN (MURILLO, PERSONAL COMMUNITATION).

LAKE FISHERMEN USE 3-4 METER DUGOUTS, SMALL ROWBOATS AND SOME OUTBOARD POWERED BOATS. HANDLINES, NETS AND OCCASIONALLY SPEARS MAY BE USED FOR CAPTURE (LIN 1956). OTHER METHODS MENTIONED INCLUDE ARROWS AND CYLINDRICAL BASKETS. FINALLY DESPITE LAWS PROHIBITING THEIR USE, DYNAMITE AND A TOXIN EXTRACTED FROM THE ROOTS OF A PLANT CALLED TIMBO AND STILL USED IN UNKNOWN QUANTITIES TO KILL LARGE AREAS OF THE RIVERS AND COLLECT THE FISH DOWNSTREAM. AS EARLY AS 1956 THE RIVERS PATUCA, AGUAN, ULUA WERE CHARACTERIZED AS HAVING FISH POPULATIONS REDUCED TO INSIGNIFICANT LEVELS AS A RESULT OF ABUSIVE USE OF DYNAMITE AND TOXICS (LIN 1956). THERE ARE NO DATA TO INDICATE THE EXTENT TO WHICH THESE RIVERS HAVE RECOVERED AND/OR OTHER RIVERS HAVING BEEN EXPLOITED TO THE SAME LEVEL. IT IS NOT KNOWN WHETHER THE PRACTICE OF BILLING FISH WITH PESTICIDES EXISTS IN HONDURAS. RIOS (CHAPTER VIII) HAS RECOMMENDED THAT FISH BE ANALYZED IN YOJOA TO DETERMINE THE LEVELS OF TOXIC MATERIALS OCCURRING AS A RESULT OF CONTAMINATION OF THE LAKE BY EFFLUENT FROM THE ROSARIO DEVELOPMENT CORPORATION MINE.

2.2.3. THE MARKET

LAGO YOJOA IS THE ONLY AREA WHERE RECORDS OF LANDINGS ARE MAINTAINED. IN 1980 LANDINGS WERE AN ESTIMATED 80 MTONS. FISH THAT ARE NOT CONSUMED DIRECTLY ARE SOLD IN THE LOCAL MARKET.

2.2.4. FISHERY POTENTIAL

THERE ARE NO REMAINING UNEXPLOITED FRESHWATER BODIES IN HONDURAS. ANY DEVELOPMENT STRATEGY OF NATURAL INTERNAL WATER RESOURCES MUST PROCEED FROM A RESTOCKING AND MANAGEMENT PERSPECTIVE WITH THE POSSIBLE EXCEPTION OF LAGO YOJOA WHERE ONLY AN INTEGRATED MANAGEMENT EFFORT MAY BE REQUIRED (THE ASSUMPTION BEING THE ECOSYSTEM IS AT PRESENT IN EQUILIBRIUM WITH PREVIOUS EXOTIC SPECIES INTRODUCTION AND PRESENT LEVELS OF EXPLOITATION). RESEARCH ON RAPIDLY DIMINISHING AND PRIZED SPECIES SUCH AS THE CUYAMEL SHOULD BE ENCOURAGED TO UNDERSTAND ITS LIFE CYCLE AND CRITICAL HABITAT NEEDS TO THE END OF REBUILDING NATURAL POPULATIONS. RESEARCH ON OTHER POTENTIALLY VALUABLE SPECIES SUCH AS THE INDIGENOUS SPECIES OF *MACROBRACHIUM* SHOULD BE PURSUED RATHER THAN RELYING ON PREVIOUSLY KNOWN INTRODUCED SPECIES. INTRODUCTION DISCOURAGES RESEARCH AND MAY CREATE AN IRREVERSIBLE ECOLOGICAL EVENT SUCH AS COMPETITIVE EXCLUSION OF ONE OR MORE INDIGENOUS SPECIES. FINALLY IT APPEARS EVIDENT THAT THE MAJOR SOURCE OF FUTURE PROTEIN FROM INTERNAL WATERS WILL COME FROM THE AREA OF AQUACULTURE. IT IS RECOMMENDED THAT INTRODUCTION OF EXOTICS BE CONFINED TO HYBRIDS AND MALES UNTIL THE POTENTIAL ECOLOGICAL IMPACT CAN BE BETTER EVALUATED AND THAT RESEARCH ON NATIVE CICHLIDS BE ACCELERATED.

2.2.5 AQUACULTURE

THE FIRST RECORD OF EFFORT AT AQUACULTURE OCCURRED IN 1936 WITH THE INTRODUCTION OF A SPECIES OF GUATEMALAN CARP (LIN 1956). THIS EFFORT WHICH FAILED WAS FOLLOWED UP BY ADDITIONAL ATTEMPTS AT REPRODUCTION OF LOCAL AND IMPORTED CICHLIDS AND THE BLACK BASS INCLUDED THE CONSTRUCTION OF PONDS IN COMAYAGUA BY THE CENTRO NACIONAL DE AGRONOMIA Y GANADERIA AND ESCUELAS RURALES. THE FIRST NATIONAL EFFORT AT AQUACULTURE STARTED IN 1956 WITH THE

CONSTRUCTION OF A HATCHERY FOR CICHLIDS IN PICACHO. JUVENILES WERE THEN MADE AVAILABLE TO PEOPLE WITH PONDS AVAILABLE FOR STOCKING. THE FACILITY IS STILL OPERATING AND SERVES PRIMARILY AS A DISTRIBUTION FACILITY.

IN 1977 CONSTRUCTION BEGAN ON AN 8 HA. 36 POND PILOT HATCHERY EL CARAO IN COMAYAGUA WITH ASSISTANCE FROM A.I.D. THE OBJECTIVES WERE TO PROVIDE JUVENILE FISH SPECIES TO REGIONAL DISTRIBUTION CENTERS FROM WHICH LOCAL PONDS WERE STOCKED, TECHNICAL TRAINING AND A RESEARCH FACILITY. THE PRINCIPAL SPECIES BEING CULTURED ARE *I. NILOTICA* AND *I. MOZAMBICA*. EXPERIMENTAL WORK IS ALSO BEING CONDUCTED ON THE NATIVE GUAPOTE AND THE INTRODUCED FRESHWATER SHRIMP *MACROBRACHIUM ROSENBERGII*. USERS THUS FAR OF THESE SERVICES ARE MOSTLY PRIVATE INDIVIDUALS AND A FEW COOPERATIVES. THERE ARE AN ESTIMATED 90 NON

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COMMERCIAL PONDS IN THE COUNTRY RANGING IN TOTAL SIZE FROM 14 TO 10,000 M² (BERRIOS, PERSONAL COMMUNICATION). THE PROJECT HAS SUFFERED FROM PAST MIS-MANAGEMENT, PRESENT BUDGET CUTBACKS AND CONTAMINATED SUPPLIES OF FRESHWATER RESULTING FROM PESTICIDE USE IN NEARBY FARMING AREAS.

THE LARGEST COMMERCIAL AQUACULTURE FACILITY IN HONDURAS IS AQUA FINCA NEAR SAN PEDRO SULA. AT PRESENT THERE ARE 67 ACRES UNDERWATER WITH PONDS RANGING IN SIZE FROM 1/10 TO 5 ACRE PONDS. ORIGINALLY THE SITE HAD BEEN USED AS A GROWOUT FACILITY FOR THE FRESHWATER SHRIMP *MACROBRACHIUM ROSENBERGII* PRODUCED AT THE HATCHERY LOCATED ON BAHIA OMOA. THE HATCHERY HAS SINCE BEEN CLOSED AND THE CYCLE COMPLETED AT THE GROW OUT FACILITY WITH SALT WATER TRUCKED IN FROM THE COAST. AQUA FINCA HAS THEIR OWN PROCESSING AND PACKING PLANT AND SHIPS APPROXIMATELY 23,000 KILOS OF HEADS OFF SHRIMP TO THE U.S. PER YEAR. AREAS OF INTEREST FOR POSSIBLE FUTURE DEVELOPMENT INCLUDE POLYCULTURE WITH *TILAPIA* AND MARICULTURE PROJECTS WITH ONE OR MORE OF THREE COMMERCIAL SHRIMP SPECIES THAT OCCUR ON THE CARIBBEAN COAST.

2.2.6. FISHERY ADMINISTRATION AND EXISTING LEGISLATION

SEE APPENDIX 1.

2.2.7. MAJOR AREAS OF CONCERN

- A. INADEQUATE MEANS TO IMPLEMENT AND ENFORCE EXISTING LEGISLATION, AT THE EXPENSE OF THE RESOURCE.
- B. INADEQUATE INFORMATION BASE AND NONEXISTENT DATA COLLECTION EFFORTS IN INTERNAL WATERS (EXCLUDING LAGO YOJOA) UPON WHICH TO BASE MANAGEMENT STRATEGIES.
- C. WIDESPREAD AQUATIC DEGRADATION RESULTING FROM ILLEGAL FISHING METHODS AND INDISCRIMINANT PESTICIDE USE (CHOLUTECA, CHAMELECON, AGUAN) INCREASED SEDIMENTATION FROM DEGRADED WATERSHEDS (CHOLUTECA, CHAMELECON, ULUA) AND INDUSTRIAL OUTFALL OR DEVELOPMENT (LAGO YOJOA ROSARIO DEVELOPMENT CORP., RIO BONITO OLANCHO FOREST PROJECT, ULUA AND CHAMELECON RIVERS EL CAJON HYDROELECTRIC PLANT).

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- D. TENDENCY TO INTRODUCE EXOTIC SPECIES WITH IDENTIFIED LIFE CYCLES RATHER THAN CONDUCT RESEARCH AND DEVELOP RESTOCKING STRATEGIES FOR INDIGENOUS SPECIES.

2.3. MINING

2.3.1. THE RESOURCES

THE IMPORTANCE OF COASTAL MINING IN HONDURAS IS MINIMAL. THIS IS IN PART DUE TO A SPARSE DATA BASE OF COASTAL MINERAL RESOURCES, ABSENCE OF KNOWN HIGH VALUE RESOURCES AND RELATIVE INACCESSIBILITY TO SOME PARTS OF THE COAST. KNOWN COASTAL MINERALS INCLUDE GNEISS, LIME, MARBLE, TITANIUM, SALT AND CLAY OFFSHORE, A DEPOSIT OF ANHYDROUS EVAPORITES IS INDICATED AS PRESENT ADJACENT TO LAGUNA DE CARATASCA BUT THIS WAS NOT CONFIRMED (IVEN DATA ATLAS, DRAFT).

2.3.3. SALT EXTRACTION

AT PRESENT THE MAJOR MINING ACTIVITY ENTAILS SALT EXTRACTION FROM WATERS IN THE GULF OF FONSECA (FIG 2). SALT IS EXTRACTED BY AN ESTIMATED 105 SMALL SCALE OPERATIONS USING 311 OVENS TO HEAT AND EVAPORATE OFF WATER. AT A MUCH LARGER SCALE SIX OPERATIONS USE SALT PANS WITH SOLAR EVAPORATION (GRUPO TECNICO, 1981). A MAJOR CONCERN ASSOCIATED WITH SALT EXTRACTION BY OVEN IS THE LOW LEVEL CHRONIC DESTRUCTION OF MANGROVES FOR FIRE WOOD. CONVERSELY THE INDUSTRIAL LEVEL USER MUST CLEAR CUT THE MANGROVE AREA TO ALLOW CONSTRUCTION OF SALT PONDS. ONE PRODUCER WHO IS CURRENTLY EXTRACTING 100,000 QUINTALES OF SALT PER YEAR CLEAR CUT 100 HA OF MANGROVES FOR HIS OPERATION (MOLINO, PERSONAL COMMUNICATION).

2.3.3. PETROLEUM

HONDURAS IS HIGHLY DEPENDENT ON IMPORTED OIL TO MEET ITS ENERGY NEEDS (HONDURAS IMPORTS 100% OF ITS OIL TO SATISFY 80% OF ITS ENERGY REQUIREMENTS, WORLD BANK 1980). AS OF AUGUST 1980 15 EXPLORATION WELLS HAVE BEEN DRILLED ON THE NORTH COAST ON THE ADJACENT PLATFORM. ONLY ONE WELL ON THE NORTHEASTERN PLATFORM NEAR LAGUNA CARATASCA INDICATED PRESENCE OF HYDROCARBONS. MUCH OF THE CARIBBEAN PLATFORM HAS BEEN GRANTED AS CONCESSIONS TO SEVERAL OIL COMPANIES WITH THE EXCEPTION OF A LARGE NATIONAL RESERVE ON THE NORTHEASTERN OUTER PLATFORM. ON THE PACIFIC SIDE APPROXIMATELY ONE-HALF OF THE HONDURAN GULF IS BEING SOLICITED FOR CONCESSION STATUS.

TO REDUCE THE COUNTRY'S DEPENDENCY ON OIL THE WORLD BANK HAS APPROVED A 3 MILLION DOLLAR LOAN TO PROMOTE PETROLEUM EXPLORATION. THE FOCUS WILL BE PRIMARILY ONE OF COLLECTING INFORMATION, GEOSTRATIGRAPHIC MAPPING AND TRAINING. THE PROJECT IS PRESENTLY BEING DELAYED AS THE BANK AND GOH ATTEMPT TO FIND AGREEMENT ON A COORDINATING MECHANISM. OTHER RELATED PROJECTS INCLUDE A FEASIBILITY STUDY FOR THE CONSTRUCTION OF A 410,000 BBL TRANSHIPPING TERMINAL IN AMAPALA AND A PROPOSED DEEPWATER OIL TERMINAL IN PUERTO CÁSTILLA.

THE ONE REFINING FACILITY IN HONDURAS IS OWNED AND OPERATED BY TEXACO IN PUERTO CORTES. IT WAS BUILT IN 1968 AT A COST OF \$13 MILLION AND HAS A

REFINING CAPACITY OF 14,000 BBL/DAY OF RECONSTITUTED CRUDE OIL FOR INTERNAL USE. IN 1980, 18 CRUDE AND 8 CLEAN PRODUCT SHIPS VISITED THE REFINERY RANING IN SIZE BETWEEN 20-30,000 DWT. IN ADDITION TO THIS TRAFFIC, APPROXIMATELY 30 ADDITIONAL VESSELS WITH AN AVERAGE CAPACITY OF 5,000 BBL DELIVERED OIL PRODUCTS ALONG THE HONDURAN COAST (ETHERIDGE, PERSONAL COMMUNICATION).

TEXACO HAS NOT BEEN INVOLVED IN ANY OIL SPILL INCIDENTS IN THE LAST THREE YEARS. THE COMPANY BELONGS TO THE CLEAN CARIBBEAN COOPERATIVE WITH A RESPONSE TEAM BASED IN BOSTON. AN OIL SPILL CONTINGENCY PLAN DOES EXIST BUT THERE IS NO TRIGGER MECHANISM TO ENACT THE PLAN. ONLY ONE PERSON IN THE PLANT HAS ANY FORMAL OIL SPILL RESPONSE TRAINING AND NO TRAINING EXERCISES HAVE BEEN CONDUCTED SINCE 1979. EQUIPMENT THOUGH APPROPRIATE APPEARS MINIMAL WITH ONE SKIMMER, TWO PATROL BOATS, ABSORBANTS AND DISPERSANTS. THIS EQUIPMENT IS TO BE AUGMENTED THIS YEAR AT A COST OF \$80,000. NO FORMAL PLAN OF COORDINATION EXISTS BETWEEN TEXACO AND GOH IN THE EVENT OF A TOXIC SUBSTANCE SPILL BY EITHER OF THE PARTIES. IN DAY TO DAY OPERATIONS OILY WATERS ARE TREATED BY AN API GRAVITY SEPARATOR FOLLOWED BY EVAPORATING PONDS BEFORE DISCHARGE (LADINE 1978).

2.3.4. INLAND MINING

THE ONE MAJOR MINING ACTIVITY IMPACTING INTERNAL WATERS IS THE EL MOCHITO MINE OWNED BY ROSARIO INTERNATIONAL. THE MINE HAS BEEN IN OPERATION SINCE 1948 EXTRACTING LEAD, ZINC, AND SILVER. FROM 1948 TO 1971, THE PERIOD PREVIOUS TO THE ESTABLISHMENT OF A SETTLING POND, AN ESTIMATED 2.3 MILLION M TONS OF SOLID WASTE WAS DISCHARGED IN A STREAM THAT FEEDS LAGO YOJOA (CID 1976). DESPITE THE CONSTRUCTION OF A SETTLING POND IN 1971 A WIDESPREAD FISHKILL OCCURRED IN LAGO YOJOA IN 1976. AN INVESTIGATION BY DIRENARES INDICATED A "DEAD" FEEDER STREAM AND HIGH CONCENTRATIONS OF CD, EE, ZN, MG IN THE BORDERING SOIL BUT FISH ANALYSIS FAILED TO ESTABLISH A DIRECT LINK WITH CONTAMINANT OUTFALL. DESPITE A PROJECTED LIFETIME FOR THE SETTLING POND OF ONLY FIVE YEARS IT IS STILL BEING USED WHILE A SECOND ONE IS BEING CONSTRUCTED (SANDOVAL PERSONAL COMMUNICATION). THERE HAS BEEN CONCERN EXPRESSED RELATED TO THE SUITABILITY OF THE NEW IMPOUNDMENT GIVEN THE SLOPE OF THE PROPOSED SITE (LADINE 1978). (FOR ADDITIONAL INFORMATION SEE RIOS, CHAPTER VIII).

2.3.5. MINING ADMINISTRATION AND EXISTING LEGISLATION

THE AGENCY RESPONSIBLE FOR REGULATING MINERAL RESOURCES IS THE DIRECCION GENERAL DE MINAS E HIDROCARBUROS (DIMHC). THE AGENCY WAS CREATED IN 1950 AND SITUATED IN THE SECRETARIA DE RECURSOS NATURALES. IN ADDITION TO EXERCIZING AUTHORITY OVER PROSPECTING AND EXPLOITATION THE AGENCY IS ALSO RESPONSIBLE FOR MONITORING AND PREVENTING CONTAMINATION OF NATIONAL WATERS BY INDUSTRIES ASSOCIATED WITH MINING ACTIVITY INCLUDING PETROLEUM EXPLORATION AND PRODUCTION. DESPITE THIS MANDATE THERE ARE NEITHER HUMAN OR FINANCIAL RESOURCES TO CARRY OUT THE MONITORING ON COMPLIANCE FUNCTIONS. SALT EXTRACTION IS ADDRESSED IN SEPARATE LEGISLATION AND ADMINISTERED ILLEGALLY BY THE INSTITUTO NACIONAL AGRARIA (INA).

2.3.6. MAJOR AREAS OF CONCERN

- A. INADEQUATE HUMAN AND FINANCIAL RESOURCES TO ENFORCE EXISTING LEGISLATION PREVENTING AQUATIC DEGRADATION RESULTING FROM MINING WATERS.
- B. NO COORDINATION MECHANISM TO RESPOND TO TOXIC SPILLS BETWEEN THE TWO PRIMARY USERS AND SHIPPERS OF TOXIC SUBSTANCES (TEXACO AND GOH).
- C. POSSIBLE INADEQUATE PREPARATION TO RESPOND TO AN OIL SPILL BY TEXACO EMPLOYEES.
- D. A NEED FOR AN ALTERNATIVE MEANS TO EXTRACT SALT WITHOUT THE ACCOMPANYING MANGROVE DESTRUCTION.

2.4. PORTS

2.4.1. CAPACITY

AT PRESENT THERE ARE FIVE PORTS OPERATING IN HONDURAS WITH ANNUAL MOVEMENT OF CARGO EXCEEDING 50,000 M TONS (MEMORIA 1979). OF THE FIVE PORTS, THREE: PUERTO CORTES, TELA AND LA CEIBA, ARE LOCATED ON THE CARIBBEAN COAST, THE REMAINING TWO, SAN LORENZO AND AMAPALA, SERVICE THE PACIFIC. TOTAL METRIC TONS HANDLED IN 1979 WAS 3.2 MILLION TONS OF WHICH 69% MOVED THROUGH PUERTO CORTES.

2.4.2. CARIBBEAN PORTS

PUERTO CORTES SITUATED ON THE NORTH WESTERN COAST NEAR SAN PEDRO SULA POSSESSES THE MOST COMPLETE PORT FACILITIES AND SERVICES IN HONDURAS WHICH INCLUDES 5 WHARVES TOTALING 12 METERS CAPABLE OF HANDLING PETROLEUM, LIQUID BULK CARGO, BANANAS, ROLL ON/ROLL OFF AND CONTAINERS. A FREE/ZONE WAS CREATED IN 1976 ADJACENT TO PUERTO CORTES FOR THE PURPOSES OF PROVIDING A MAJOR REGIONAL CENTER OF DISTRIBUTION OF GOODS. THE FREE/ZONE IS 75 ACRES IN AREA BUILT THROUGH DREDGE AND FILL OF THE BAY OF OMOA. THE REMAINING TWO ACTIVE PORTS ON THE CARIBBEAN COAST ARE PIERS THAT SERVE PRIMARILY FOR THE EXPORTING OF PLANTATION FRUIT AND COASTAL TRADE. IN THE BAY OF TRUJILLO CONSTRUCTION BEGAN ON A DEEP WATER PORT IN 1978. THE PROJECT PARTIALLY FUNDED BY THE WORLD BANK HAS BEEN PLAGUED BY DELAYS AND CONTRACTOR DISPUTES AND ACTIVITY AT PRESENT IS SUSPENDED UNTIL NEGOTIATIONS ARE COMPLETED. FOR PURPOSES OF CONSTRUCTION AND FUTURE OPERATIONS SERVICE ROAD WAS COMPLETED CONNECTING TRUJILLO WITH THE PORT PASSING OVER THE ENTRANCE TO THE LAGOON GUAYMORETO. IN ADDITION IN 1978, 1600 PEOPLE WERE REMOVED FROM THE AREA AND RESETTLED IN A COMMUNITY OF 198 NEW HOUSES SOUTH OF THE PORT. AT PRESENT THE PORT WILL SERVE THE OLANCHO FOREST INDUSTRIES AND AGUAN VALLEY AGRICULTURE PROJECTS WITH FUTURE EXPANSION AS AN OIL TRANSHIPMENT SUPERPORT A POSSIBILITY.

2.4.3. PACIFIC PORTS

ON THE PACIFIC COAST TWO PORTS AMAPALA AND SAN LORENZO FUNCTION AS THE PRINCIPLE PORTS. AS A RESULT OF THE SHALLOW DEPTH LIGHTERING WAS REQUIRED BETWEEN AMAPALA AND SAN LORENZO. AS A RESULT THE GOH COMMISSIONED THE CONSTRUCTION OF THE NEW PORT OF SAN LORENZO IN 1975. THE SITE CHOSEN WAS A MANGROVE AREA NEAR THE CITY OF THE SAME NAME. AN ACCESS ROAD WAS CUT AND FILLED.

IN ORDER TO MAKE THE AREA ACCESIBLE TO DEEP DRAFT SHIPS A 35 KM NAVIGATION CHANNEL AND TURNING BASIS WAS DREDGE IN 1979. A TOTAL OF 1 1/2 MILLION M WAS REMOVED AT A COST OF 3.2 MILLION DOLLARS. TAMMS (1979) ESTIMATED MAINTENANCE DREDGING WOULD BE REQUIRED ONCE EVERY FOUR YEARS. NO ENVIRONMENTAL ASSESSMENT WAS MADE PRIOR TO DEVELOPMENT.

IN ADDITION TO THESE PORTS THERE ARE SEVERAL MINOR PORTS THAT SERVE COASTAL TRADE INCLUDING ROATAN, UTILA, LIMON, IRIONA, SANTA ROSA DE AGUAN, PUERTO PLAYA, BRUS LAGUNA, GUAQUIRA, PUERTO LEMPIRA IN THE CARIBBEAN AND COYOLITO, PUERTO GRANDE, RATON AND PUERTO DE SIERRA ON THE PACIFIC COAST.

2.4.4. PORT ADMINISTRATION AND EXISTING LEGISLATION

THE GOH CREATED AN AUTONOMOUS INSTITUTION IN 1965 WITH THE MANDATE TO DEVELOP AND MODERNIZE THE PORT OF CORTES. THIS INSTITUTION EMPRESA NACIONAL PORTUARIA (ENP) OPERATES UNDER ITS OWN BOARD COMPOSED OF SEVERAL GOVERNMENT MINISTERS AS WELL AS REPRESENTATIVES OF ASSOCIATIONS OF WORKERS, SHIPPERS AND COMMERCE. THE 1974 ENP WAS GIVEN AUTHORITY TO OPERATE ALL THE COUNTRY'S CARGO PORTS.

ENP CONSISTS OF THE BOARD AND ADMINISTRATION COMPOSED OF EIGHT DIVISIONS ONE OF WHICH IS THE DIVISION OF PLANNING AND TECHNICAL SUPERVISION. THEIR RESPONSIBILITIES INCLUDES ASSESSMENT OF OCEAN CURRENT AND SUBSTRATE CONDITIONS, PLACEMENT OF NAVIGATION BUOYS AND SUPERVISING OF DREDGING OPERATIONS.

DESPITE THE PRESENCE OF LEGAL PROVISIONS AND REMEDIES IN THE LEGAL CODE OF ENP AGAINST CONTAMINATION OF PORT WATERS, THERE ARE NO CRAFT OR INSPECTORS MONITORING SHIPS OUTSIDE OF THOSE BERTHED. LAST YEAR DESPITE THE HIGH LEVEL OF TONNAGE PASSING THROUGH PUERTO CORTES ONLY ONE COMPANY WAS FINED FOR DISCHARGING CONTAMINANTS IN THE BAY (MCLIBERTY, PERSONAL COMMUNICATION). BALLAST DUMPING HOWEVER MAY BE MORE SIGNIFICANT THAN THE NUMBER OF LEVIED FINES MAY INDICATE AS TAR DEPOSITS HAVE BEEN OBSERVED ON THE BEACHES OF BAY OMOA (TOYOFUKU, PERSONAL COMMUNICATION).

THE GREATEST PORTION OF POTENTIALLY TOXIC SUBSTANCES PASS THROUGH THE PORT OF CORTES (TABLE 4). DESPITE THIS ACTIVITY THEIR DOES NOT EXIST A CONTINENCY PLAN FOR TOXIC SPILL CLEAN UP OR EQUIPMENT TO DO SO IN THE PORT.

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TABLE 4. QUANTITIES AND THEIR PORT OF ORIGIN OR DESTINATION OF POTENTIALLY TOXIC SUBSTANCES IN HONDURAS 1979 (MTONS)

PRODUCT	P O R T					TOTAL
	P. CORTES	TELA	LA CEIBA	SAN LORENZO	AMAPALA	
IMPORTS						
CHEMICALS	56,039	4,066	8,561	474	7,976	77,116
FERTILIZERS	19,811	13,687	9,733	1,420	-.-	44,651
CRUDE OIL AND DERIVITIVES	553,983	10,630	402	-.-	-.-	565,015
EXPORTS						
GAS AND DERIVITIVES	547	-.-	-.-	-.-	-.-	547
TOTAL	630,380	28,383	18,696	1,894	7,976	686,782

2.4.5. MAJOR AREAS OF CONCERN

- A. DESPITE PAST, PRESENT AND PROPOSED MAJOR PORT DEVELOPMENT PROJECTS IMPACTING THE COASTAL AND NEAR SHORE MARINE ZONES THE FAILURE OF THE ENP OR ITS CONTRACTORS TO DETERMINE ENVIRONMENTAL IMPACT AND ADDRESS MEANS TO AMELIORATE SAID IMPACT.
- B. NOMINAL ENFORCEMENT OF EXISTING LEGISLATION TO PREVENT SHIPS FROM DISCHARGING CONTAMINANTS IN PORT AND ADJACENT AREAS.
- C. ABSENCE OF CONTINGENCY PLANNING TO RESPOND TO TOXIC OIL SPILL IN THE HEAVY USE PORT OF CORTES.

2.5. TOURISM

2.5.1. HISTORY

IN RECOGNITION OF THE POTENTIAL FOR DEVELOPMENT OF A TOURIST INDUSTRY THE GOH CREATED THE INSTITUTO HONDURENO DE TURISMO (IHT) IN 1972. AS ITS CHIEF FUNCTION WAS TO FACILITATE TOURISM DEVELOPMENT A TECHNICAL AND ECONOMIC FEASIBILITY STUDY WAS COMPLETED IN 1975. THREE AREAS WERE EXAMINED FOR THEIR SUITABILITY FOR DEVELOPMENT, THE COPAN AREA IN WESTERN HONDURAS DUE TO ITS IMPORTANCE AS A MAYAN ARCHEOLOGICAL SITE; THE TOURNASAL AREA STRECHING ALONG THE NORTH COAST FROM PUNTA SAL TO TRUJILLO WITH ITS MANY PRISTINE SAND BEACHES; AND THE BAY ISLANDS DUE TO THEIR INSULAR NATURE, CLEAR WATER AND DEVELOPED REEFS. (PROYECTO TOURNASAL 1975). SINCE THE ORIGINAL STUDY MUCH OF THE FOCUS FOR DEVELOPMENT HAS BEEN DIRECTED TOWARD COPAN AND THE BAY ISLANDS RATHER THAN THE TOURNASAL AREA.

2.5.2. FINANCING

THE FINANCING FOR THESE TWO AREAS OF DEVELOPMENT AND RELATED INFRASTRUCTURE COMES FROM A LOAN BY WORLD BANK APPROVED IN 1979. THE TOTAL COST OF THE PROJECT IS AN ESTIMATED \$38.3 MILLION HALF OF WHICH IS A WORLD BANK LOAN AND THE REMAINDER IN THE FORM OF LOANS FROM THE CENTRAL BANK, GOH FINANCIAL INTERMEDIARIES AND INVESTORS EQUITY.

2.5.3. PROPOSED PROJECTS

THE PROJECTS IMPACTING THE MAINLAND COASTAL ZONE ARE INDIVIDUAL EFFORTS INVOLVING EITHER HOTEL MODIFICATIONS OR CONSTRUCTION. TWO PROJECTS ARE IN TELA, AND TWO OTHERS ARE IN THE FEASIBILITY STUDY STAGE ONE IN AMAPALA AND A SECOND IN PUERTO CORTES. TWO FUTURE DEVELOPMENTS ARE PROJECTED FOR TRUJILLO AND LA CEIBA BUT HAVE NOT BEEN APPROVED AT THIS TIME. THE MAJOR FOCUS OF DEVELOPMENT, HOWEVER, IS DIRECTED TOWARD THE BAY ISLANDS, SPECIFICALLY ROATAN. THIS WILL BE ELABORATED ON IN THE CASE STUDY BELOW.

2.5.4. ADMINISTRATION

THE IHT IS PLACED DIRECTLY UNDER THE PRESIDENCY. THE PRINCIPLE COORDINATING BODY IS A COUNCIL COMPOSED OF ALL MINISTERS AS WELL AS REPRESENTATIVES FROM THE NATION'S AIRLINES AND TRAVEL AGENTS. THE INSTITUTE IS DIVIDED BETWEEN CULTURE AND TOURISM DEPARTMENTS. THE COMPONENT RESPONSIBLE FOR SETTING GUIDELINES FOR DEVELOPMENT IS THE UNIDAD TECNICA. THIS GROUP IS COMPOSED OF SIX ADMINISTRATORS AND EIGHT TECHNICAL PROFESSIONALS INCLUDING HOTEL MANAGERS, ECONOMISTS AND ARCHITECTS. THEY ARE NOT ENVIRONMENTAL SPECIALISTS. RECOMMENDATIONS FROM THE UNIDAD TECNICA INCORPORATED IN THE CONDITIONS OF THE LOAN MUST BE AGREED UPON ON THE LOAN WILL NOT BE APPROVED. THE IHT HAS THE POWER TO DECLARE AN AREA A TOURIST ZONE WHICH DOES NOT CHARGE OWNERSHIP RIGHTS ON STATUS BUT DOES PREVENT DEGRADATION OF THE RESOURCES THAT JUSTIFIED THE DESIGNATION.

2.5.5. MAJOR AREAS OF CONCERN

- A. ABSENCE OF AN ENVIRONMENTAL CAPABILITY IN THE TECHNICAL GROUP RESPONSIBLE FOR EVALUATING TOURIST DEVELOPMENT PROJECTS.
- B. ABSENCE OF LEGISLATION REQUIRING IHT TO ADDRESS ENVIRONMENTAL CONSIDERATIONS BEFORE GRANTING APPROVAL.

3.0 A CASE STUDY OF BAY ISLANDS DEVELOPMENT

THE BAY ISLANDS COMPRISE THE THREE MAJOR ISLANDS OF UTILA, GUANAJA AND ROATAN, 5 SMALLER ISLANDS AND 65 CAYS. LOCATED APPROXIMATELY 60 KM FROM THE MAINLAND THE THREE LARGE ISLANDS ARE RELATIVELY STEEP SLOPED WITH THE EXCEPTIONS OF LOW LYING WETLANDS IN UTILA AND THE EASTERN AREAS OF ROATAN AND GUANAJA. SURFACE VEGETATION HAS BEEN DESCRIBED AS TROPICAL DECIDUOUS FOREST PREDOMINATING WITH MANGROVE CHARACTERIZING THE WET COASTAL FLAT LANDS (HEIBIG 1965). PINE MAY STILL BE FOUND ON RIDGES IN ROATAN AND GUANAJA (DAVIDSON 1979). TODAY AN ESTIMATED 50% OF ROATAN IS IN PASTURE OF SOME DEGREE OF USE WITH SMALLER DEGREES OF PRESENCE OF SAVANNAH/MIXED GRASSES, CARIBBEAN PINE, MIXED STANDS OF HARDWOODS AND ABANDONED PASTURE (DULIN, 1979).

AVERAGE RAINFALL IS 2500 MM/YEAR. WITH THE EXCEPTION OF THE FLAT PORTIONS OF THE ISLANDS DRAINAGE IS RAPID AND MOSTLY CONFINED TO WELL DEFINED RAVINES. THOUGH THE WATER SUPPLY AUGMENTED BY THE USE OF CISTERNS APPEARS AMPLE TO SUPPORT PRESENT POPULATIONS THERE HAS BEEN NO WATER RESOURCE INVENTORY ATTEMPTED.

NO SOIL SURVEY HAS BEEN COMPLETED FOR THE ISLANDS THOUGH DULIN (1979) INDICATES THAT SOILS TEND TO BE SHALLOW AND BETTER DEVELOPED ONLY IN THE FORESTED AREAS.

OFFSHORE, SCATTERED PATCH REEFS WITH ADJACENT GRASSBEDS ON THE SOUTHEASTERN COASTS DEVELOP INTO FRINGING BARRIER REEFS ON THE NORTH WEST COASTS. WELL DEVELOPED GRASS BEDS ARE CHARACTERISTIC OF THE INNER LAGOONS.

BASED ON THE NATIONAL CENSUS IN 1974 THE POPULATION OF ROATAN WAS 8,250 DISTRIBUTED AMONG THE FOLLOWING RACIAL GROUPS NEGRO (50%), WHITE (23%), BLACK CARIB (6%), LATIN (6%), FOREIGNER (3%) AND MIXED (15%). TODAY THE THREE ISLANDS POPULATIONS IS AN ESTIMATED 12,000 WITH 7,000 LIVING ON ROATAN.

UNTIL ONLY RECENTLY THE BAY ISLANDS HAVE MAINTAINED A RELATIVELY PURE BRITISH CARIBBEAN CULTURE RATHER THAN A LATIN ONE. INCREASED IMMIGRATION OF LANDINOS WHO BRING TRADITIONAL LAND USE METHODS HAVE IMPOSED SERIOUS PRESSURE ON THE INSULAR ENVIRONMENT. INSULAR LAND USE PATTERNS ARE CHARACTERIZED BY COASTAL DEVELOPMENTS ASSOCIATED WITH SCARCE FLAT LAND FOUND ON THE COAST (DAVIDSON 1979). THE SEA HAD BEEN THE MAJOR SOURCE OF SUSTINANCE WITH AGRICULTURE EFFORTS CONFINED TO LOW LYING FRUIT PLANTATIONS AND OCCASIONAL SMALL SUBSISTENCE AGRICULTURAL PLOTS. WITH MAINLANDER IMMIGRATION INTERIOR SETTLEMENT BEGAN. WITH THE DEVELOPMENT OF THE INTERIOR OF ROATAN THE FAMILIAR PATTERNS OF SLASH AND BURN FOLLOWED BY THE GRAZING OF CATTLE AND CULTIVATION OF PLANTAINS, MANGOS, MAIZE AND SUGAR CANE CAN BE DISCERNED. IT IS NOT CLEAR WHAT PERCENTAGE OF LAND CLEARING CAN BE ATTRIBUTED TO LANDINOS VERSUS PREVIOUS EFFORTS BY EARLY BRITISH AND SPANISH SETTLERS. MOST LIKELY VEGETATION CURRENTLY BEING CLEARED IS SECONDARY RATHER THAN VIRGIN. PATTERNS OF PRESENT SLASH AND BURN ARE MOST SEVERE NEAR POPULATION CENTERS. SLASH AND BURN METHODS ON STEEP SLOPES HAVE CONTRIBUTED TO GULLYING, EROSION, SLUMPS AND LAND SLIDES (DULIN 1979). IMMIGRATION CONTINUES FOR PURPOSES OF AGRICULTURAL DEVELOPMENT AND POTENTIAL EMPLOYMENT OFFERED BY THE FISHING INDUSTRY. MEANWHILE MANY OF THE NATIVE BORN ISLANDERS SEEK EMPLOYMENT IN THE OIL FIELDS OF MEXICO OR IN THE MARITIME INDUSTRY SENDING REMITTANCES BACK TO THE ISLANDS.

IN THE EARLY 1960S THE ISLANDS BEGAN TO BE EXAMINED AS SITIES FOR POTENTIAL TOURIST DEVELOPMENT. PRIOR TO 1960 THERE EXISTED ONLY ONE HOTEL ON THE THREE ISLANDS, TODAY THERE ARE 17 WITH A TOTAL NUMBER OF ROOMS OF 248. IN RECOGNITION OF THIS POTENTIAL, THE ISLANDS WERE INCLUDED IN A TECHNICAL AND ECONOMIC FEASIBILITY STUDY FOR TOURIST DEVELOPMENT PROJECTED TORUSTS ARRIVALS WERE PREDICTED TO CLIMB FROM 9,200 IN 1980 TO 27,000 BY 1990 (PROYECTO TORNASAL, 1975). BASED ON RECOMMENDATIONS FROM THE STUDY IHT PROPOSED A REQUEST FOR A LOAN TO THE WORLD BANK. THIS LOAN WAS APPROVED IN 1979 WITH A MAJOR FOCUS ON THE DEVELOPMENT OF THE COPAN REGION AND ROATAN.

IN ADDITION TO PROVIDING A LINE OF CREDIT FOR HOTEL AND TOURIST ENTERPRISES IT ALSO PROVIDED FOR THE LENGTHING AND PAVING OF THE ROATAN AIRPORT TO EVENTUALLY PROVIDE JET SERVICE. IN A PRIOR PROJECT THE WORLD BANK HAD PARTICIPATED WITH THE GOH TO FUND THE CONSTRUCTION OF A ROAD OPENING UP AREAS IN ROATAN THAT PREVIOUSLY COULD ONLY BE REACHED BY FOOT PATH.

AT PRESENT THERE ARE 2 HOTEL DEVELOPMENT PROJECTS AVAILABLE FOR FUNDING, 3 OTHER PROPOSED PROJECTS WHICH WILL CONSIST OF RENOVATIONS OF TWO EXISTING HOTELS AND THE CONSTRUCTION OF A THRID AND A YACHT CHARTERING COMPANY REQUESTING APPROVAL FOR LOANS.

THE WORLD BANK LOAN, UNDER A PROVISION FOR TECHNICAL ASSISTANCE REQUIRED THE PREPARATION OF AN ENVIRONMENTAL CONTROL PLAN FOR ROATAN. THE TERMS OF REFERENCE CALLED FOR: A NATURAL RESOURCES INVENTORY OF THE ISLAND TO INCLUDE

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GEOMORPHOLOGY, GEOLOGY AND SOILS, WATER AND HYDROLOGIC RESOURCES, COASTAL DYNAMICS, BEACH AND VEGETATION INVENTORIES AND CLIMATOLOGICAL STUDIES; AN EVALUATION OF THE HUMAN RESOURCE BASE; AND AN INVENTORY OF EXISTING COMMUNITY INFRASTRUCTURE. BASED ON THESE THREE DATA BASES, A LAND USE CAPABILITY STATEMENT WILL BE DEVELOPED, RECOMMENDATIONS AND REGULATIONS FOR ZONING PRESENTED AND REGULATIONS FOR ENVIRONMENTAL CONTROL OUTLINED.

DESPITE THE LOGIC OF THE PROJECT THE STUDY HAS YET TO BEGIN. A SERIES OF PROBLEMS INCLUDING THE FAILURE TO ALLOCATE FOR A GOH COUNTERPART TO PARTICIPATE WITH THE CONTRACTOR AND CONTRACT DISPUTES BETWEEN GOH AND THE WINNING BIDDER HAVE DELAYED THE PROJECT. AT PRESENT NEGOTIATIONS HAVE JUST BEEN OPEN WITH THE SECOND RANKED BIDDER. THE PROJECT PROPOSED DURATION IS 7 MONTHS AN ESTIMATES FOR ITS COMPLETION RANGE FROM THE MIDDLE TO END OF 1982.

ONE MUST QUESTION THE VALUE OF SUCH A STUDY ONCE MAJOR DEVELOPMENT PROJECTS HAVE BEEN IDENTIFIED AND FUNDED. THE POINT BEING NOT TO PLACE BLAME BUT TO CONVEY THE IDEA THAT A NATURAL RESOURCES MANAGEMENT PLAN CAN BEST BE UTILIZED PRIOR TO DEVELOPMENT RATHER THAN IN A CURRENT OR POST DEVELOPMENT MODE.

IN THE DESIGN OF A DEVELOPMENT PLAN AREAS OF CONCERN THAT NEED TO BE ADDRESSED INCLUDE THE FOLLOWING:

- A. TECHNICAL ASSISTANCE TO ISLAND AUTHORITIES TO AID IN IMPLEMENTATION OF RECOMMENDATIONS.
- B. MANAGEMENT OPTIONS IN THE AREAS NEWLY OPENED AND SOON TO BE OPENED BY ROADS MOST NOTABLY THE COMPLETION OF THE LOOP BETWEEN COXEN HOLE--WEST END--SANDY BAY AND THE ACCESS ROAD TO PORT ROYAL.
- C. PRESENT ZONING DESIGNATES THE BAY ISLANDS AS URBAN AREAS. AS SUCH FOREIGNERS MAY OWN 100% PROPERTY RIGHTS. THE IMPACT HAS THUS FAR BEEN MINIMAL WITH THE EXCEPTION OF TWO ISLANDS OWNED OUT RIGHT OFF ROATAN. STEPS SHOULD BE TAKEN TO DISCOURAGE SPECULATION AND SIGNIFICANT PURCHASE OF LAND BY FOREIGN INVESTORS.
- D. INCREASED PRESSURE ON THE BARRIER REEF FROM SOIL EROSION, FISHING PRESSURE AND DIVE BOATS ANCHORING ON THE REEF. MAJOR DENUDED AREAS ON ROATAN INCLUDED BODDEN POINT, CALABASH POINT, JENNINGS POINT, CAMP BAY AND SIX HUT POINT.
- E. INCREASED DEPENDENCE ON MAINLAND SOURCES OF ESSENTIALS AS THE ISLAND GROWS EXCEEDING ITS NATURAL CARRY CAPACITY RESULTING IN FLIGHT OF CAPITAL, ADDED EXPENSE AND RISING EXPECTATIONS.
- F. SIMILAR DEVELOPMENT PLANS COMPLETED FOR THE ISLANDS OF UTILA AND GUANAJA.

4.0 CONCLUSIONS AND RECOMMENDATIONS

COASTAL RESOURCES OF HONDURAS ARE MANAGED BY A LARGE AND DIVERSE NUMBER OF AGENCIES AND LEVELS OF GOVERNMENT. THIS MANAGEMENT EFFORT IS CHARACTERIZED BY AREAS OF CONFLICT, LACK OF COORDINATION, AND DIFFERING LEVELS OF HUMAN AND FINANCIAL RESOURCES TOO OFTEN RESULTING IN DEGRADATION OF THE RESOURCES.

RELEVANT LEGISLATION IN THE CIVIL CODE DEFINES THE COASTAL ZONE AS PLAYA OR BEACH BEING THE AREA FROM WHICH THE WAVES FIRST BREAK TO THE HIGHEST SEA LEVEL; THE TERRITORIAL SEA BEGINS AT THE LOWEST SEA LEVEL AND EXTENDS TO 12 NAUTICAL MILES, BEFORE AN EEZ IS RECOGNIZED EXTENDING TO 200 NAUTICAL MILES. NO ONE IS ALLOWED TO CONSTRUCT OR PLACE OBJECTS IN THE COASTAL ZONE WITHOUT PRIOR PERMISSION. THIS DOES NOT APPLY TO THE COASTAL FRINGE WHERE DEVELOPMENT IS PRIMARILY MANAGED BY THE LOCAL MUNICIPALITIES WITH THE EXCEPTION CITED BELOW. HONDURAN NATIONALS CAN OWN PROPERTY UP TO THE COASTAL EDGE BUT FOREIGN NATIONALS MUST TAKE A MINORITY POSITION IN LANDS WITHIN 50 KMS OF THE COAST ZONED AS RURAL. THIS DOES NOT APPLY TO URBAN ZONED AREAS SUCH AS THE BAY ISLANDS.

GOVERNMENT AGENCIES AND RESPECTIVE LEGISLATION RELEVANT TO COASTAL ZONE MANAGEMENT INCLUDE:

- A. DIRENARES. FISHERMEN ARE ALLOWED TO PLACE STRUCTURES, BOATS AND EQUIPMENT IN A 50 MT. ZONE BEHIND THE HIGH TIDE MARK WITHOUT IMPEDIMENT. OTHER PERTINENT LEGISLATION PROTECTS AQUATIC, RIVER AND LAND EDGE, COASTAL AND MARINE FLORA AND FAUNA WITH PERMITS REQUIRED FOR REMOVAL. THIS INCLUDES CALCAREOUS COASTAL DEPOSITS FROM THE COASTS, LAKES AND LAGOONS.
- B. COHDEFOR. AN AUTONOMOUS INSTITUTION CREATED TO PROTECT MANAGE AND COMMERCIALLY EXPLOIT ALL HONDURAN TREES. THIS INCLUDES MANGROVE AREAS AND PERMISSION IS REQUIRED TO REMOVE ANY TREE. THE EXTENSIVE AREA OF MANGROVES IN THE GULF OF FONSECA WAS DECLARED A PROTECTED FOREST ZONE IN 1961.
- C. INA. THE AGENCY IS RESPONSIBLE FOR AGRARIAN REFORM; ADMINISTERS THE UTILIZATION OF MANY AGRICULTURAL LANDS AND PRESENTLY MANAGES SALT EXTRACTION FROM HONDURAN COASTAL ZONES THOUGH WITHOUT LEGAL MANDATE.
- D. PIMHC. THE AGENCY IS RESPONSIBLE FOR ALL MINING AND PETROLEUM ACTIVITY INCLUDING COASTAL AND OUTER CONTINENTAL SHELF ACTIVITY AND THE RELATED ENVIRONMENTAL ISSUES ASSOCIATED WITH MINING.
- E. IHT. THE AGENCY IS EMPOWERED TO DESIGNATE AN AREA, A TOURIST ZONE, REQUIRING THAT FUTURE DEVELOP NOT DESPOIL THE QUALITY OF THE AREA THAT JUSTIFIED THE DESIGNATION.
- F. ENP. AN AUTONOMOUS AGENCY CREATED TO ADMINISTER THE COUNTRY'S PORTS. IT REGULATES THE BUILDING OF ARTIFICIAL STRUCTURES IN THE COASTAL ZONE AND IS CHARGED WITH ENFORCING LEGISLATION PREVENTING SHIP DISCHARGES IN PORTS OR ADJACENT WATERS.

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- G. SECOPT. PUBLIC WORKS ADMINISTERS THE CONSTRUCTION OF LARGE SCALE PROJECTS FOR THE PUBLIC GOOD SUCH AS ROADS AND POWER PLANTS.
- H. THE MUNICIPIOS. EACH MUNICIPALITY HAS A CERTAIN DEGREE OF AUTONOMY TO DEVELOP THE COASTAL ZONE WITHIN THE CONSTRAINTS OF THE LAW.
- I. AGENTS OF ENFORCEMENT. THESE INCLUDE THE AGENCY'S RESPECTIVE INSPECTORS, LOCAL POLICE, CUSTOMS AGENTS, THE MERCHANT MARINE AND ARMED FORCES.

THE MOST ILLUSTRATIVE EXAMPLE OF MANAGEMENT CONFLICT IS THE MANGROVE PROBLEM IN THE GULF OF FONSECA. BY LAW THE MANGROVES MANAGEMENT IS THE RESPONSIBILITY OF BOTH COHDEFOR AND DIRENARES WITH NO FORMAL MECHANISM OF COORDINATION BETWEEN THE TWO. THE PRINCIPAL NEED FOR UTILIZATION OF MANGROVES COMES FROM THE SALT PRODUCERS, A SECTOR MANAGED BY INA. TO BE SURE LACK OF COORDINATION IS NOT THE ONLY PROBLEM RESPONSIBLE FOR MANGROVE MISMANAGEMENT. THE GULF OF FONSECA ESPECIALLY IN THE EASTERN AREA HAS A HIGH LEVEL OF POVERTY. MANGROVE AS WELL AS OTHER TREES ARE UTILIZED NOT ONLY FOR ENERGY BUT CONSTRUCTION AND TANNIN PRODUCTION. THE LARGER CLEAR CUTS OF MANGROVES FOR INDUSTRIAL SALT PRODUCTION HAVE BEEN LEGAL (FROM COHDEFOR AND INA'S PERSPECTIVE) WHILE LOCAL HARVESTING ALTHOUGH ILLEGAL IS ACKNOWLEDGED AS A SOCIO-ECONOMIC PROBLEM AND DIFFICULT TO ADDRESS.

THE SOLUTION TO THESE "TYPES" OF CONFLICTS HAVE BEEN THE FORMATION OF INFORMAL COORDINATING GROUPS BETWEEN AGENCIES MORE SO THAN FORMAL INTERMINISTRY COUNCILS.

TO ADDRESS THE MANGROVE ISSUE A TECHNICAL GROUP WAS FORMED BETWEEN CONSUPLANE, COHDEFOR, RENARE AND THE DIRECTOR GENERAL OF INDUSTRIES. A PROPOSAL HAS BEEN DRAFTED WITH THE KEY COMPONENTS ADDRESSING MANGROVE INVENTORY, MANGROVE MANAGEMENT ON A SUSTAINED BASIS, AND SOLAR ENERGY SUBSTITUTION FOR FIREWOOD FOR PURPOSES OF SALT PRODUCTION. THE ISSUE IS REAL AND THE PROPOSAL DESERVING OF SUPPORT. THE KEY ELEMENT IS THE SUBSTITUTION OF AN ALTERNATIVE ENERGY SOURCE FOR FUELWOODS. A.I.D. PLAYS A SIGNIFICANT ROLE IN SUCH A PROJECT. THREE COMPONENTS ARE: A PILOT PROJECT, AN EDUCATIONAL EFFORT, AND TECHNICAL ASSISTANCE AND EXTENSION. THE AREAS SUGGESTED FOR SUCH A PROJECT WOULD BE THE RELATIVE BARREN SALT FLATS BEHIND THE ESTUARIES SIMILAR TO THE LOCATION UTILIZED FOR MARINE SHRIMP PRODUCTION ON THE PACIFIC COAST. DIFFERENT METHODOLOGIES SHOULD BE TESTED TO DETERMINE THE BEST ALTERNATIVE TO CONVEY ESTUARINE WATER TO SOLAR PONDS (SMALL LOCALLY BUILT PUMPS, WINDMILLS, ETC.). AN ADDITIONAL EFFORT SHOULD BE TO EXAMINE THE FEASIBILITY OF UTILIZING THESE SALT PONDS AS AQUACULTURE GROW OUT FACILITIES DURING THE WET SEASON. THE POTENTIAL FOR COOPERATIVE EFFORTS NEED ALSO BE STUDIED. ONCE PROVEN ECONOMICALLY AND ECOLOGICALLY VIABLE A PUBLIC EDUCATION AND EXTENSION OF TECHNICAL ASSISTANCE WOULD FOLLOW. THE PROJECT PRESENTLY CONTEMPLATED WOULD BE A SMALL SCALE EFFORT FOR A.I.D. BUT WITH A HIGH POTENTIAL FOR SUCCESSFUL IMPACT.

OTHER MAJOR ENVIRONMENTAL ISSUES IN THE GULF OF FONSECA INCLUDE THE HIGH SEDIMENT AND PESTICIDE LOADING FROM THE CHOLUTECA WATERSHED, OVERFISHING OF

CERTAIN KEY SPECIES OF SHELLFISH AND UNKNOWN ENVIRONMENTAL IMPACTS RESULTING FROM THE CONSTRUCTION AND SUBSEQUENT MAINTENANCE DREDGING OF THE NEW PORT OF SAN LORENZO. AS A.I.D. ALREADY FUNDS AN INTEGRATED WATERSHED MANAGEMENT PLAN IN THE CHOLUTECA WATERSHED IT SHOULD INTEGRATE THE REMAINING COMPONENTS OF THE WATERSHED, I.E., THE INTENSELY FARMED COASTAL PLAN AND ESTUARINE AREA. THE ISSUES THAT NEED TO BE ADDRESSED ARE THE FATE AND EFFECTS OF PESTICIDE USE IN THE GULF, AND TO WHAT DEGREE IRRIGATION IS INCREASING THE POSSIBILITIES OF SALT INTRUSION IN THE CHOLUTECA.

PRESENTLY IN HONDURAS THERE DOES NOT APPEAR TO EXIST EITHER THE NEED NOR AVAILABLE RESOURCES TO CREATE AN EFFECTIVE COASTAL ZONE MANAGEMENT UNIT. SUCH A UNIT SHOULD BE A FUTURE GOAL TO STRIVE FOR AS INFRASTRUCTURE DEVELOPS, MORE AREAS OF THE COASTAL ZONE BECOME ACCESSIBLE (MOST NOTABLY IN THE NORTHEAST COAST) AND INTERAGENCY PROBLEMS BECOME MORE FORMIDABLE. WHEN THE NEED FOR COASTAL ZONE MANAGEMENT BECOMES A REALITY CONSUPLANE AS THE NATIONAL COORDINATING AND PLANNING AGENCY WOULD APPEAR TO BE THE MOST VIABLE AGENCY FOR CZM PLAN IMPLEMENTATION.

AS AN INTERMEDIATE STEP IN ACHIEVING SUCH A GOAL, A GULF MANAGEMENT PLAN SHOULD BE CONTEMPLATED. BASED ON THE ASSUMPTION THAT THE POLITICAL CLIMATE WILL IMPROVE, SUCH A PLAN WOULD ENTAIL COOPERATION ON A LOCAL, REGIONAL, NATIONAL AND INTERNATIONAL LEVEL. AS DISTANT AS THAT MAY SEEM ONE MUST NOT UNDERESTIMATE THE ROLE OF ECONOMICS IN REGIONAL COOPERATIVE EFFORTS. THE COUNTRIES THAT BORDER THE GULF OF FONSECA BENEFIT FROM IT IN MANY WAYS INCLUDING AS A SOURCE OF PROTEIN, SALT, A MAJOR SOURCE OF EXPORTS AND AN ACCESS TO THE PACIFIC. THESE SHARED INTERESTS PROMOTE THE NEED FOR REGIONAL DEVELOPMENT AND MANAGEMENT.

UNTIL SUCH A TIME THAT THESE STEPS CAN BE TAKEN, ENVIRONMENTAL ISSUES SUCH AS THOSE OUTLINED ABOVE REQUIRE INDIVIDUAL TREATMENT BY COMMITTEES OF TECHNICAL PERSONNEL FROM RELEVANT AGENCIES. EVERY GOVERNMENT INSTITUTION CITED ABOVE WITH A PARTIAL COASTAL MANAGEMENT MANDATE HAS A TECHNICAL GROUP THOUGH FEW WITH AN ENVIRONMENTAL CAPABILITY. WHERE ABSENT AN ENVIRONMENTAL COMPONENT SHOULD BE BUILT INTO THE RESPECTIVE AGENCIES' TECHNICAL GROUPS IN THE ADDITION OF A LICENCIATURA OR MASTERS LEVEL ENVIRONMENTAL SCIENTIST. THIS COULD BE REQUIRED AS AN ARTICLE IN THE ENVIRONMENTAL LAW PRESENTLY BEFORE CONGRESS AND ENTAIL VERY LITTLE ADDITIONAL MONIES IN THE AGENCIES' BUDGETS.

A SMALL SCALE EFFORT HAS RECENTLY BEEN INITIATED BY DIRENARES TO CONDUCT A RESOURCE INVENTORY IN LAGUNA DE LOS MICOS. THE JUSTIFICATION FOR SUCH A SURVEY WAS THE INCREASING STRESS ON THE LAGOON (DISCHARGING OF IRRIGATION EFFLUENTS AND OVERFISHING) AND VIRTUALLY NO DATA BASE TO ASSESS THE SERIOUSNESS OF IMPACTS.

THE NORTHERN COASTAL LAGOONS ARE ONE OF THE FEW REMAINING UNTAPPED NATURAL AQUATIC RESOURCES IN HONDURAS. AS SUCH THESE RESOURCES SHOULD BE EVALUATED TO UNDERSTAND THE ROLE THEY PLAY IN RELATED COASTAL ECOSYSTEMS AND HOW THEY CAN BE MANAGED TO SERVE AS MAJOR SOURCES OF PROTEIN. THE ABOVE EFFORT SHOULD BE EXPANDED TO INCLUDE THE REMAINING NORTHERN LAGOONS. RESOURCE INVENTORIES SHOULD BE FOLLOWED BY A MONITORING PHASE SPREAD OVER A 1-2 YEAR PERIOD TO

BETTER UNDERSTAND THE DYNAMICS OF THESE LAGOONS. THIS PHASE SHOULD BE FOLLOWED UP BY THE IMPLEMENTATION OF MANAGEMENT RECOMMENDATIONS WITH THE OBJECTIVE OF DETERMINING AN INDIVIDUAL LAGOON'S MAXIMUM SUSTAINABLE YIELD AS SOURCES OF PROTEIN.

MANY OF THE ENVIRONMENTAL ISSUES ADDRESSED IN THIS ANALYSIS ARE TEMPORARY IN NATURE AND CAN BE RECTIFIED WITH A CORRECT AND ADEQUATE INPUT OF RESOURCES. THIS PATTERN, HOWEVER EFFECTIVE IN INDIVIDUAL TREATMENT, FAILS TO CONSIDER THE UNDERLYING SOURCE OF MANY OF THE COASTAL AND MARINE ASSOCIATED PROBLEMS IN HONDURAS, I.E., AN INADEQUATE HUMAN RESOURCE AND INFRASTRUCTURE BASE. HONDURAS A COUNTRY WITH TWO COASTS WHOSE COMBINED LENGTH IS 840 KMS., A FISHING INDUSTRY WITH EXPORTS VALUE AT \$25 MILLION ANNUALLY AND A CONTINENTAL

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SHelf MEASURING 50,000 KMS DOES NOT HAVE THE CAPABILITY TO PRODUCE A MARINE SCIENTIST OR A FACILITY TO CONDUCT BASIC RESEARCH.

TO REMEDY THE SITUATION A TWO STEP PROCESS IS RECOMMENDED TO BUILD UP EXISTING OR CONSTRUCT NEW PHYSICAL INFRASTRUCTURE FOR PURPOSES OF PROVIDING A MARINE RESEARCH FACILITY WHILE SUPPLYING A MECHANISM TO SEND QUALIFIED CANDIDATES OUT OF COUNTRY TO SPECIALIZE IN MARINE SCIENCES.

THE FIRST COMPONENT COULD CONSIST OF A TRIANGULAR AGREEMENT BETWEEN PRIVATE SECTOR GROUPS OR BENEFICIARIES OF BASIC MARINE RESEARCH, USAID AND DIRENARES/UNAH. THE PRIVATE SECTOR, IF AGREEABLE, WOULD PROVIDE IN KIND AID IN THE FORM OF LEASING AVAILABLE SEASIDE FACILITIES (AQUA FINCA, SEA FARMS) AND SHIPTINE (HYBUR MARISCOS, MARISCOS AGUA AZUL); USAID WOULD PROVIDE FINANCIAL AND POSSIBLY TECHNICAL ASSISTANCE TO DEVELOP THE FACILITY; AND DIRENARES/UNAH WOULD PROVIDE THE GOH COUNTERPART. ANOTHER CONSIDERATION IS THE PRESENCE OF A SEASIDE FACILITY IN LA CEIBA MANAGED BY DIRENARES.

THE SECOND COMPONENT PROCEEDING IN LOCK STEP WITH THE FIRST WOULD BE THE PROVIDING OF FIVE FELLOWSHIPS TO NATURAL SCIENCE GRADUATES TO STUDY IN REGIONAL MARINE INSTITUTIONS AT THE MASTERS LEVEL. FELLOWSHIPS NEED NOT ALL BE CONCURRENT AND MAY BE PROVIDED THROUGH SEVERAL SOURCES SUCH AS THE CURLA PROGRAM, THE UNAH IN TEGUCIGALPA, USAID AND THE TINKER CENTER.

ONLY WITH THE CREATION OF A MECHANISM TO PRODUCE HONDURAN MARINE RESOURCE SPECIALISTS WILL SUCH ISSUES AS INEFFECTIVE FISHERIES MANAGEMENT, COASTAL ENVIRONMENTAL DEGRADATION, AND FISHERIES DEVELOPMENT BE ADEQUATELY ADDRESSED.

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APPENDIX 1. DIRENARES --- AN INSTITUTIONAL ANALYSIS

THE ADMINISTRATIVE AGENCY WHOSE MANDATE IS THE MANAGEMENT OF LIVING NATURAL RESOURCES IS DIRECCION GENERAL DE RECURSOS NATURALES RENOVABLES (DIRENARES). CREATED IN 1974, DIRENARES HAS TWO ADMINISTRATIVE UNITS: FISHERIES AND WILDLIFE MANAGEMENT. THE FISHERIES UNIT IS DIVIDED UP INTO OFFICES OF STATISTICS, INSPECTION, REGISTRATION, PROMOTION, AQUACULTURE AND APPLIED INVESTIGATIONS. OF THE APPROXIMATELY 150 PEOPLE THAT WORK IN THE FISHERIES UNIT, ONLY 15 ARE TRAINED BIOLOGISTS.

THE 1980 BUDGET FOR DIRENARES WAS REDUCED FROM \$1.25 MILLION TO \$1.04 MILLION, WITH THE MAJOR PORTION ALLOCATED TO FISHERIES (MURILLO, PERSONAL COMMUNICATION). DIRENARES EXPERIENCED ADMINISTRATIVE DIFFICULTIES IN 1980 WITH THE APPOINTMENT OF THREE DIFFERENT DIRECTORS, EACH CHANGE ACCOMPANIED BY AN ADMINISTRATIVE RESHUFFLING.

THE DEPARTMENT OF STATISTICS IS RESPONSIBLE FOR THE COLLECTION OF DATA NECESSARY TO MANAGE FISH STOCKS. SOURCES OF DATA ARE EXPORT AND IMPORT STATISTICS (THE LATTER COMING FROM THE U.S.), CATCH STATISTICS (FORWARDED FROM THE INDUSTRIAL SECTOR EVERY 15 DAYS), AND PERIODIC STATISTICS COLLECTED BY INSPECTORS FROM LOCAL MARKETS. STATISTICS ARE CONFINED TO GENERIC OR COMMON NAME CATEGORY, PROCESSED PRODUCTS, PACKAGE BY NUMBER AND WEIGHT, AND PRICE.

THE DEPARTMENT RESPONSIBLE FOR COLLECTING STATISTICS, REGISTRATION AND ENFORCEMENT OF BOTH WILDLIFE AND FISHERY LEGISLATION IS INSPECTION. AT PRESENT THERE ARE ONLY 27 INSPECTORS IN THE COUNTRY. GIVEN THEIR MISSION THEY ARE LARGELY INEFFECTIVE AS A RESULT OF SEVERAL FACTORS INCLUDING LACK OF TRAINING, THE MAGNITUDE OF TASKS THEY HAVE BEEN GIVEN, INSUFFICIENT BUDGET MOST NOTABLY FOR VEHICLES AND TRIP EXPENSES, AND DECIDED INDIFFERENCE ON THE GOVERNMENT TOWARD STRICT INTERPRETATION OF REGULATIONS. THESE LATTER TWO FACTORS ARE BEST ILLUSTRATED BY THE FOUR INSPECTORS DISTRIBUTED ON THE THREE BAY ISLANDS, THE CENTER OF THE INDUSTRIAL FISHING SECTOR. IN THE CASE OF ROATAN THE INSPECTOR'S BUDGET CONSISTS OF HIS SALARY AND NO RESOURCES TO REPAIR THE MOTORBIKE REQUIRED TO MAKE HIS BIWEEKLY INSPECTIONS. THESE INSPECTORS' EFFORTS ARE LIMITED TO SPOT CHECKS FOR SIZE LIMITATIONS AND HYGIENE. IN 1980 AN ESTIMATED \$8,450 IN FINES WERE LEVIED (INFORME ANUAL RENARES, 1980).

THE DEPARTMENT OF REGISTRATION IS RESPONSIBLE FOR THE REGISTRATION OF BOTH ARTESANAL AND INDUSTRIAL FISHERMEN AND BOATS. AT THE INDUSTRIAL LEVEL SEPARATE LICENSES FOR LOBSTER AND SHRIMP ARE REQUIRED AND A COMBINATION LICENSE IS AVAILABLE. REGISTRATION APPEARS WELL ENFORCED IN THE COMMERCIAL SECTOR. IN THE ARTESANAL SECTOR AN ESTIMATED 50% OF ALL FISHERMEN ARE REGISTERED (MURILLO, PERSONAL COMMUNICATION). REGISTRATION IS REQUIRED EVERY YEAR.

PRIOR TO 1977 THERE HAD BEEN NO COORDINATED ATTEMPT TO DEVELOP A NATIONAL AQUACULTURE PROGRAM. IN 1977 AN AGREEMENT WAS SIGNED BETWEEN A.I.D. AND THE GOH TO INITIATE A THREE YEAR PILOT PROJECT WHICH INCLUDED CONSTRUCTION OF A RESEARCH CENTER, A HATCHERY AND PONDS, THREE YEARS OF TECHNICAL ASSISTANCE AND TRAINING COMPONENT. THE OBJECTIVES OF THE PROJECT ARE TO PROVIDE THE EXPERTISE REQUIRED TO MAKE BETTER USE OF THE COUNTRY'S RESOURCES, ASSIST IN DEVELOPMENT OF THE COUNTRY'S POOR RURAL AREAS, AND PROVISION OF TECHNICAL ASSISTANCE TO THOSE THAT REQUEST IT. IN 1980, A TOTAL OF 11 PROFESSIONALS AND TECHNICIANS WORKED IN THE PROJECT WITH A REDUCED BUDGET OF \$60,000. THE PROJECT HAS SUFFERED FROM ADMINISTRATIVE PROBLEMS AND FURTHER ASSISTANCE IS BEING DELAYED UNTIL EFFORTS OF THE NEW GOV ADMINISTRATION CAN BE EVALUATED.

THE DEPARTMENT OF APPLIED INVESTIGATION WAS CREATED IN 1980 WITH THE INTENT OF PROVIDING TECHNICAL ASSISTANCE TO BOTH THE FISHERY AND WILDLIFE MANAGEMENT SECTIONS. CURRENT PROJECTS INCLUDE JOINT EFFORTS WITH THE CHINESE AND JAPANESE MISSIONS IN FISH PREPARATION, PROCESSING AND PUBLIC EDUCATION TO MODIFY EXISTING ATTITUDES TOWARDS FISH CONSUMPTION. PROJECTS THAT WERE PROPOSED TO BEGIN THIS YEAR SUFFERED FROM SEVERAL SETBACKS WHICH INCLUDED THE ACCIDENTAL SINKING OF A BOAT DONATED BY THE JAPANESE TO BEGIN AN EXPLORATORY FISHING SURVEY OF THE NORTHERN COAST AND DELAYS IN OUTFITTING A BOAT IN THE PACIFIC TO INITIATE A SIMILAR EFFORT. A CONSERVATION PROJECT OF PACIFIC MARINE TURTLES IS PLANNED FOR AUGUST WHICH WILL INCLUDE PUBLIC EDUCATION, EGG RECOVERY, HATCHING AND RELEASE COMPONENTS. A SECOND PROJECT PROPOSAL FOR THE CONSERVATION OF THE MANATEE IS BEING MANAGED FROM LA CEIBA. THE OBJECTIVE IS TO OBTAIN A MANAGEMENT AREA DESIGNATION BETWEEN THE CUERO AND SALADO RIVERS. THIS AREA WHICH IS UNDER INTENSIVE PRESSURE FROM RICE FARMING IS ONE OF THE FEW REMAINING AREAS WHERE MANATEE POPULATIONS ARE KNOWN.

FINALLY, AS A RESULT OF INTENSIVE PRESSURE ON THE BAHIA DE LOS MICOS FROM INTENSIVE FISHING PRESSURE AND IRRIGATION EFFLUENT FROM BANANA AND AFRICAN PALM PLANTATIONS, A LAGOON INVENTORY HAS BEGUN TO PROVIDE THE BASIC INFORMATION TO FORMULATE A LAGOON MANAGEMENT PLAN. IT IS HOPED THAT RESOURCES WILL ALLOW INCORPORATION OF OTHER NORTH COAST LAGOONS.

DIRENARES MANDATE TO MANAGE LIVING AQUATIC RESOURCES COMES FROM LEY 154 APPROVED AND SIGNED IN 1959. AMONG OTHER STIPULATIONS IT ALLOWS FOR MANAGEMENT OF ALL COASTAL AND AQUATIC FLORA AND FAUNA, LICENSING, GEAR RESTRICTIONS, CLOSING OF SEASONS AND FISHERIES, AQUA AND MARICULTURE ACTIVITIES. LEGISLATION DOES EXIST TO PREVENT FISHING IN NURSERY AREAS, PROHIBIT THE DUMPING OF TOXIC SUBSTANCES IN THE COUNTRY'S WATERS AND PROHIBIT THE USE OF DYNAMITE. AT PRESENT IT IS ILLEGAL TO HUNT MANATEE, COLLECT MARINE TURTLES AND THEIR EGGS, HARVEST BLACK CORAL FROM NATIONAL WATERS AND CUT MANGROVES OR OTHER TREES ON THE EDGE OF RIVERS OR COASTS. SPECIFIC RESOURCES PRESENTLY MANAGED ARE LOBSTER (5 1/2-INCH TAILS OR LARGER, NO GRAVID FEMALES). CARIBBEAN SHRIMP (SEASONAL CLOSING OF FISHERY) AND SIZE RESTRICTIONS ON THE CURILE AND MANGROVE OYSTER FROM THE PACIFIC COAST.

IN 1980, THE GOH DECLARED A 200 NAUTICAL MILE EEZ THAT GAVE THE COUNTRY SOVEREIGN RIGHTS OVER THE EXPLOITATION, CONSERVATION AND ADMINISTRATION OF NATURAL RESOURCES OF THE OCEAN FLOOR, SUBSOIL AND OVERLYING WATERS. AN INTERMINISTERIAL COMMITTEE HAS BEEN FORMED TO ASSIST IN IMPLEMENTING THE LAW. DIRENARES IS RESPONSIBLE FOR ENFORCING ITS MANDATE IN FRESH AND MARINE WATERS OUT TO 200 NAUTICAL MILES. TO DO SO, THEY HAVE TO RELY ON THEIR OWN INSPECTORS, THE MERCHANT MARINE AND THE ARMED FORCES.

THE DEPARTMENT HAS TWO RESEARCH STATIONS, AN AGRICULTURAL LABORATORY AND A MARINE LABORATORY IN LA CEIBA. THE LATTER CONSISTS OF LITTLE MORE THAN AN EMPTY HOUSE THOUGH WITH A PREFERRED SEASIDE LOCATION. WITH THE PROPER MODIFICATIONS IT COULD BE MOST SUITABLE FOR A CENTER OF MARINE INVESTIGATION. FIVE BIOLOGISTS WORK FOR THE DEPARTMENT WITH A CURRENT BUDGET OF \$80,000.

IN 1978, A JOINT PROJECT BETWEEN THE INTERAMERICAN DEVELOPMENT BANK, THE EEC AND THE GOH WAS INITIATED TO ORGANIZE AND ASSIST FIVE FISHING COOPERATIVES. THERE ARE FOUR COMPONENTS OF THE PROJECT: ESTABLISH A LINE OF CREDIT FOR THE FISHERMEN IN THE COOPERATIVE TO ACQUIRE BOATS, EQUIPMENT, ETC.; CONSTRUCT ADEQUATE LANDING FACILITIES IN LA CEIBA, TELA, TRUJILLO AND PUERTO CORTES, AND COYOLITO-AMAPALA; PROVIDE ADEQUATE PROCESSING, PRESERVATION AND

DISTRIBUTION FACILITIES; AND PROVIDE TECHNICAL ASSISTANCE TO THE
COOPERATIVES. THE LOAN WHICH AMOUNTS TO \$3.4 MILLION HAS BEEN BADLY
ADMINISTERED BY THE GOH WHICH HAS RESULTED IN DELAYS. ONE RESULT WAS THE
REMOVAL OF THE PROGRAM FROM THE FISHERIES UNIT OF RENARES TO A POSITION
DIRECTLY UNDER THE SECRETARIAT OF NATURAL RESOURCES FROM WHERE IT IS
ADMINISTERED.

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APPENDIX 2. PERSONS CONTACTED

GOH

MARIO BERLIOZ
COORDINADOR NACIONAL DE ACUACULTURA
DIRENARES, TEGUCIGALPA

MIRNA MARIN*
DIRENARES
TEGUCIGALPA

JOSE CECILIO ZELAYA
JEFE, UNIDAD TECNICA
IHT, TEGUCIGALPA

VICTOR MARTINEZ
JEFE, LABORATORIO DE BIOLOGIA MARINA
DIRENARES, LA CEIBA

CLARISA DE FERRERA
DEPARTAMENTO LEGAL
DIRENARES, TEGUCIGALPA

ASTOR MCLIBERTY
SUPERINTENDENTE DE PUERTO
ENP, PUERTO CORTES

JONATHAN ESPINOZA*
JEFE, DEPARTAMENTO DE INVESTIGACION
DIRENARES, TEGUCIGALPA

MANFREDO MURILLO*
JEFE DE DEPARTAMENTO DE PESCA
DIRENARES, TEGUCIGALPA

SIXTO EVELIO A.
INSPECTOR, PESCA Y CAZA
DIRENARES, ROATAN

NAPOLEON RAMOS
MINAS E HIDROCARBUROS
SRN

OSCAR FLORES
COMDEFOR
TEGUCIGALPA

SIGFRIDO SANDOVAL*
MINAS E HIDROCARBUROS
SRN

MARIO LOPEZ
INSPECTOR, PESCA Y CAZA
DIRENARES, LA CEIBA

GLEN SALOMON*
GOBERNADOR DE LAS ISLAS DE LA BAHIA
ROATAN

EDUARDO TORO
ENP, TEGUCIGALPA

PRIVATE SECTOR

KENNETH W. ETHEREDGE
GENERAL MANAGER, TEXACO
SAN PEDRO SULA

RALPH PARKMAN
SEA FARMS DE HONDURAS
CHOLUTECA

ALAN AND KERN HYDES
HYBUR MARISCOS
ROATAN

JIM RADAWSKI
DOC'S DIVE SHOP
ROATAN

ALBERT JACKSON
MARISCOS AGUA AZUL
ROATAN

WAYNE TOYO FUKU
RESEARCH MANAGER, AQUA FINCA
SAN PEDRO SULA

RAFAEL MOLINA*
PROMARSA
SAN LORENZO

* SHOULD RECEIVE COPIES OF THE FINAL REPORT.

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ACADEMIC SECTOR

BECKY MYTON
DEPARTAMENTO DE BIOLOGIA
UNAH

DEPARTAMENTO DE BIOLOGIA
UNAH

BILATERAL AID

ANDRES MARCHANT*
SECTOR SPECIALIST
BID, TEGUCIGALPA

SANTIAGO VALLADARES
CHIEF, AQUACULTURE PROJECT
USAID

NICHOLAS METES
NATURAL RESOURCES PROGRAM
U.S. PEACE CORPS
TEGUCIGALPA

* SHOULD RECEIVE COPIES OF THE FINAL REPORT.

APPENDIX 3. ACRONYMS

AID AGENCY FOR INTERNATIONAL DEVELOPMENT
API AMERICAN PETROLEUM INSTITUTE
BID INTER AMERICAN DEVELOPMENT BANK
COMDEFOR HONDURAN FOREST CORPORATION
DIRENARES DIRECTORATE OF RENEWABLE RESOURCES
DIMHC DIRECTORATE OF MINES AND HYDROCARBONS
ENP NATIONAL PORT AUTHORITY
FAO FOOD AND AGRICULTURE ORGANIZATION
GOH GOVERNMENT OF HONDURAS
IHT HONDURAN TOURISM INSTITUTE
INA AGRARIAN REFORM INSTITUTE
IUCN INTERNATIONAL UNION FOR CONSERVATION OF NATURE
NMFS NATIONAL MARINE FISHERIES SERVICE
SECOPT SECRETARIAT OF COMMUNICATIONS, PUBLIC WORKS, AND TRANSPORT
UNAH NATIONAL UNIVERSITY OF HONDURAS
UNEP UNITED NATIONS ENVIRONMENTAL PROGRAM
WECAF WESTERN CENTRAL ATLANTIC FISHING COMMISSION

BIBLIOGRAPHY

- CABALLERO, H. L. 1976. MONOGRAFIA DE LAS COSTAS DE HONDURAS. INTERREGIONAL SEMINAR ON THE DEVELOPMENT AND MANAGEMENT OF RESOURCES OF COASTAL AREAS BERLIN, ED. SZEKIELDA AND BREVER
- CARR, A.F. AND L. GIOVANNOLI 1950. THE FISHES OF THE RIO CHOLUTECA DRAINAGE OF SOUTH HONDURAS. OCC. PAPERS OF THE MUSEUM OF ZOOLOGY, U. OF MICH NO. 523
- CID, O.F. DEL 1976. IMPACTO ECOLOGICO DEL MINERAL EL MOCHITO. DIVISION DE INGENIERIA AMBIENTAL, DIRECCION GENERAL DE MINAS E HIDROCARBUROS, SECRETARIA DE RECURSOS NATURALES.
- CRUZ, G. A. 1980 LAGO DE YOJDA. DEPARTAMENTO DE ECOLOGIA. DIRECCION GENERAL DE RECURSOS NATURALES RENOVABLES, SECRETARIA DE RECURSOS NATURALES.
- DATA ATLAS. DRAFT. PLANNING A MARINE CONSERVATION STRATEGY FOR THE CARIBBEAN REGION IUCN/UNEP/CEPAL.
- DAVIDSON, W.V. 1979. HISTORICAL GEOGRAPHY OF THE BAY ISLANDS HONDURAS. SOUTHERN U. PRESS.
- DULIN, P. 1979. NATURAL RESOURCES CONSERVATION AND WATERSHED MANAGEMENT IN ROATAN, BAY ISLANDS, HONDURAS. COHDEFOR, TEGUCIGALPA, HONDURAS.
- ECONOMIST INTELLIGENCE UNIT. 1977. AN EVALUATION OF THE MANGROVE FOREST RESOURCE IN THE GULF OF Fonseca, REPUBLIC OF HONDURAS.
- ESTADISTICAS PESQUERAS 1978. SECRETARIA DE RECURSOS NATURALES, DIRENARES, HONDURAS.
- ESTADISTICAS PESQUERAS 1979 (DRAFT). SECRETARIA DE RECURSOS NATURALES DIRENARES, HONDURAS.

ESTADISTICAS PESQUERAS 1980 (DRAFT). SECRETARIA DE RECURSOS NATURALES
DIRENARES, HONDURAS.

FAO 1965. FOREST MAP OF HONDURAS. PINE FOREST SURVEY PROJECT FAO/UNDP.

FAO. 1980 HONDURAS FISHERY COUNTRY PROFILE FAO/FID/CP/HON REV. 1.

GIUDICELLI, M. 1979. PROGRAMA PARA LA INVESTIGACION Y LA EVALUACION
COMERCIAL
DE LOS PRINCIPALES POTENCIALES PESQUEROS MARITIMOS DE
HONDURAS. WECAP/FAO
NO. 23.

GRUPO TECNICO 1981. PROPUESTO PROTECCION Y DESARROLLO DE LOS MANGLARES
DEL
GOLFO DE FONSECA, HONDURAS. COHDEFOR/RENARE/CONSUPLANE.

HEIBIG, K. M. 1971. AREAS Y PAISAJES DEL NORESTE DE HONDURAS. BANCO
CENTRAL DE
HONDURAS.

HONDURAS 1971. AREA HANDBOOK FOR HONDURAS. AMERICAN UNIVERSITY.

HU, S. C., LU O.T AND M. N. LIN 1978. ESTUDIO MORFOMETRICO SOBRE LOS
CURILES
SERIE DE PESCA NO. 6, DIRENARES.

INFORME ANNUAL 1980. DIRECCION GENERAL DE RECURSOS RENOVABLES.

LANDINE, R. C. 1978. ENVIRONMENTAL ENGINEERING IN THE MINING SECTOR FOR
THE
DIRECCION GENERAL DE MINAS E HIDROCARBUROS.

LIN, S. Y. 1956. LOS RECURSOS PESQUEROS DE LAS AGUAS INTERIORES.
FAO/56/11/8725, ROME, ITALY.

MCBIRNEY, A. AND M. BASS. 1969. GEOLOGY OF THE BAY ISLANDS, GULF OF
HONDURAS
IN TECTONIC RELATIONS OF NORTHERN CENTRAL AMERICA AND THE
WESTERN
CARIBBEAN. THE BONACCA EXPEDITION, AM. ASSOC. OF PET.
GEOL. MEM. II.

MEMORIA 1979. EMPRESA NACIONAL PORTUARIA, PUERTO CORTES, HONDURAS.

NATURAL DISASTERS 1980. NATURAL DISASTERS IN THE WIDER CARIBBEAN AREA: AN
OVERVIEW UNEP/CEPAL/WG. 48/JNF-13.

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N.M.F.S. 1981. THE FISHERIES OF HONDURAS 1980. FOREIGN FISHERIES ANALYSIS
DIVISION, NATIONAL MARINE FISHERIES SERVICE/NOAA/DOC.

NEDECO 1979. OCEAN PORT IN THE GULF OF FONSECA, FINAL REPORT I. EMPRESA NACIONAL PORTUARIA DE HONDURAS.

N.M.F.S. 1976. THE LOBSTER FISHERY OF HONDURAS. OFFICE OF INTERNATIONAL FISHERIES, NATIONAL MARINE FISHERY SERVICE/NOAA/DOC.

PLAN OPERATIVO ANNUAL-SECTOR PESCA 1980. SECRETARIA TECNICA DEL CONSEJO SUPERIOR DE PLANIFICACION AGRICOLA.

PROYECTO TOURNASAL 1975. A TECHNICAL AND ECONOMIC FEASIBILITY STUDY OF THE TOURNASAL-COPAN-ROATAN PROJECT. ROBERT NATHAM ASSOC. INC.

RATHUN G. AND J. POWELL 1979. HONDURAS MANATEC SURVEY, 28 FEB 25 MARCH 1979. TRIP REPORT.

RIO PLATANO DRAFT. PLAN DE MANEJO. RESERVA DE LA BIOSFERA, RIO PLATANO.

TAMS 1979. DREDGING OF LARBOR BASIN AND ACCESS CHANNEL OF THE PORT OF SAN LORENZO. FINAL REPORT.

WECAF 1975. AN ASSESSMENT OF CRUSTACEAN RESOURCES OF THE WESTERN CENTRAL ATLANTIC AND NORTHERN SOUTHWEST ATLANTIC. WECAF STUDIES NO. 2.
FAO/UNDP.

WORLD BANK 1980. WORLD BANK ASSISTS PETROLEUM EXPLORATION IN HONDURAS. BANK NEWS RELEASE NO. 80/111.

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HONDURAS ENVIRONMENTAL PROFILE

CHAPTER VII

WILDLIFE, WILDLANDS AND ENVIRONMENTAL EDUCATION IN HONDURAS

DENNIS GLICK
NATURAL RESOURCES MANAGER

JRB ASSOCIATES
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WILDLIFE, WILDLANDS AND ENVIRONMENTAL EDUCATION IN HONDURAS

"IN THE UNINHABITED REGIONS OF HONDURAS, WILDLIFE HAS LONG BEEN ALMOST EXTINCT EXCEPT FOR IGUANAS AND SNAKES, BOTH ADAPTABLE TO CHANGING CONDITIONS. THERE IS NO EVIDENCE THAT ADDITIONAL FARMING UNITS IN THE UNINHABITED AREAS WILL AFFECT WILDLIFE EITHER ADVERSELY OR FAVORABLY". A.I.D. PROJECT PAPER HONDURAS--SMALL FARMER TECHNOLOGIES, 1976.

"OF COURSE THEY ARE FRESHLY KILLED."

OWNER OF A SMALL STORE LOCATED THREE BLOCKS FROM THE OFFICE OF WILDLIFE AND ENVIRONMENTAL RESOURCES AS HE SHOWED THE INVESTIGATOR A LARGE CARDBOARD BOX FILLED WITH JAGUAR, OCELOT AND RIVER OTTER SKINS.

1.0 INTRODUCTION

HONDURAS, SECOND LARGEST OF THE CENTRAL AMERICAN COUNTRIES IS ALSO ONE OF MOST GEOGRAPHICALLY AND BIOLOGICALLY DIVERSE. THE 112,088 KM² OF NATIONAL TERRITORY HARBOURS REPRESENTATIVE SAMPLES OF SOME OF MESOAMERICA'S MOST ECOLOGICALLY AND ECONOMICALLY IMPORTANT WILDLAND AND WILDLIFE RESOURCES. FROM PRISTINE CORAL REEFS TO LUSH CLOUD FORESTS, PINE CLAD SAVANNAH TO TROPICAL RAIN FOREST, THE POTENTIAL FOR SUSTAINED YIELD DEVELOPMENT BASED UPON RATIONAL UTILIZATION OF THE NATURAL RESOURCE BASE APPEARS TO BE HONDURAS' MOST PROMISING STRATEGY. BUT SOUND UTILIZATION IS DEPENDENT UPON APPROPRIATE RESOURCE MANAGEMENT - A DEFICIENT COMPONENT IN THIS COUNTRY'S DEVELOPMENT PRACTICES. BOTH HARDWOODS AND PINE FOREST STOCKS ARE BEING RAPIDLY DEPLETED, SOIL EROSION IS RAMPANT, DOZENS OF PLANT AND ANIMAL SPECIES ARE EMINENTLY THREATENED WITH EXTINCTION, HYDROELECTRIC POWER POTENTIAL IS BEING REDUCED, POTABLE WATER SUPPLIES LOWERED AND TOURIST DEVELOPMENT OPPORTUNITIES LIMITED.

HOWEVER, THE EXISTENCE OF BASIC INSTITUTIONAL AND TECHNICAL RESOURCES TO DEAL WITH THESE PROBLEMS WOULD INDICATE THAT WITH A FIRM NATIONAL COMMITMENT AND RESPONSIBLE INTERNATIONAL ASSISTANCE, HONDURAS CAN ACHIEVE THE GOAL OF BALANCING NATURAL RESOURCE UTILIZATION WITH NATURAL RESOURCE PROTECTION. MANAGEMENT OF WILDLANDS AND WILDLIFE AND INITIATION OF ENVIRONMENTAL EDUCATION PROGRAMS MUST BE AN INTEGRAL COMPONENT OF THIS EFFORT.

THE FOLLOWING CHAPTER WILL INCLUDE BOTH WILDLIFE AND WILDLAND CHARACTERISTICS OF HONDURAS AND AN ANALYSIS OF THE INSTITUTIONS CHARGED WITH THEIR MANAGEMENT. IT BEGINS WITH WILDLANDS; THEIR HABITAT COMPOSITION AND BIOLOGICAL AND ECONOMIC IMPORTANCE, LEGAL STATUS, STATE OF MANAGEMENT AND CAPABILITIES OF THE MANAGING AGENCIES. THE REPORT WILL THEN DISCUSS FAUNAL RESOURCES IN A SIMILAR FASHION BEGINNING WITH A DESCRIPTION OF SPECIES AND THEIR SIGNIFICANCE AND CONCLUDING WITH REVIEW AND CRITIQUE OF WILDLIFE MANAGEMENT EFFORTS. ENVIRONMENTAL EDUCATION WILL BE DISCUSSED AND FINAL

RECOMMENDATIONS CONCERNING ALL OF THESE IMPORTANT COMPONENTS OF NATURAL RESOURCE MANAGEMENT WILL BE DETAILED.

GENERAL CHARACTERISTICS OF HONDURAN NATURAL AREA: ABOUT THE SIZE OF OHIO, HONDURAS IS BORDERED BY GUATEMALA, EL SALVADOR AND NICARAGUA WITH A NORTHERN CARIBBEAN COAST STRETCHING SOME 640 KM. AND A SHORTER 124 KM. SOUTHERN COASTLINE ON THE PACIFIC. MOST OF THE NATIONAL TERRAIN IS MOUNTAINOUS (ABOUT 80%), THE HIGHEST POINT BEING 2,849 METERS. THOUGH SEVERAL VALLEYS DISSECT THE MOUNTAIN RANGES OF THE WEST, THE ONLY EXTENSIVE EXPANSES OF FLATLANDS ARE THE CARIBBEAN COASTAL PLAINS AND TWO MAJOR NORTH COAST RIVER VALLEYS; THE AGUAN AND THE ULUA. THE PACIFIC COAST NEAR THE GULF OF FONSECA IS ALSO CHARACTERIZED BY A THIN BELT OF LOWLANDS BETWEEN THE SEA AND THE INTERIOR MOUNTAINS. AT ITS NARROWEST POINT, THE DISTANCE BETWEEN THE ATLANTIC AND THE PACIFIC IS ABOUT 280 KM.

THE INFLUENCE OF THESE TWO SEAS, RUGGED TOPOGRAPHY AND VARYING SOIL TYPES HAS RESULTED IN A WIDE ARRAY OF NATURAL ECOSYSTEMS. ACCORDING TO THE HOLDRIDGE LIFE ZONE SYSTEM (HOLDRIDGE, L. 1962) THE FOLLOWING LIFE ZONES HAVE BEEN IDENTIFIED: TROPICAL MOIST FOREST - 29% OF THE TOTAL LANDMASS; TROPICAL DRY FOREST - 15.2%; TROPICAL ARID FOREST - .003%; WET SUBTROPICAL FOREST - 14.1%; MOIST SUBTROPICAL FOREST - 35.4%; SUBTROPICAL DRY FOREST - 1.5%; LOWER MONTANE MOIST FOREST - 2.6%; AND LOWER MONTANE WET FOREST - 2.1%. AND, ALTHOUGH NOT YET COMPLETED, RECENT REVISIONS OF THIS ZONAL MAP INDICATE THAT SEVERAL OTHER LIFE ZONES OCCUR WITHIN THE COUNTRY. USING THE UDVADY SCHEME FOR WORLD BIOGEOGRAPHICAL PROVINCES, HONDURAS FALLS WITHIN TWO CATEGORIES: THE CENTRAL AMERICAN AND GRAND CHACO PROVINCES IN THE NEOTROPICAL REALM (UDVADY, N. 197).

THE PREVAILING MOISTURE LADEN EASTERLIES AT THE CARIBBEAN DRENCH THE HOT AND HUMID ATLANTIC WATERSHED WITH BETWEEN 1750 AND 2500 MM. OF RAIN ANNUALLY. THIS HAS RESULTED IN A PROFUSE GROWTH OF VEGETATION AND A CLIMAX FOREST TYPE OF TROPICAL RAIN FOREST. THESE WOODLANDS, WHERE UNALTERED BY MAN ARE GENERALLY CHARACTERIZED BY BROADLEAF TREES ALTHOUGH IN SOME AREAS (PROBABLY AS A RESULT OF FIRE AND EDAPHIC CONDITIONS) THEY ARE INTERSPERSED WITH PINE SAVANNAH. IN SEVERAL SHELTERED LAGOONS AND COASTAL REGIONS MANGROVE SWAMPS FRINGE THE COAST AND FOLLOW THE BRACKISH RIVER SOME WAYS INLAND. BARRIER REEFS SURROUNDING THE BAY ISLANDS AND OTHER ISOLATED CORAL RINGED KEYS ON THE CARIBBEAN ARE SOME OF THE BEST DEVELOPED AND MOST PRISTINE IN THIS HEMISPHERE.

THE WESTERN INTERMOUNT BASINS, VALLEYS AND MOUNTAINS WHICH ARE NOT EXPOSED TO THESE MOIST WINDS ARE OCCUPIED MOSTLY BY STANDS OF PINE (PINUS QUERCIFOLIA ON THE LOWER SLOPES AND PINUS PSEUDOSTROBUS IN THE HIGHER REACHES) AND OAK (QUERCUS SERRATA). ON SLOPES AND PLATEAUS ABOVE 1,200 METERS HARDWOOD COMMUNITIES KNOWN AS CLOUD FOREST OFTEN OCCUR. SEVERAL VALLEYS TO THE NORTH AND EAST OF TEGUCIGALPA, THE CAPITAL CITY, ARE ALMOST DESERT LIKE IN APPEARANCE AND OFTEN A STRIKING CONTRAST TO THE COOL, GREEN CLOUD FOREST ABOVE THEM (BETANCCURT ET AL. 1973). THE SOUTHERN COAST IS CHARACTERIZED BY LARGE EXPANSES OF MANGROVE AND FURTHER INLAND REMNANT TROPICAL DRY FOREST.

OF EQUAL IMPORTANCE AS GEOGRAPHIC DIVERSITY IS IN PRODUCING THE VARIETY OF HABITAT TYPES IS THE FACT THAT HONDURAS REPRESENTS AN IMPORTANT LINK IN THE TRANSITION BETWEEN NEARCTIC AND NEOTROPICAL PLANTS AND ANIMALS. THE LOWLAND TROPICAL RAIN FORESTS OF SOUTHERN CENTRAL AMERICA BECOMES CONSTRICTED AND DISCONTINUOUS IN NORTH AND EASTERN HONDURAS AND FORM THE FIRST NATURAL FILTER TO NORTHERN EXPANSION OF RAIN FOREST BIOTA NORTH OF PANAMA (MONROE, B. 1968). TROPICAL PLANT AND ANIMAL SPECIES ARE OFTEN FOUND IN JUXTAPOSITION WITH THOSE OF MORE TEMPERATE CLIMATES.

2.0 HABITATS

UTILIZING MONROE'S (1968) CLASSIFICATION FOR NATURAL HABITATS IN HONDURAS, SEVERAL DISTINCT COMMUNITIES CAN BE IDENTIFIED AND DESCRIBED. THESE ARE BASED UPON CLIMATOLOGICAL DATA, EDAPHIC AND OTHER VARIABLES SUCH AS FIRE AND FLOODS, AND INCLUDE: TROPICAL LOWLAND RAIN FOREST, TROPICAL (MONSOON FOREST), CLOUD (MONTANE RAIN) FOREST, HIGHLAND PINE (COCOTAL) AND PINE-OAK ASSOCIATIONS, LOWLAND PINE SAVANNAH, MARSH AND SWAMP AND MANGROVE. ALSO INCLUDED IS THE MAJOR OUTSTANDING MARINE HABITAT - THE CORAL REEFS.

2.1. TROPICAL LOWLAND RAIN FOREST

TROPICAL RAINFOREST AS DISCUSSED HERE GENERALLY CORRESPONDS TO HOLDRIDGE'S TROPICAL MOIST FOREST (SEE MAP NO. 1) WHICH IS CONFINED TO THE CARIBBEAN DRAINAGE AND REACHES ITS GREATEST EXTENT IN THE EASTERN SECTOR OF THE COUNTRY KNOWN AS LA MOSQUITIA. IT IS LIMITED TO REGIONS WITH MORE THAN 80 INCHES OF RAINFALL AND NO EXTENDED DRY SEASON. CLIMAX FORESTS ARE COMPOSED AT MOSTLY BROADLEAF EVERGREEN TREES AND OCCASIONALLY A FEW DECIDUOUS SPECIES (CARR, A. 1950). THE UPPER CANOPY AND EMERGENTS OFTEN EXCEED 60 METERS IN HEIGHT (MONROE 1968) AND LIKE MOST WOODLANDS OF THIS TYPE TREES ARE CHARACTERIZED BY A LARGE VARIETY OF SPECIES BUT SELDOM PURE STANDS OF ANY ONE TYPE. UNDER PRIMARY CONDITIONS THESE FORESTS ARE RELATIVELY OPEN UNDERNEATH THE DENSE CANOPY ALTHOUGH NATURAL AND MAN MADE DISTURBANCES ARE GENERALLY QUICKLY INVADDED BY DENSE SHRUBBY VEGETATION. REACHING ELEVATIONS OF 750 METERS, RAINFOREST THEN BEGINS THE TRANSITION INTO CLOUD FOREST (LOWER MONTANE FORESTS OF HOLDRIDGE).

THESE FORESTS REPRESENT SOME OF THE BIOLOGICALLY RICHEST ECOSYSTEMS ON THE PLANET. AS STOREHOUSES OF GENETIC DIVERSITY, THEY ARE UNMATCHED BY ANY OTHER ECOSYSTEM (MYERS 1929). ALTHOUGH SOME BOTANICAL STUDIES HAVE BEEN CARRIED OUT IN THIS ZONE (CRUZ ET AL. 1978) THERE IS STILL A DEARTH OF INFORMATION ON THE TAXONOMIC FEATURES OF HONDURAS' RAIN FOREST REGIONS. UNFORTUNATELY THEY ARE BEING DESTROYED BY SHIFTING AGRICULTURALISTS, CATTLE RANCHERS, AGROINDUSTRIES AND FOREST INDUSTRIES AT AN UNPRECEDENTED RATE. OF THE 4.4 MILLION HECTARES OF BROADLEAF FOREST WHICH EXISTED IN HONDURAS IN 1960, ONLY 1.9 MILLION REMAIN TODAY. THIS SIGNIFIES A LOSS OF OVER 2 MILLION HECTARES IN THE LAST 20 YEARS (TRCENSEGUARD, J. 1980). UPON REMOVAL OF RAIN FOREST VEGETATION, MANY OF THESE SITES ARE SUBJECT TO SERIOUS EROSION AND DEPLETION OF SOIL NUTRIENTS. IF PERMITTED TO OCCUR, REGENERATION SELDOM RESEMBLES THE ORIGINAL FOREST COMPOSITION. AS DEVELOPMENT ACCELERATES IN THESE REGIONS, FUTURE OPTIONS FOR SUSTAINED UTILIZATION OF THESE FORESTS FOR

TIMBER, BUILDING MATERIALS, FIREWOOD, HYDROELECTRIC POWER, SOILS MAINTENANCE, MEDICINAL PLANTS, GENETIC RESERVOIRS, WILDLIFE AND TOURISM WILL RAPIDLY DECLINE.

2.2 TROPICAL DECIDUOUS (MONSOON) FORESTS

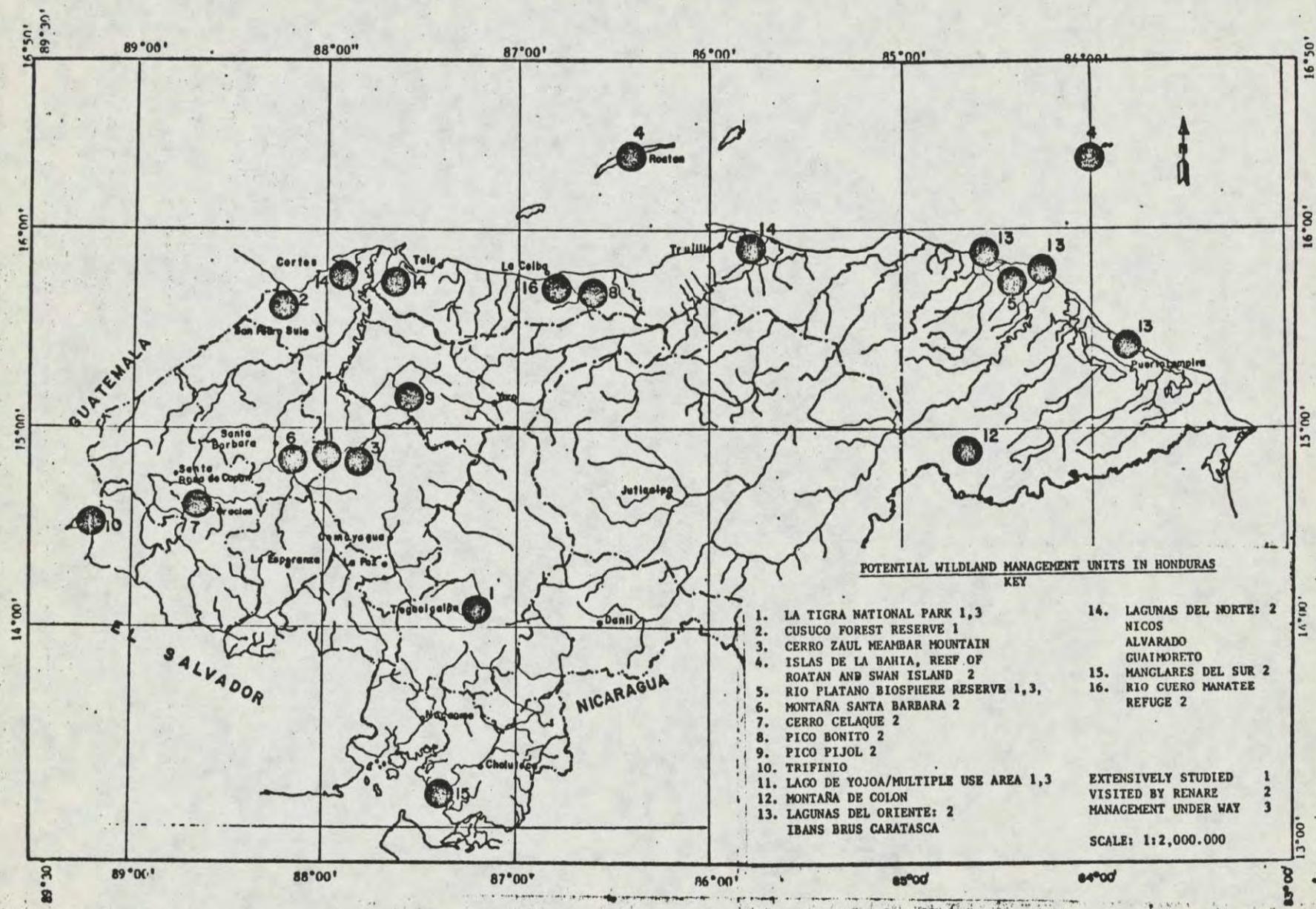
THE TROPICAL DECIDUOUS WOODLANDS REPLACE THE RAIN FORESTS WHERE SEASONALITY OF PRECIPITATION IS THE GENERAL CLIMATIC PATTERN (CASS 1950). DURING THE WET SEASON THEY ARE QUITE SIMILAR IN APPEARANCE TO THE RAIN FOREST. HOWEVER, DURING THE EXTENDED DRY SEASON MOST OF THE TREES LOSE THEIR LEAVES AND THE FOREST DRIES OUT CONSIDERABLY (MONROE 1969). THESE BROADLEAF FORESTS ARE TYPICALLY FOUND AS RIPARIAN FORESTS ALONG RIVERS RUNNING THROUGH ARID REGIONS OF THE CARIBBEAN WATERSHED AND ON THE BAY ISLANDS AND OTHER SMALLER KEYS. THEY MAKE UP THE DOMINANT FOREST TYPE IN THE LOWLANDS OF THE PACIFIC COASTAL REGION ALTHOUGH HERE THEY HAVE BEEN ALMOST COMPLETELY DESTROYED BY AGRICULTURALISTS AND CATTLE RANCHERS. ONLY A FEW SMALL REMNANTS REMAIN MOSTLY AS SCATTERED GALLERY FORESTS.

2.3 CLOUD (MONTANE RAIN) FOREST

THESE HIGHLAND BROADLEAF FORESTS ARE TYPICALLY FOUND IN THE SOUTHERN MOUNTAINS OF HONDURAS AT ELEVATIONS RANGING FROM 1,350 - 2,300 METERS AND IN THE CARIBBEAN WATERSHED FROM ABOUT 900 - 2,800 METERS. IN EACH OF THESE REGIONS THEY ARE FORMED BY DIFFERENT CLIMATIC FACTORS ALTHOUGH THE RESULTANT HABITATS ARE VERY SIMILAR. IN THE SOUTHERN CORDILLERA ALMOST DAILY CLOUD BUILDUP ON THESE MOUNTAIN PEAKS LOWER EVAPORATION RATES AND PROVIDES MOISTURE FOR THE EXHUBERANT PLANT GROWTH. THESE FORESTS ARE GENERALLY SURROUNDED BY PINE OR ARID REGIONS. HEAVY RAINS AND SIMILAR CLOUD BUILDUP IN THE NORTHERN MOUNTAIN RANGES CREATES A SIMILAR CLOUD FOREST HABITAT ALTHOUGH THESE AREAS ARE OFTEN TIMES CONTIGUOUS WITH LOWLAND RAIN FORESTS.

SPECIES DIVERSITY IN THESE FORESTS IS USUALLY LESS THAN THAT OF THE LOWLAND RAINFOREST, HOWEVER THEY ARE NEVERTHELESS OF EXTREME IMPORTANCE IN THE REGULATION OF SURFACE AND GROUND WATER SUPPLIES FOR DRINKING, IRRIGATION AND HYDROELECTRIC POWER. THE ROLE OF INTACT FOREST ECOSYSTEMS IN MAINTAINING WATER SUPPLIES IS ESPECIALLY EVIDENT IN CLOUD FORESTS AS CONDENSATION ON LEAVES AND TRUNKS IS THE SOURCE OF MUCH OF THE PRECIPITATION (LA BASTILLE 1973). TEGUCIGALPA AND MANY OTHER CITIES GET A LARGE PERCENTAGE OF THEIR DRINKING WATER SUPPLIES FROM CLOUD FORESTS. HYDROELECTRIC ENERGY GENERATED AT LAGO YOJOA WHICH POWERS HONDURAS' TWO MAJOR CITIES, THE MOCHITO MINE, SANTA BARBARA AND OTHER REGIONS ARE DEPENDENT IN PART ON THE SOUND MANAGEMENT OF CLOUD FORESTS AND MONTANE RAIN FORESTS. BECAUSE THESE WOODLANDS ARE USUALLY ON EXTREMELY STEEP AREAS THEY ALSO SIGNIFICANTLY REDUCE EROSION AND SILTATION OF STREAMS AND LAKES WHICH HAS IN MANY PARTS OF THE WORLD APPRECIABLY SHORTENED THE USEFUL LIFE OF HYDROELECTRIC POWER PROJECTS.

BECAUSE OF THEIR GENERALLY INHOSPITABLE CLIMATIC CONDITIONS AND RUGGED TERRAIN MANY OF THE CLOUD FORESTS OR MONTANE RAIN FORESTS HAVE UNTIL RECENTLY REMAINED FAIRLY INTACT. HOWEVER, WITH INCREASED COFFEE CULTIVATION AND THE SPREADING OF SLASH AND BURN AGRICULTURE INTO EVEN THESE FORMERLY INACCESSIBLE



POTENTIAL WILDLAND MANAGEMENT UNITS IN HONDURAS
KEY

- | | |
|--|--------------------------------|
| 1. LA TIGRA NATIONAL PARK 1,3 | 14. LAGUNAS DEL NORTE: 2 |
| 2. CUSUCO FOREST RESERVE 1 | NICOS |
| 3. CERRO ZAUL MEAMBAR MOUNTAIN | ALVARADO |
| 4. ISLAS DE LA BAHIA, REEF OF ROATAN AND SWAN ISLAND 2 | GUATIMORETO |
| 5. RIO PLATANO BIOSPHERE RESERVE 1,3, | 15. MANGLARES DEL SUR 2 |
| 6. MONTAÑA SANTA BARBARA 2 | 16. RIO CUERO MANATEE REFUGE 2 |
| 7. CERRO CELAQUE 2 | |
| 8. PICO BONITO 2 | |
| 9. PICO PIJOL 2 | |
| 10. TRIFINIO | |
| 11. LAGO DE YOJOA/MULTIPLE USE AREA 1,3 | EXTENSIVELY STUDIED 1 |
| 12. MONTAÑA DE COLON | VISITED BY RENARE 2 |
| 13. LAGUNAS DEL ORIENTE: 2 | MANAGEMENT UNDER WAY 3 |
| IBANS BRUS CARATASCA | |

SCALE: 1:2,000,000

DISTRIBUTION OF MAJOR HABITATS IN HONDURAS

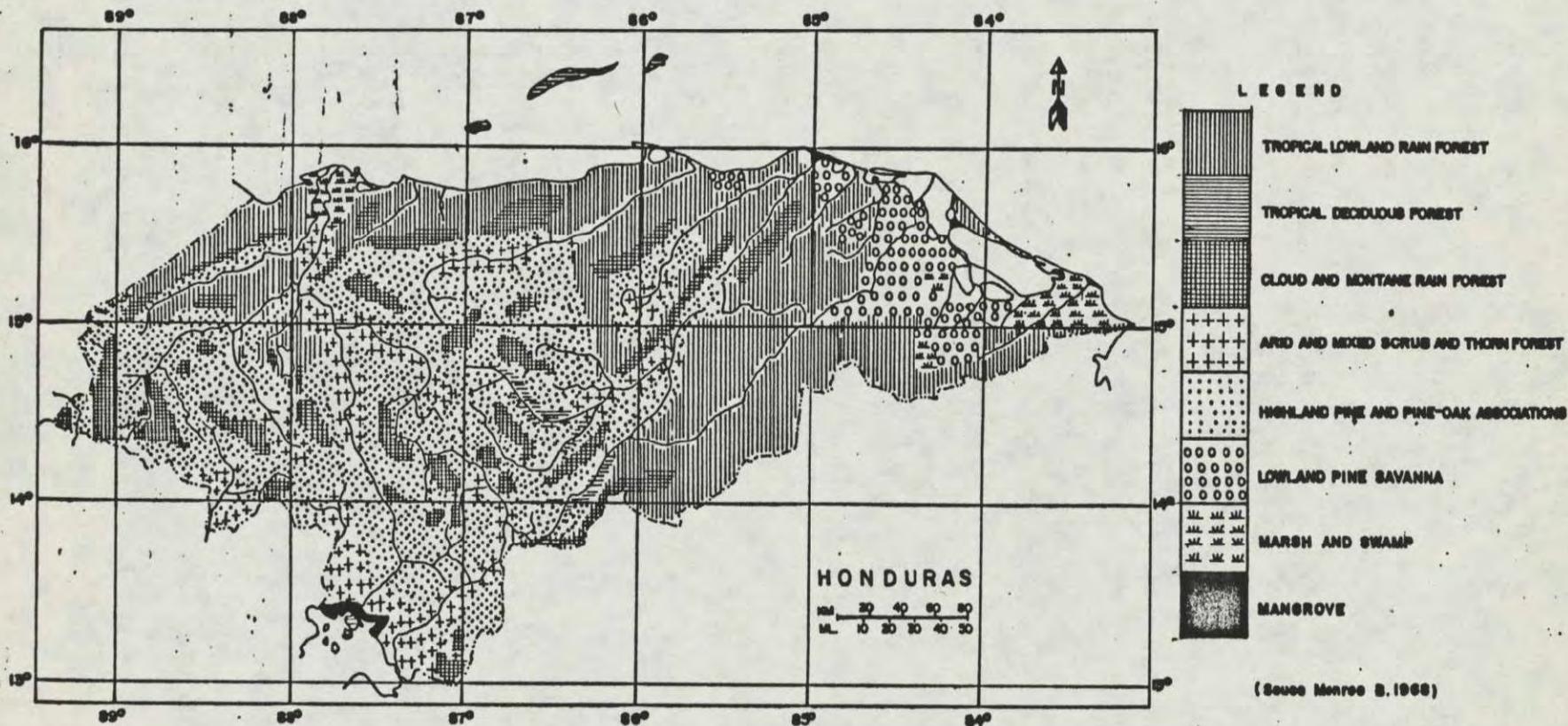
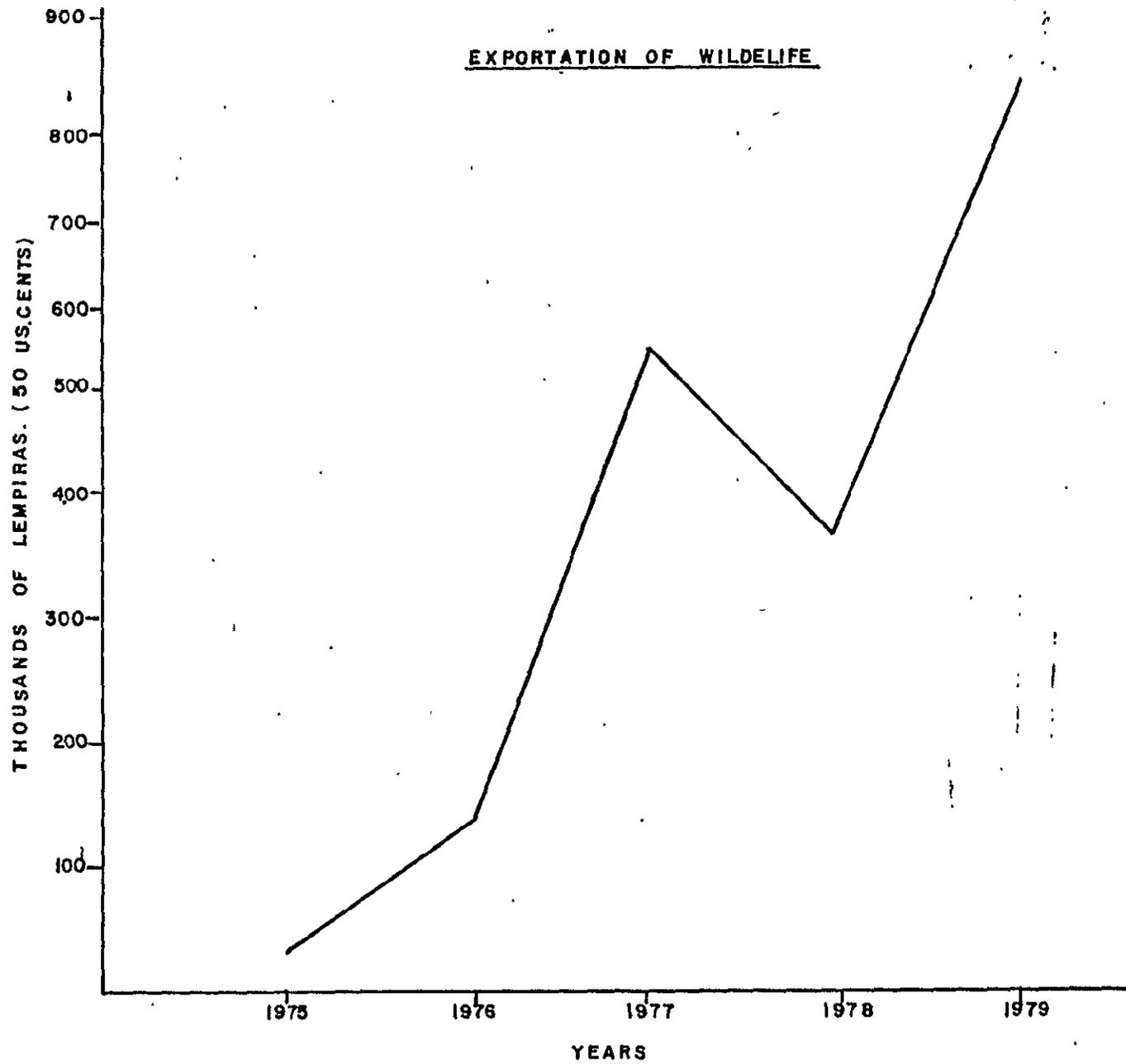


FIGURE 1

Blick



(Source: Gonzalez, J. 1980)

ZONES, THE QUALITY AND QUANTITY OF THIS ECOSYSTEM TYPE IS BEING DEGRADED. ALTHOUGH ORIGINALLY NEVER REACHING NOTICEABLE EXTENSION AND FOUND ONLY ON ISOLATED PEAKS SCATTERED THROUGHOUT THE COUNTRY, MANY HAVE BEEN REDUCED EVEN FURTHER IN SIZE WITH A RESULTANT DROP IN YEAR AROUND WATER PRODUCING CAPABILITIES (RENARE 1977).

2.4 HIGHLAND PINE AND PINE OAK ASSOCIATIONS

THE PINE AND OAK ASSOCIATIONS CORRESPOND TO HOLDRIDGE'S SUB-TROPICAL MOIST FOREST LIFE ZONE (HOLDRIDGE 1969). THEY EXTENSIVELY COVER MUCH OF WESTERN HONDURAS ALTITUDINALLY RANGING FROM 600 TO AT LEAST 1,800 METERS (MONROE 1968). PREDOMINANT SPECIES ARE *Pinus quercifolia* IN THE LOWER ELEVATIONS AND *Pinus psuedoquercifolia* IN THE UPPER REACHES AT THE PINE ZONE. UNDERSTORY VARIES FROM PARKLIKE GRASSY REGIONS TO ALMOST IMPENETRABLE LOW SHRUBS AND TALL GRASSES (CAR 1950). THE PINE SEEMS WELL ADAPTED TO THE THIN, POOR SOILS OF MUCH OF THIS REGION BUT ARE OFTEN TIMES REPLACED BY OAKS (*Quercus* SP.) WHERE THERE ARE POCKETS OF DEEPER SOILS. IN A FEW SCATTERED AREAS MIXED STANDS OF PINE AND OAK ARE FOUND.

IT IS PRINCIPALLY FROM THESE FORESTS THAT HONDURAS HAS HARVESTED AND EXPORTED OVER 240 MILLION DOLLARS WORTH OF WOOD BETWEEN 1975 AND 1980 (COHDEFOR, 1980). IT IS ALSO FROM THESE FORESTS THAT 38,000 BARRILS OF RESIN WERE TAPPED IN 1979, 295,000 LOADS OF FIREWOOD COLLECTED AND 27 THOUSAND POSTS WERE CUT (IGUD, 1980). THE CREATION AND SUBSEQUENT DEVELOPMENT OF COHDEFOR AND ITS EMPHASIS UPON EXPLOITATION, MANAGEMENT AND PROTECTION OF THE PINE FORESTS ATTESTS TO THE RECOGNITION OF THE ECONOMIC IMPORTANCE OF THESE ECOSYSTEMS.

HOWEVER, THIS IS ALSO A REGION WHOSE RESOURCES ARE BEING RAPIDLY DEPLETED BY BOTH THE FOREST INDUSTRIES AND BY FIRES. IN 1978 ALONE 261 MILLION BOARD FEET OF WOOD WERE CUT WHILE IN 1980 85,000 MANZANAS WERE BURNED, SIGNIFYING A LOSS OF 44 MILLION DOLLARS WORTH OF WOOD, (SABIORE, PERSONAL COMMUNICATION). RECENT IMMIGRATION FROM EL SALVADOR AND NICARAGUA AS WELL AS POPULATION GROWTH FROM WITHIN HONDURAS - 2.75 IN 1976 - (WORLD BANK 1978) IS PUTTING INCREASING PRESSURE UPON THESE AS WELL AS OTHER FOREST ECOSYSTEMS. THE WESTERN HIGHLAND PINE AREA HAS AN AVERAGE POPULATION DENSITY OF 1029/SQ. KM. ON ARABLE LAND AS COMPARED TO AN AVERAGE OF 200/SQ. KM. FOR THE REST OF THE COUNTRY (USAID 1980).

ALTHOUGH NATURAL REGENERATION OF THESE FORESTS IS IN MANY CASES VERY GOOD, GRAZING, FARMING AND FIRES ARE PREVENTING ADEQUATE REPLACEMENT OF HARVESTED STOCKS. IT IS BECOMING OBVIOUS THAT IF CURRENT TRENDS CONTINUE, HONDURAS MAY SOON BE FACING SERIOUS ECONOMIC PROBLEMS IN ITS FOREST INDUSTRY (TROENSEGUARD, J. 1980).

2.5 LOWLAND PINE SAVANNAH

THE LOWLAND PINE FORESTS OF THE MOSQUITIA ARE COMPOSED OF CARIBBEAN PINE (*Pinus caribaea*) WITH SOME FINGERS OF HARDWOOD GALLERY FORESTS FOLLOWING STREAM AND RIVERSBANKS. THE AREA CORRESPONDS TO HOLDRIDGE'S TROPICAL HUMID

FOREST (HOLDRIDGE, L. 1962) ALTHOUGH THIS IS ALSO THE LIFE ZONE CHARACTERIZED BY THE BROADLEAF RAIN FOREST WHICH ALMOST SURROUNDS THESE SAVANNAHS. SEVERAL REASONS FOR THE MAINTENANCE OF THIS VEGETATIVE FORMATION HAVE BEEN PROPOSED INCLUDING THE FACT THAT FIRES ARE COMMON IN THE ZONE AND THAT SOILS HAVE BEEN SEVERELY LENCHEDED.

ALTHOUGH NOT AS EXTENSIVELY EXPLOITED AS THE INTERIOR PINE REGIONS, THIS ZONE HAS BEEN IDENTIFIED BY FORESTERS AS AN AREA OF EXTREME POTENTIAL FOR INTENSIVE FOREST INDUSTRIALIZATION (MERKLE, A. PERSONAL COMMUNICATION). PRODUCTIVITY IS HIGH AND FEW PERSONS INHABIT THE REGION. FIRE, HOWEVER, IS STILL A PROBLEM WHICH HAS LIMITED SURVIVAL OF SEEDLINGS IN SEVERAL AREAS. ALSO PROJECTED HIGHWAY CONSTRUCTION TO LINK THIS AREA TO THE INTERIOR COULD BRING A WAVE OF IMMIGRATION INTO THE ZONE.

2.6 MARSH, SWAMP AND MANGROVE

THIS MAJOR COASTAL SWAMP AND MARSHY AREAS ARE RESTRICTED TO PARTS OF THE GULF OF FONSECA, THE DELTA OF THE ULUA AND CHAMELECON RIVERS AND IN PARTS OF THE MOSQUITIA. THESE PRODUCTIVE AREAS PROVIDE NURSERY AREAS AND NUTRIENTS FOR COASTAL FISH AND SHELLFISH AS WELL AS FILTERING TERRESTRIAL RUNOFF BEFORE IT REACHES THE SEA. THEY ALSO SERVE AS IMPORTANT HABITATS FOR SEVERAL BIRD SPECIES (MONROE, 1968).

THE MOST EXTENSIVE MANGROVE AREAS (SOME 32,000 HA.) ARE FOUND ON THE SOUTH COAST (BETANCOURT, J. PERSONAL COMMUNICATION) MANGROVES ARE ALSO FOUND IN SCATTERED AREAS ON THE NORTH COAST. THE PRINCIPAL SPECIES, RED MANGROVE (RHIZOPHORA MANGLE), AS WELL AS OTHER MANGROVE VEGETATION IS ALSO OF EXTREME IMPORTANCE MAINTENANCE OF THE 25 MILLION DOLLAR A YEAR SHRIMP FISHERIES. BESIDES PROVIDING LARGE AMOUNTS OF NUTRIENTS IN THE FORM OF ORGANIC MATTER THEY TOO HAVE A FILTERING EFFECT ON FRESH WATER ENTERING THE SEA AND ALSO BUFFER SHORELINES FROM THE ERCSIGNAL FORCES OF WAVES AND CURRENTS.

DESPITE THEIR ECONOMIC AND ECOLOGIC IMPORTANCE, MANGROVES, SWAMPS AND MARSHES HAVE BEEN SEVERELY DEGRADED IN MANY AREAS. IN THE SOUTH COAST OVER 80% OF THE MANGROVE HAS BEEN EXPLOITED (EIU, 1977) AND REGENERATION HAS BEEN POOR. CUTTING FOR FIREWOOD IS THE PRINCIPAL REASON FOR THIS DESTRUCTION. ON BOTH COASTS, LARGE AREAS OF MANGROVE HAVE BEEN CUT FOR THE DEVELOPMENT OF PORT FACILITIES. THE PORT AT SAN LORENZO AND CONSTRUCTION OF A NEW FACILITY AT PUERTO CASTILLA ARE TWO AREAS OF NOTABLE DAMAGE. PESTICIDE AND OTHER CONTAMINANT RUNOFF, ESPECIALLY IN THE SOUTH COAST COTTON GROWING DISTRICTS, MAY ALSO BE AFFECTING THE INTEGRITY OF THE MANGROVE AND MARSH AREAS ALTHOUGH THIS HAS NOT YET BEEN SCIENTIFICALLY DOCUMENTED.

2.7. CORAL REEFS

THE BARRIER REEF OF THE BAY ISLANDS AS WELL AS THOSE SURROUNDING SEVERAL OF THE CARIBBEAN KEYS (CAYOS COCHINOS, AND SWAN ISLANDS) ARE RECOGNIZED AS BEING SOME OF THE MOST EXTENSIVE AND PRISTINE IN THE WORLD. BESIDES SUPPORTING ARTESANAL AND COMMERCIAL FISHERIES THEY ARE ALSO AN IMPORTANT ATTRACTION FOR TOURISTS VISITING HONDURAS (19 TOURIST HOTELS ARE LOCATED ON THE BAY ISLANDS AS COMPARED TO 12 IN TEGUCIGALPA, IHT, 1980).

ALTHOUGH MAJOR REEF DESTRUCTION HAS BEEN CAUSED BY PERIODIC HURRICANES SUCH AS FIFI IN 1974, DEFORESTATION AND CONSTRUCTION ON THE ISLANDS IN CAUSING INCREASED SILTATION, OVERFISHING IS THREATENING SHELLFISH AND FISH POPULATIONS, AND MANGROVE CUTTING IS REDUCING FOOD SUPPLIES FOR REEF ORGANISMS.

3.0 UTILIZATION OF WILDLAND RESOURCES

WHILE MANY OF THE AMENITIES OF INTACT WILDLAND RESOURCES SUCH AS SCENIC VISTAS, SITES FOR MENTAL AND PHYSICAL REJUVENATION, PROTECTION OF GENETIC RESOURCES AND ECOLOGICAL PROCESSES, THE PROMOTION OF NATIONAL NATURAL HERITAGE PRIDE, AND EDUCATIONAL OPPORTUNITIES, HAVE ALL TRADITIONALLY BEEN CONSIDERED OF INTANGIBLE VALUE BY ECONOMISTS, IT IS NOW BECOMING EVIDENT THAT WILDLANDS OFFER AN ARRAY OF QUANTIFIABLE PRODUCTS THAT CAN SUSTAIN LONG TERM UTILIZATION IF MANAGED WISELY. THESE INCLUDE: TIMBER AND OTHER MATERIALS FOR CONSTRUCTION, RESINS, FIREWOOD, SEEDS FOR REFORESTATION, MEDICINAL PLANTS, SOIL STABILIZATION, WILDLIFE, TOURISM OPPORTUNITIES, AND WATER FOR DRINKING, INDUSTRY, ENERGY AND AGRICULTURE. THEY MAY ALSO INCLUDE POSSIBLE SOURCES OF ENERGY, FOOD AND DOZENS OF OTHER POTENTIAL WILDLAND DERIVED PRODUCTS. HOWEVER, SO LITTLE IS CURRENTLY KNOWN ABOUT MANY OF THESE ECOSYSTEMS (ESPECIALLY THE TROPICAL RAIN FORESTS) AND DESTRUCTION IS OCCURRING SO RAPIDLY THAT MANY POSSIBLE DEVELOPMENT OPTIONS ARE BEING ELIMINATED BEFORE THEIR POTENTIAL CAN BE REALIZED. THE FOLLOWING LIST INCLUDES SOME OF THE CURRENT AND PROJECTED USES OF HONDURAN WILDLAND PRODUCTS AND COMMENTARY ON THEIR STATUS.

3.1 TIMBER

WITH 80% OF THE HONDURAN LAND MASS OF GENERALLY MOUNTAINOUS TERRAIN UNSUITABLE FOR FARMING, TIMBER PRODUCTION HAS LOGICALLY BEEN EMPHASIZED IN NATIONAL ECONOMIC DEVELOPMENT SCHEMES. UNDER PROPER MANAGEMENT HONDURAN PINE FORESTS WILL BE ABLE TO PROVIDE A SUSTAINABLE LUCRATIVE INCOME FOR FUTURE GENERATIONS.

TABLE 1

GLOBAL WOOD EXPORTATIONS FROM HONDURAS - 1974/1979
(MILLIONS OF BOARD FEET)

YEAR	VOLUME	VALUE
1974	194.2	\$ 40.3 MILLION
1975	192.8	35.5
1976	192.4	40.75
1977	189.2	47.3
1978	151.7	42.3
1979	142.3	42.0
TOTAL	1,062.6	\$ 246.5 MILLION

ALTHOUGH HONDURAN PINE FORESTS ARE GENERALLY VERY PRODUCTIVE, INAPPROPRIATE LOGGING AND MANAGEMENT TECHNIQUES, DESTRUCTION OF REGENERATION BY FIRE AND EROSION OF FORESTS BY FARMERS AND CATTLE RANCHERS ARE ALL REDUCING FOREST RESOURCES AND TRANSFORMING THESE FORMER WILDLANDS INTO DEGRADED ZONES OF MARGINAL VALUE. WOODLANDS ORIGINALLY COVERED VIRTUALLY ALL OF HONDURAS, NOW ONLY ABOUT 59% REMAINS AND MUCH OF THIS IS NO LONGER PRIMARY FOREST (CONSUPLANE, 1972). HARDWOOD FORESTS ARE BEING ESPECIALLY IMPACTED BY THE LACK OF MANAGEMENT AND PROTECTION EFFORTS. COHDEFOR HAS RECENTLY ATTEMPTED TO CONTROL EXPLOITATION BY BOTH FOREST INDUSTRIES AND FARMERS AND CATTLEMAN ALTHOUGH THEY HAVE MET WITH QUESTIONABLE SUCCESS. AT THIS TIME SOME 34 SPECIES OF THE MANY HUNDREDS OF HARDWOODS TYPES EXISTING IN THE COUNTRY ARE UTILIZED. OF THESE MAHOGANY AND CEDAR ARE MOST IN DEMAND FOR EXPORT (SILLIMAN ET AL, 1981). MANY OTHER POTENTIALLY USEFUL SPECIES ARE BELIEVED TO EXIST ALTHOUGH STUDIES ARE STILL DEFICIENT ON THIS MATTER. BECAUSE SOUND MANAGEMENT PRACTICES FOR TROPICAL FOREST ARE STILL BEING IDENTIFIED, MAJOR EFFORTS SHOULD BE TAKEN TO CONTROL UNPLANNED EXPLOITATION OF THESE REGIONS UNTIL MORE ECONOMICALLY AND ECOLOGICALLY SOUND TECHNOLOGIES HAVE BEEN DEVELOPED.

BESIDES WOOD FOR EXPORT, TIMBER AND OTHER MATERIALS FOR DOMESTIC CONSTRUCTION ARE ALSO HARVESTED FROM BOTH THE BROADLEAF AND PINE FORESTS. IN 1978 ALMOST HALF OF THE WOOD HARVESTED WAS USED WITHIN HONDURAS (CLIFF, 1980). IN RURAL AREAS ESPECIALLY, BASIC CONSTRUCTION MATERIALS OFTEN INCLUDE NATURALLY OCCURRING TREES, PALM FRONDS, VINES, GRASSES AND SHRUBS. ARTESANAL FISHERMEN ON BOTH COASTS RELY ON TIMBER SPECIES FROM PRIMARY FORESTS FOR THE CONSTRUCTION OF THEIR BOATS AND DUGOUTS.

3.2. FIREWOOD

ALTHOUGH PREDOMINATELY USED IN RURAL AREAS, WOOD IS UTILIZED AS AN ENERGY SOURCE FOR COOKING AND HEATING IN VIRTUALLY ALL PARTS OF THE COUNTRY. IN 1979 APPROXIMATELY 295,000 LOADS (COHDEFOR 1980) OR 4.4 MILLION CUBIC METERS (A.I.D. 1980) OF FIREWOOD WAS HARVESTED. THIS HAS REDUCED CONSIDERABLY HONDURAS' DEPENDENCE ON FOREIGN PETROLEUM FOR THESE PURPOSES. IT IS ALSO IMPORTANT TO CONSIDER WHAT IT IS A RENEWABLE RESOURCE IF PROPERLY MANAGED AND IS GENERALLY EASILY HARVESTED.

NOT ALL SPECIES ARE PREFERRED FOR FIREWOOD AND THIS HAS RESULTED IN THE DEPLETION OF CERTAIN TYPES OF TREES SUCH AS OAKS (QUERCUS SPP.) IN MANY AREAS. FAST GROWING FUELWOOD PLANTATIONS ARE BEING CONTEMPLATED (DULIN, PERSONAL COMMUNICATION) AND COULD GREATLY HELP TO RELIEVE UNREGULATED PRESSURES ON NATURALLY OCCURRING FORESTS.

3.3 RESINS, GUMS AND SEEDS

EXTRACTION OF RESINS FROM PINE, SWEETGUM AND OTHER FOREST TREES ALSO PROVIDED AN INCOME FOR BOTH THE GOVERNMENT AND THE RURAL POOR WHO ARE OFTEN EMPLOYED IN SOCIAL FORESTRY PROGRAMS. IN 1979 4.7 MILLION DOLLARS WAS MADE ON EXTRACTIVE PRODUCTS, WHICH IF DONE PROPERLY, CAN BE SUSTAINED FOR LONG PERIODS OF TIME (COHDEFOR 1980). SEED COLLECTION IS ALSO IMPORTANT FOR BOTH DOMESTIC REFORESTATION PROGRAMS AND FOR EXPORTATION TO THE MANY OTHER TROPICAL NATIONS

WHICH ARE BEGINNING TO LAUNCH PLANTATION PROJECTS USING FAST GROWING TREES LIKE EINUS CARIBBEAE FROM HONDURAS.

3.4 MEDICINAL PLANTS

ALTHOUGH IN ITS INFANCY, THE COLLECTION AND INDUSTRIALIZATION OF WILD PLANT SPECIES IN HONDURAS FOR MEDICINAL PURPOSES APPEARS TO HOLD GREAT PROMISE. CONSIDERING THAT ALMOST 50% OF OUR MEDICINES ARE DERIVED FROM TROPICAL PLANTS (MYERS 1979) AND THAT BOTANICALLY THE HARDWOOD FORESTS OF HONDURAS ARE VIRTUALLY UNKNOWN, IT IS REASONABLE TO ASSUME THAT MANY POTENTIALLY USEABLE PLANTS OCCUR HERE.

THE GOVERNMENT HAS BEEN INVESTIGATING SEVERAL SPECIES AND HAS BEGUN TO CULTIVATE AND PROCESS THE CALAJUALA (POLYPERIDIUM LEUCOTOMOS), USED IN CANCER RESEARCH (ALVARADO, F., PERSONAL COMMUNICATION). RURAL PEOPLES RELY CONSIDERABLY UPON DOZENS OF MEDICINAL PLANTS FOR A VARIETY OF MALADIES AND CAN OFTEN ASSIST ETHNOBOTANISTS IN IDENTIFYING POTENTIAL PLANTS FOR ASSAYING MEDICINAL PROPERTIES (ESPINAL, M.).

3.5 WILDLIFE

WHILE THE UTILIZATION OF WILDLIFE WILL BE DISCUSSED IN DETAIL UNDER A SEPARATE SECTION, SOME GENERAL PATTERNS OF USE WILL BE COVERED HERE. AS A PROTEIN SOURCE SEVERAL SPECIES SUCH AS A WHITE TAILED DEER (ODOCOILEUS VIRGINIANUS) TEDESCUINTLY (CUNICULUS PUCA), COLLARED PECCARY (TAYASSU TAJACU) GREEN IGUANA (IGUANAMIGUANA) THE EGGS OF SEVERAL SPECIES OF SEA TURTLE AND SEVERAL OTHER ANIMALS ARE ALL HARVESTED WHENEVER POSSIBLE (KLEIN, PERSONAL COMMUNICATION). EXPORTATION OF BIRDS AND OTHER PETS IN 1979 WAS VALUED AT ABOUT \$ 421,000 (RENARE, 1980). SKINS, PRINCIPALLY FROM CROCODRILES AND CAIMANS ARE ALSO A VALUABLE EXPORT ITEM.

FOREIGN HUNTERS (PRINCIPALLY DOVE HUNTERS) COMING TO HONDURAS ARE A SOURCE OF INCOME FOR BOTH THE GOVERNMENT (FROM LICENSES) AND FOR LOCAL HOTEL OWNERS, RESTAURANTEERS AND GUIDES. BIRD WATCHERS AND ANIMAL OBSERVERS, WHILE NOT YET IN GREAT NUMBERS DO COME TO HONDURAS TO ENJOY ITS TREMENDOUS DIVERSITY OF AVIAN AND OTHER ANIMAL SPECIES. UNFORTUNATELY DESTRUCTION OF HABITAT, UNREGULATED HUNTING AND CAPTURE, AND EXCESSIVE PESTICIDE USE ARE ALL RAPIDLY DEPLETING WILDLIFE RESOURCES. LOSS OF HABITAT ESPECIALLY HAS REDUCED MANY WILDLIFE POPULATIONS TO THE POINT WHERE THEY MAY SOON BE THREATENED WITH EXTINCTION. PRESERVATION OF WILDLANDS AND SOUND WILDLIFE MANAGEMENT COULD ALLEVIATE MANY OF THESE THREATS.

3.6 FISH AND MARINE RESOURCES

BECAUSE OF THE IMPORTANCE ROLE OF MANGROVE, MARSH AND SWAMP AND EVEN TERRESTRIAL WILDLAND AREAS IN MAINTAINING VIABLE FRESH AND SALT WATER FISHERIES, THESE AQUATIC RESOURCES SHOULD ALSO BE CONSIDERED AS PRODUCTS DERIVED FROM WILDLANDS. ALTHOUGH NOT DEVELOPED TO ANY GREAT DEGREE, THE CATCH OF BOTH FRESH AND SALT WATER ARTESANAL FISHERMEN IN 1978 REACHED APPROXIMATELY 1,220 TONS OF FISH WHILE COMMERCIAL FISHING EXPORTS WERE VALUED AT 25 MILLION

DOLLARS (DUBOIS, R. PERSONAL COMUNICACION). BECAUSE NEITHER OF THESE FISHING EFFORTS HAVE BEEN WELL CONTROLLED IT CAN BE EXPECTED THAT THROUGH PROPER MANAGEMENT AND VIGILANCE, CATCH NUMBERS CAN BE INCREASED OR AT LEAST HARVESTING LEVELS SUSTAINED. ADEQUATE PROTECTION OF BOTH COASTAL AND INLAND HABITATS WILL HOWEVER ALSO HAVE TO BE INCORPORATED INTO FISHERIES PROGRAMS.

3.7 TOURISM AND RECREATION

BECAUSE OF A LACK OF INFRASTRUCTURE, TOURISM IN HONDURAS IS STILL IN ITS INFANCY. IT SHOULD BE NOTED HOWEVER, THAT IN ALMOST ALL OF THE CURRENT OR PLANNED TOURIST PROJECTS NATURE HAS BEEN INCORPORATED AS AN INTEGRAL COMPONENT. PERHAPS THE MOST VISITED SITE IN HONDURAS BY FOREIGN TOURISTS ARE THE BAY ISLANDS WHERE DIVING AND SNORKLEING IN THE CORAL REEFS IS THE FEATURED ACTIVITY. TOURIST CIRCUITS ON THE CARIBBEAN COAST EMPHASIZE PRISTINE TROPICAL BEACHES AND INCLUDE STOPS AT THE LANCETILLA BOTANICAL GARDEN AND RAIN FOREST. THE RECENT CREATION OF THE LA TIGRA NATIONAL PARK, LOCATED NEAR THE TOURIST CENTER OF VALLE DE ANGELES CLOSE TO TEGUCIGALPA, IS EXPECTED TO RECEIVE INCREASED VISITATION UPON DEVELOPMENT OF ROADS AND VISITOR FACILITIES. ORCHID GROUPS FROM THE UNITED STATES COMMONLY VISIT HONDURAS TO OBSERVE AND COLLECT SPECIMENS. A REVIEW OF TOURISM ADS IN ANY NATURE MAGAZINE WILL REVEAL THAT SCIENTIFIC TOURISM IS A BURGEONING FIELD WHICH HONDURAS COULD READILY ENTER IF THE ORGANIZATION AND FACILITIES WERE AVAILABLE.

NATIONALS ARE TO A GREATER AND GREATER DEGREE USING WILDLAND AREAS FOR RECREATION PURPOSES. AS INCOME RISES AND TRANSPORTATION SYSTEMS IMPROVE, THIS USAGE IS EXPECTED TO INCREASE. THE CAVE AT TAULABE NEAR LAGC YOJOA IS A VERY POPULAR TOURIST ATTRACTION FOR TRAVELERS BETWEEN SAN PEDRO SULA AND TEGUCIGALPA. IT IS COMMON IN CERTAIN UPLAND AREAS SUCH AS CERRO DE ULE NEAR TEGUCIGALPA TO SEE DOZENS OF PICNICERS IN THE PINE FORSTS BORDERING THE HIGHWAY FOR WANT OF A MANAGED AND ACCESSIBLE NATURAL AREA SUCH AS A NATIONAL PARK TO VISIT. AND, ESPECIALLY DUPING HOLIDAY SEASONS LIKE EASTER VACATION, HUNDREDS OF THOUSANDS OF HONDURAKS FLOCK TO BOTH THE NORTH AND SOUTH COAST BEACHES.

WHILE BOTH FOREIGN AND DOMESTIC TOURISM POTENTIAL IS GREAT, IT SHOULD BE NOTED THAT UNCONTROLLED AND UNPLANNED DEVELOPMENT OF THIS NATURE HAS OFTEN DESTROYED THE VERY RESOURCE THAT PEOPLE HAVE COME TO EXPERIENCE. COASTAL TOURISM DEVELOPMENT IN PARTICULAR HAS SEVERELY DEGRADED THE CARIBBEAN REGION. POORLY MANAGED VISITATION IN FRAGILE ECOSYSTEMS SUCH AS CLOUD FORESTS OR CAVES CAN HAVE SERIOUS DETRIMENTAL IMPACTS UPON BOTH LIVING AND NON-LIVING NATURAL FEATURES. TOURISM PLANNERS SHOULD BE WORKING CLOSELY WITH NATURAL RESOURCE MANAGERS TO ENSURE MAXIMUM ECONOMIC AND SOCIAL BENEFITS FROM TOURISM WITH DETRIMENTAL IMPACTS.

3.8 WATER RESOLRCES

THE ROLE OF WILDLANDS IN MAINTAINING THE QUALITY AND YEAR AROUND AVAILABILITY OF FRESH WATER SUPPLIES FOR HONDURAS IS OF UNDENIABLE IMPORTANCE. FOR DOMESTIC, INDUSTRIAL, AGRICULTURAL AND ENERGY SECTORS, WATER IS A VITAL RESOURCE..

POTABLE WATER SUPPLIES FOR MANY CITIES IN HONDURAS ARE DERIVED DIRECTLY FROM WILDLAND AREAS WHERE SMALL CHECK DAMS AND TUBING CHANNEL WATER FROM FORESTS DEPTHS TO CITY CENTERS. TEGUCIGALPA RECEIVES 40% OF ITS DRINKING WATER FROM THE LA TIGRA CLOUD FOREST NATIONAL PARK (BETANCOURT ET AL.) WHILE SAN PEDRO, LA CEIBA, TELA AND MANY OTHER CITIES RECEIVE VARYING PROPORTIONS OF THEIR WATER FROM SIMILAR SOURCES.

WATER FOR HYDROELECTRIC POWER HAS BECOME ESPECIALLY IMPORTANT FOR HONDURAS AS CONSTRUCTION BEGINS ON THE \$550 MILLION DOLLAR EL CAJON HIGH ARCH DAM. THIS PROJECT WILL PRODUCE 300 MEGAWATTS WHICH WILL PROVIDE 52% OF THIS COUNTRY'S ENERGY NEEDS. HYDROELECTRIC GENERATING PLANTS AT LAGO YOJOA ARE ALREADY PRODUCING 110 MEGAWATTS OR ENOUGH ENERGY TO LIGHT THE COUNTRY'S TWO LARGEST CITIES AS WELL AS OTHER TOWNS AND INDUSTRIES (BETANCOURT, J. ET AL. 1978) ENEC HAS IDENTIFIED SEVERAL OTHER SITES FOR POSSIBLE HYDROELECTRIC AND MINIHYDRO PROJECTS AND HAS ESTIMATED THAT ONLY 5% OF THE AVAILABLE HYDROPOWER IS CURRENTLY USED (USAID 1978)

IRRIGATION IS IMPORTANT FOR LARGE SCALE AGRICULTURE PROJECTS LOCATED IN SEVERAL REGIONS OF THE COUNTRY. VIRTUALLY ALL OF THE WATER USED IN THESE IRRIGATION SYSTEMS COMES FROM SURFACE WATER SUPPLIES, MANY OF WHICH ARE FED BY STREAMS ORIGINATING IN UPLAND WILDLAND ZONES.

SANAA HAS TAKEN SOME PRECAUTIONS TO GUARD WATERSHEDS PROTECTING IMPORTANT DRINKING WATER SOURCES. THERE ARE PLANS TO MANAGE THE WATERSHEDS AFFECTING THE LAGO YOJOA, THE EL CAJON DAM SITE AND THE LA TIGRA CLOUD FOREST NEAR TEGUCIGALPA. HOWEVER, NO COMPREHENSIVE WATERSHED MANAGEMENT PROGRAM IS BEING CARRIED OUT IN THE FIELD AT THIS TIME. DESPITE THE MULTI MILLION DOLLAR INVESTMENT IN HYDROELECTRIC AND IRRIGATION PROJECTS AND THE DEPENDENCE UPON SURFACE WATER FOR DRINKING SUPPLIES, EFFORTS TO PROTECT AND PROPERLY MANAGE THESE RESOURCES HAVE NOT BEEN ENFORCED OR NOT NEARLY OF THE MAGNITUDE THAT SUCH A VALUABLE RESOURCE AND SUCH SERIOUS WATERSHED PROBLEMS MERIT. FOR EXAMPLE, EXCEPT ON THE HIGHEST POINTS OF SANTA BARBARA AND AZUL MOUNTAINS AND SOME SMALLER PATCHES OF WOODLAND NEAR THE LAKE, VIRTUALLY ALL OF THE FORESTS SURROUNDING LAGO YOJOA HAVE BEEN REMOVED (BETANCOURT, J. ET AL. 1978). SMALL FARMERS AND PERIODIC FIRES CONTINUE TO DIMINISH THE QUALITY OF THE VEGETATIVE COVER AFFECTING THE EL CAJON PROJECT DESPITE EFFORTS TO PREVENT THESE HUMAN INCURRANCES. AND AT LA TIGRA SMALL AGRICULTURALISTS EAT AWAY AT THE FOREST WHILE COMMUNICATION TOWERS REPLACE BROMELIAD SHRUBBED OAK TREES ON THE HIGHEST PEAKS. EXCEPT IN LA MOSQUITIA WATER LEVELS IN RIVERS FLUCTUATE CONSIDERABLY WITH FLOODING COMMON IN THE WET SEASON AND DROUGHT IN THE DRY. MANY CITIES, INCLUDING THE CAPITAL ANNUALLY HAVE TO RATION WATER DURING PERIODS OF LOW FLOW. OBVIOUSLY DEFICIENT MANAGEMENT OF WATER RESOURCES COULD SEVERELY LIMIT HONDURAS' DEVELOPMENT CAPABILITIES.

3.9 SOILS STABILIZATION

ANOTHER IMPORTANT ROLE OF WILDLAND VEGETATION IS TO PROTECT SOILS FROM THE POUNDING SEASONAL RAINS COMMON IN THIS COUNTRY. THE FOREST CANOPY INTERCEPTS RAINDROPS AND BUFFERS THE GROUND BELOW FROM EXCESSIVE IMPACT AND SPLASH EROSION. ROOTS, GROUND COVER AND HUMUS HOLD SOILS IN PLACE AND ARE

ESPECIALLY IMPORTANT ON THE STEEP SLOPES WHICH CHARACTERIZE THE HONDURAN LANDSCAPE.

INAPPROPRIATE FARMING AND LOGGING PRACTICES HAVE EXPOSED LARGE AREAS OF THE COUNTRY TO THE POSSIBILITY OF SERIOUS EROSIONAL PROBLEMS. IN THE CHOLUTECA WATERSHED 22 TONS PER HECTARE ARE LOST ANNUALLY (USAID 1980) AND THE ENVIRONMENTAL IMPACT STUDY ON THE EL CAJON PROJECT FOUND THAT "LOGGING, AGRICULTURE AND GRAZING PRACTICES HAVE CAUSED SERIOUS EROSION OF TOPSOILS AND EXPOSURE OF BEDROCK IN THE CATCHMENT" (GOLDMAN, C. 1972). PERHAPS THE MOST STRIKING EXAMPLE OF MASSIVE EROSION AT LEAST PARTIALLY CAUSED BY REMOVAL OF FOREST COVER WERE THE MUD SLIDES AND FLOODING IN THE WAKE OF THE 1974 HURRICANE FIFI WHICH LEFT OVER 12,000 DEAD AND CAUSED OVER 200 MILLION DOLLARS IN DAMAGES (UNDP 1979).

3.10 EDUCATION

WILDLAND AREAS PROVIDE UNIQUE OUTDOOR LABORATORIES WHERE (STUDENTS AND) PEOPLE OF ALL AGES CAN LEARN FROM FIRST HAND EXPERIENCE ABOUT THE ENVIRONMENT IN WHICH THEY LIVE. ENVIRONMENTAL EDUCATION AND INTERPRETATION IN PARKS AND WILDLANDS HAS GLOBALLY BEEN ACCEPTED AS ONE OF THE MOST EFFICIENT MEANS OF PROMOTING AN ENVIRONMENTAL AWARENESS. THIS AWARENESS IN TURN CAN MANIFEST ITSELF IN ACTIVE PARTICIPATION IN ENVIRONMENTAL MANAGEMENT AND PROTECTION. EDUCATION IS THE PREREQUISITE TO ACHIEVING SUCCESS IN ANY EFFORT TO PROTECT RESOURCES. THE FACT THAT THE FOREST FIRES HAVE TRIPLED SINCE THE ADVENT OF CONDEFOR SHOWS THAT FOREST PROTECTION EFFORTS WHICH DO NOT ADEQUATELY INCLUDE EDUCATIONAL COMPONENTS WILL NOT MEET WITH SUCCESS (SABION, M. PERSONAL COMMUNICATION).

APPROPRIATELY DEVELOPED WILDLANDS CAN FACILITATE THE ENVIRONMENTAL EDUCATION PROCESS IN A SAFE, ENJOYABLE MANNER WITHOUT DETRIMENTALLY AFFECTING THE RESOURCES. IN A COUNTRY SUCH AS HONDURAS WHEN NATURAL RESOURCES ARE PLAYING SUCH A KEY ROLE IN DEVELOPMENT IT SEEMS ONLY LOGICAL THAT A MAJOR THRUST OF EDUCATIONAL PROGRAMS SHOULD BE DIRECTED AT INTERPRETING THE ENVIRONMENT AND MAN'S ROLE IN MANAGING IT.

3.11 GENETIC RESERVES

GENETIC RESOURCES NOT ONLY INSURE THE CONTINUANCE OF EVOLUTIONARY PROCESSES, BUT ALSO PROVIDE MANKIND WITH A STORE HOUSE OF GOODS AND SERVICES. BESIDES THE AFOREMENTIONED WILDLAND DERIVED PRODUCTS, A MYRIAD OF OTHER POTENTIAL USES FOR THESE RESOURCES REMAINS TO BE INVESTIGATED. ALTERNATIVE FOOD AND ENERGY SOURCES AS WELL AS RAW MATERIALS FOR CONSTRUCTING THE INFRASTRUCTURE UPON WHICH OUR CIVILIZATION IS BUILT ARE BEING DISCOVERED WITH MORE AND MORE FREQUENCY AS THE TROPICAL REGIONS ARE STUDIED. IN AGRICULTURE FOR EXAMPLE, MANY OF THE HYBRID FORMS OF WHEAT, CORN AND RICE WERE DEVELOPED USING FERAL STRAINS FOUND IN WILDLAND AREAS. PLANT GENETICISTS STILL DEPEND ON THESE WILD CULTIGENS ESPECIALLY IN THE BATTLE AGAINST PLANT DISEASES AFFECTING HIGH PRODUCTION MONOCULTURES. THE TROPICAL RAIN FOREST IS, ECOLOGICALLY SPEAKING, THE MOST IMPORTANT OF HONDURAS' WILDLAND AREAS. UNFORTUNATELY IT IS ALSO THE AREA WHICH IS BEING MOST RADICALLY ALTERED AND IN MOST CASES NO ONE KNOWS WHAT IS BEING LOST.

4.0 PROTECTION AND CONSERVATION OF WILDLANDS

4.1. LEGISLATION

AT THIS TIME LAWS PERTAINING TO PROTECTION AND MANAGEMENT OF WILDLANDS ARE EITHER NON-EXISTENT OR MERELY ON PAPER BUT NOT ENFORCED. THOSE THAT DIRECTLY OR INDIRECTLY PERTAIN TO WILDLANDS ARE SCATTERED AMONG SEVERAL DIFFERENT AGENCIES AND ARE GENERALLY NOT UTILIZED IN EFFORTS TO PROTECT NATURAL AREAS. A BRIEF REVIEW OF THE RELEVANT LAWS AND LEGISLATION IS INCLUDED IN TABLE 2.

TABLE 2

LEGISLATION RELATED TO WILDLAND MANAGEMENT AND PROTECTION

LEGISLATION	RELEVANCE	ENFORCEMENT AGENCY	STATUS
DECRETO LEY NO. 976 CREATION OF THE LA TIGRA NATIONAL PARK	THIS LAW OFFICIALLY ESTABLISHED THE CREATION LA TIGRA CLOUD FOREST AS A NATIONAL PARK. LEGAL LIMITS OF THE PARK WERE SET AND GOALS OF THE PARK ESTABLISHED.	NATURAL RENEWABLE RESOURCES (RENARE)	ALTHOUGH LEGAL STATUS HAS GIVEN RENARE THE LEGAL MANDATE TO PROTECT THIS PARK'S RESOURCES, CUTTING AND ECOSYSTEM DEGRADATION STILL CONTINUES TO WHITTLE DOWN THE TOTAL PARK AREA.
DECRETO LEY NO. 977 CREATION OF THE RIO PLATANO BIOSPHERE RESERVE	THIS LAW OFFICIALLY ESTABLISHED THE MAN AND BIOSPHERE (MAB) RIO PLATANO BIOSPHERE RESERVE IN LA MOSQUITIA. LEGAL LIMITS WERE ESTABLISHED AND GOALS OF THE RESERVE IDENTIFIED	NATURAL RENEWABLE RESOURCES (RENARE)	WITH THE PASSAGE OF THIS LAW RENARE HAS BEEN ABLE TO MOVE AHEAD WITH ITS PLANS TO MANAGE THIS VAST AREA. VIGILANCE HAS BEGUN BUT MINING, AGRICULTURE AND OTHER DISRUPTIVE ACTIVITIES IN AREAS NOT ZONED FOR DEVELOPMENT CONTINUES.
DECRETO LEY NO. 103 COHDEFOR LAW AND DECRETO LEY NO. 85 FORESTRY LAW	THESE LAWS DESCRIBE BOTH THE FOREST HARVESTING ROLE OF COHDEFOR AS WELL THE FOREST MANAGEMENT AND PROTECTION ACTIVITIES OF THIS AGENCY. WATERSHED CONTROL IS INCLUDED AS WELL AS NATIONAL PARKS ALTHOUGH THIS WAS LEFT IN THE MINISTRY OF NATURAL RESOURCES WHEN THE FOREST SECTOR OF NATURAL RESOURCES WAS REORGANIZED INTO THE SEMI-AUTONOMOUS COHDEFOR	COHDEFOR	WATERSHED MANAGEMENT AND FOREST PROTECTION HAVE NOT RECEIVED NEARLY THE EMPHASIS THAT FOREST PRO- DUCTION HAS EXPERIENCED. MANY ASPECTS OF THE LAW LAY THE FOUNDATIONS FOR SOUND WILDLAND MANAGEMENT (MANGROVE PROTECTION FOR EXAMPLE) BUT ARE SELDOM APPLIED OR COMPLIED WITH.

LEGISLATION	RELEVANCE	ENFORCEMENT AGENCY	STATUS
<p>DECRETO LEY NO. 170 AGRARIAN REFORM LAW</p>	<p>THE AGRARIAN REFORM LAW FACILITATES THE REDISTRIBUTION OF LARGE LAND HOLDINGS. IT HAS RELOCATED MANY GROUPS OF CAMPESINOS AND IS ALSO CHARGED BY LAW TO PROMOTE THEIR APPROPRIATE USE OF THE LAND THROUGH EDUCATION AND TECHNICAL ASSISTANCE.</p>	<p>NATIONAL AGRARIAN INSTITUTE (INA)</p>	<p>INA HAS FAILED TO INCORPORATE ENVIRONMENTAL VARIABLES INTO THEIR AGRARIAN REFORM PROGRAM. CAMPESINO GROUPS HAVE BEEN MOVED ONTO OR NEAR FRAGILE ECOSYSTEMS, TECHNICAL TRAINING AND EXTENSION HAVE NOT BEEN INCLUDED IN RELOCATION PROGRAMS AND STABILIZATION OF MIGRATING AGRICULTURALISTS HAS NOT BEEN ACHIEVED.</p>
<p>DECRETO LEY NO. 30 SUPERIOR COUNCIL FOR ECONOMIC PLANNING LAW</p>	<p>THIS PLANNING BODY INCLUDES AMONG ITS PRIORITIES THE PROMOTION OF SOUND LAND USE PLANNING, ENVIRONMENTAL MANAGEMENT AND PROTECTION OF WILDLAND AREAS.</p>	<p>CONSUPLANE</p>	<p>ALTHOUGH CONSUPLANE HAS BEEN VERY PROGRESSIVE IN ITS TREATMENT OF ENVIRONMENTAL AND NATURAL RESOURCE AFFAIRS, IN REALITY IT WIELDS LITTLE POWER AND IS SELDOM CONSIDERED BY THOSE AGENCIES THAT ARE ACTUALLY CARRYING OUT ENVIRONMENTALLY RELATED PROJECTS.</p>
<p>CONSTITUTIONAL LAW OF SANAA</p>	<p>SANAA IS CHARGED WITH THE STUDY, CREATION AND MANAGEMENT OF POTABLE WATER SYSTEMS FOR THE COUNTRY. THEY ARE ALSO INVOLVED IN PROTECTION OF IMPORTANT WATERSHEDS AND WERE AT LEAST IN PART RESPONSIBLE FOR PROTECTING THE LA TIGRA CLOUD FOREST BEFORE IT WAS DECLARED A NATIONAL PARK.</p>	<p>SANAA</p>	<p>SANAA'S VIGILANCE OF IMPORTANT WATERSHEDS HAS BEEN DEFICIENT. THEY HAVE ALSO FAILED TO ACTIVELY PETITION FOR COOPERATION WITH OTHER AGENCIES IMPACTING FOREST RESOURCES SUCH AS COMDEFOR AND INA.</p>

LEGISLATION	RELEVANCE	ENFORCEMENT AGENCY	STATUS
DECRETO LEY NO. 23 VEGETATIVE SANITATION	THIS AGENCY IS INVOLVED IN NOT ONLY THE CONTROL OF IMPORTATIONS OF PLANTS AND ANIMALS BUT ALSO THAT OF INSECTICIDES, FUNGI- CIDES AND OTHER AGRI- CULTURAL CHEMICALS.	THE NATIONAL SERVICE FOR SANITARY ANIMAL AND PLANT PRODUCTION.	IN REALITY LITTLE IS DONE TO PREVENT BOTH THE INTRODUCTION OF EXOTIC PLANTS AND ANIMALS NOR TO MONITOR THE USE OF POTENTIALLY TOXIC AGRI- CULTURAL CHEMICALS.
DECRETO LEY NO. 64 MINING CODE	THE MINING CODE OUTLINES STANDARDS FOR MAINTAINING BOTH HUMAN AND ENVIRON- MENTAL HEALTH IN MINING OPERATIONS.	DIRECTION OF MINES AND HYDROCARBONS	MINES HAS NOT ENFORCED ANY ENVIRONMENTALLY RELATED LEGISLATION, ESPECIALLY IN THE CASE OF THE EL ROSARIO MINE NEAR LAGO YOJOA.
LEY ORGANICA OF THE HONDURAN INSTITUTE OF TOURISM	NATURAL RESOURCES PROTEC- TION IF RELATES TO TOURISM INCLUDED IN THIS LAW.	HONDURAN INSTITUTE OF TOURISM	ALTHOUGH TOURISM HAS PARTICIPATED IN COORDINAT- ED EFFORTS TO PROTECT TOURISM RELATED NATURAL ENVIRONMENTS (LAGO YOJOA FOR INSTANCE) THEY HAVE NOT TAKEN THE INITIATIVE TO PROMOTE ENVIRONMENTAL MANAGEMENT THEMSELVES.
ANTEPROYECTO DE LA LEY DE PESCA - FISHERIES AND DECRETO NO. 154 FISHERIES LAW	BESIDES MANAGING BOTH COMMERCIAL AND ARTESANAL FISHING, THESE LAWS ALSO PROTECT MANGROVE AND CORAL ECOSYSTEMS FROM DESTRUCTION AND CONTA- MINATION AND PROTECT SOME ENDANGERED SPECIES SUCH AS THE MANATEE.	NATURAL RENEWABLE RESOURCES (RENARE)	LITTLE HAS BEEN DONE IN THE FIELD TO PROTECT IM- PORTANT MARINE HABITAT SUCH AS MANGROVES. CONTROL OF TURTLE EGG COL- LECTION AND THE KILLING OF MANATEE HAS BEEN ATTEMPTED BUT SUCCESS HAS THUS FAR BEEN LIMITED.
ACUERDO NO. 0021 PETROLEUM LAW	THIS LAW REGULATES PETRO- LEUM EXPLORATION, EXTRAC- TION, STORAGE AND REFINING.	DIRECTION OF MINES AND HYDROCARBONS	THIS LAW DOES NOT INCLUDE SPECIFIC MEASURES FOR CONTROLLING OF SPILLS.
DECRETO NO. 146 CIVIL AERONAUTICS	INCLUDES REFERENCE TO THE APPLICATION OF AGRI- CHEMICALS.	THE DIRECTION OF CIVIL AERONAUTICS	DOES NOT INCLUDE GUIDE- LINES CONCERNING THE PRO- TECTION OF WILDLIFE OR WATER RESOURCES FROM AIR- SPRAYED CONTAMINANTS.

SOURCE: CONSUPLANE, 1978.

AN ENVIRONMENTAL LAW WHICH ADDRESSES THE ISSUE OF NATIONAL PARKS AND WILDLAND MANAGEMENT WAS DRAFTED IN 1975. SINCE THEN SEVERAL MODIFIED VERSIONS HAVE BEEN ELABORATED AND AT THIS TIME TWO SEPARATE LAWS BOTH DEALING WITH ENVIRONMENTAL PROTECTION, PARKS AND WILDLIFE HAVE BEEN PROPOSED. THE DEPARTMENT OF NATURAL RENEWABLE RESOURCES' VERSION IS CALLED THE "LAW FOR THE MANAGEMENT OF WILDLIFE AND ENVIRONMENTAL RESOURCES". IT IS A GENERAL LAW FROM WHICH IT IS PLANNED TO DERIVE MORE SPECIFIC LAWS DEALING WITH WILDLIFE, WILDLANDS, ENVIRONMENTAL PROTECTION. CONSUPLANE HAS ALSO DRAFTED A LAW ENTITLED "THE BASIC LAW FOR ENVIRONMENTAL MANAGEMENT". WHILE MORE DETAILED THAN THE FORMER, IT NEVERTHELESS IS QUITE GENERAL AND WILL BE USED AS A BASIS TO ELABORATE MORE DETAILED LEGISLATION.

4.2. INSTITUTIONAL INVOLVEMENT IN WILDLAND MANAGEMENT

ALTHOUGH MANY INSTITUTIONS ARE DIRECTLY OR INDIRECTLY LEGALLY RELATED TO WILDLAND PROTECTION AND MANAGEMENT, THE DIRECTION OF NATURAL RENEWABLE RESOURCES (RENARE) DEPARTMENT OF WILDLIFE AND ENVIRONMENTAL RESOURCES HAS BEEN THE FORERUNNER IN ASSUMING THIS RESPONSIBILITY. MANY OTHER GOVERNMENT AND NON-GOVERNMENTAL AGENCIES HAVE ASSISTED IN THESE EFFORTS BUT RENARE HAS IN GENERAL BEEN THE PRINCIPAL PROMOTER AND ORGANIZER OF WILDLAND PLANNING AND MANAGING EFFORTS.

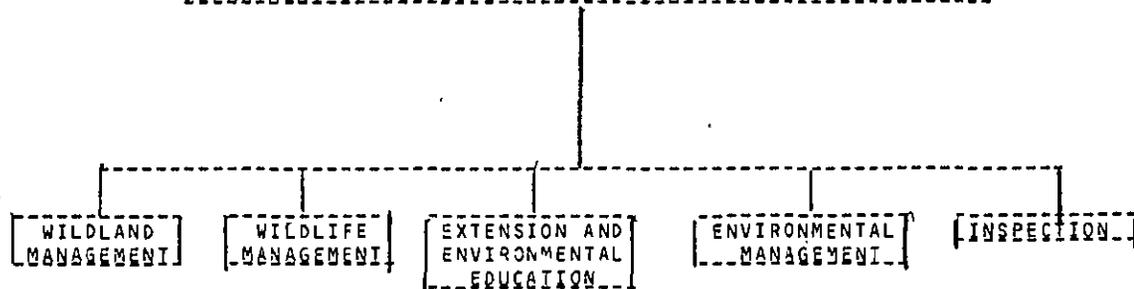
4.3 RENARE, DEPARTMENT OF WILDLIFE AND ENVIRONMENTAL RESOURCES - INSTITUTIONAL DESCRIPTION

4.3.1 DEPARTMENT STRUCTURE AND ORGANIZATION

THE DEPARTMENT OF WILDLIFE AND ENVIRONMENTAL RESOURCES (DWER) IS ONE OF FOUR MAJOR DEPARTMENTS IN THE RENARE WHICH FALLS UNDER THE MINISTRY OF NATURAL RESOURCES. THE DEPARTMENTS OF FISHERIES, ARTESANAL FISHERIES AND INVESTIGATION COMPRISE THE REST OF THE DIRECTION (SEE TABLE 3) DWER ITSELF IS ORGANIZED INTO THE FOLLOWING DIVISIONS: 1) WILDLANDS MANAGEMENT; 2) WILDLIFE MANAGEMENT; 3) EXTENSION AND ENVIRONMENTAL EDUCATION; 4) ENVIRONMENTAL MANAGEMENT; AND 5) INSPECTION (TABLE 4).

TABLE 4

DEPARTMENT OF WILDLIFE AND ENVIRONMENTAL RESOURCES (DWER)



GENERAL DEPARTMENTAL GOALS ARE TO:

- FORMULATE GENERAL POLICY RELATED TO THE UTILIZATION AND APPROPRIATE MANAGEMENT OF WILDLIFE AND WILDLAND RESOURCES
- PLAN AND PROMOTE ENVIRONMENTAL CONSERVATION PROGRAMS
- PROMOTE ENVIRONMENTAL EDUCATION AND EXTENSION ACTIVITIES INCLUDING TRAINING EXERCISES IN ENVIRONMENTALLY RELATED FIELDS
- ADMINISTER LAWS PERTAINING TO THE UTILIZATION AND PROTECTION OF THE NATURAL RENEWABLE RESOURCES MANAGED BY THIS AGENCY
- ELABORATE NEEDED LEGISLATION PERTAINING TO MANAGEMENT OF WILDLANDS, WILDLIFE AND THE ENVIRONMENT

4.3.2 DEPARTMENT STRATEGY

IN RECOGNITION OF THE IMPORTANCE OF FINANCES IN A DEVELOPING NATION LIKE HONDURAS, DWER HAS TAKEN PRAGMATIC ECONOMIC APPROACH TO NATURAL RESOURCE PROTECTION AND MANAGEMENT. ALTHOUGH THE MAINTENANCE OF ECOLOGICAL INTEGRITY IS THE PRIMARY GOAL OF THE DEPARTMENT, MANAGEMENT STRATEGIES STRESS UTILIZATION OF RESOURCES IN A RATIONAL MANNER. THIS ECODEVELOPMENT APPROACH (SUSTAINED ECONOMIC DEVELOPMENT WHICH IS BOTH ENVIRONMENTALLY AND CULTURALLY SOUND) IS EVIDENT IN MANY OF DWER'S ACTIVITIES AND PROJECTS SUCH AS THE "RIO PLATANO BIOSPHERE RESERVE" AND THE "COMERCIALIZATION OF WILDLIFE SPECIES". IT HAS BEEN RECOGNIZED THAT AN APPROACH OF THIS NATURE MUST BE BASED UPON A SOLID UNDERSTANDING OF THE RESOURCE TO BE MANAGED. FOR THIS REASON PLANNING AND INVESTIGATION HAVE BEEN STRESSED AS PRE-REQUISITES TO THE INITIATION OF PROJECTS.

EDUCATION IS CONSIDERED ANOTHER IMPORTANT COMPONENT IN MANY OF THE DEPARTMENT'S ACTIVITIES. EXTENSIONISTS HAVE CARRIED OUT ACTIVITIES FOR DECISION MAKERS (THE FIRST HONDURAN SEMINAR ON ECOLOGICAL PROBLEMS) THE GENERAL PUBLIC (EARTH DAY 1981) WITH CAMPESINO GROUPS (ENVIRONMENTAL EDUCATION IN THE RIO PLATANO) AND WITH THE PUBLIC EDUCATION SYSTEM (FIRST NATIONAL SEMINAR ON ENVIRONMENTAL EDUCATION, (AGUILAR, W. PERSONAL COMMUNICATION).

DWER RECOGNIZES THAT IT WIELDS LITTLE REAL POWER IN HONDURAS POLITICS AND HAS BEEN QUITE ACTIVE IN ORGANIZING COOPERATIVE EFFORTS WITH OTHER GOVERNMENT AND NON-GOVERNMENT AGENCIES. ALTHOUGH COMMUNICATIONS ARE OFTEN SPORADIC AND FOLLOWUP SOMETIMES DEFICIENT, DWER HAS PERHAPS ATTEMPTED MORE INTERAGENCY EFFORTS THAN ANY OTHER GOVERNMENTAL INSTITUTION.

ONE YEAR WORK PLANS ARE DEVELOPED AS IS AN ANNUAL BUDGET. ALTHOUGH A CRITICAL EVALUATION OF PROJECTS OF YEAR'S END IS NOT COMPULSORY, A REVIEW OF ACCOMPLISHED ACTIVITIES IS DOCUMENTED.

4.3.3 PERSONNEL AND RESOURCES

IN 1980 THE PROJECTED BUDGET FOR DWER WAS \$ 59,221. OF THIS, \$ 36,050 IS PROGRAMMED FOR THE ZOOLOGICAL PARK MANAGED BY THE DEPARTMENT. THE ACTUAL AMOUNT SLATED FOR WILDLAND MANAGEMENT IS ABOUT \$ 39,000 WHICH INCLUDES A LARGE PERCENTAGE DONATED BY INTERNATIONAL CONSERVATION ASSOCIATIONS. PERSONNEL GENERALLY ARE INVOLVED IN SEVERAL ASPECTS OF THE DEPARTMENT'S FUNCTIONS (NOT LIMITED TO JUST WILDLAND MANAGEMENT ACTIVITIES) THESE INCLUDE:

FUNCTION	NUMBER OF PERSONNEL INVOLVED
DEPARTMENT HEAD	1
MANAGEMENT OF SPORT HUNTING	1
MUSEUM AND TAXIDERMY DEPARTMENT	4
SERPENTARIUM AND VENOM EXTRACTION CENTER	3
WILDLIFE MANAGEMENT	3
EXTENSION AND EDUCATION	3
WILDLAND MANAGEMENT	10
WILDLIFE AND FISHERIES INSPECTORS	35
ZOOLOGICAL PARK	23
SECRETARIES	2

MOST OF THE EMPLOYEES HAVE NOT BEEN FORMALLY TRAINED IN NATURAL RESOURCE RELATED SERVICES ALTHOUGH THE HEAD OF THE DEPARTMENT DOES HAVE A MASTER'S DEGREE IN ENVIRONMENTAL STUDIES. SEVERAL US PEACE CORPS VOLUNTEERS AND THREE NATIONALS MAKE UP THE TECHNICAL STAFF (2 OTHER HONDURAN BIOLOGISTS ARE WORKING ON THEIR MASTER'S DEGREES OUTSIDE OF THE COUNTRY). OTHER PROMOTERS, TECHNICANS, AND INSPECTORS HAVE BEEN TRAINED ON THE JOB AND DEMONSTRATE VARYING DEGREES OF ENVIRONMENTAL AWARENESS.

EQUIPMENT IS BASIC AND VEHICLES WHICH ARE SHARED BY THE ENTIRE RENARE ARE SCARCE. ONLY INGENUITY AND MAKING DO WITH WHAT IS AVAILABLE HAS PERMITTED MANY WILDLAND AND WILDLIFE RELATED ACTIVITIES TO BE CARRIED OUT.

4.3.4 PROJECTS

IN 1976 RENARE TECHNICIANS DRAFTED A PLAN FOR THE FIRST COMPREHENSIVE SURVEY FOR POTENTIAL MANAGED WILDLAND UNITS. THE STUDY WAS MEANT TO: COLLECT BASIC NATURAL AND CULTURAL DATA ON SEVERAL OF THE MORE OUTSTANDING WILDLAND AREAS, TO ASSESS THEIR VALUE AS POTENTIAL PARKS AND EQUIVALENT RESERVES AND TO PRIORITIZE THEIR NEEDS FOR PROTECTION AND DEVELOPMENT. THE SURVEY STRESSED NOT JUST THE CREATION OF NATIONAL PARKS, BUT THE FORMATION OF A COMPLETE WILDLANDS SYSTEM WHERE EACH AREA WAS MANAGED ACCORDING TO ITS RESOURCE CHARACTERISTICS AND MANAGEMENT GOALS AS SHOWN IN TABLE 5. (HELLIE, R. AND GLICK, D. 1976). MANAGEMENT CATEGORIES AND THEIR DEFINITIONS INCLUDE THE FOLLOWING:

A. NATIONAL PARKS

DEFINITION: WILD OR VIRGIN AREAS WITH LITTLE SIGN OF HUMAN INTERVENTION; NOT LESS THAN 1000 HECTARES IN SIZE AND WITH UNIQUE NATURAL FEATURES WITH NATIONAL OR INTERNATIONAL SIGNIFICANCE; WITH POTENTIAL FOR TOURIST ACTIVITIES AND CONTROLLED RECREATION. EMPHASIS ON ENVIRONMENTAL EDUCATION USING NATURAL RESOURCE INTERPRETATION.

OBJECTIVES: TO PROTECT AND PRESERVE NATURAL AND CULTURAL VALUES OF THE AREA; TO PROTECT GENETIC RESOURCES; TO DEVELOP ENVIRONMENTAL EDUCATION PROGRAMS; TO OFFER OUTDOOR RECREATION OPPORTUNITIES AND AUTHORIZED INVESTIGATION.

B. NATURAL MONUMENTS

DEFINITION: AN AREA THAT GENERALLY ENCOMPASSES ONLY ONE NATURAL FEATURE THAT IS OF NATIONAL OR INTERNATIONAL SIGNIFICANCE. SIZE OF THE AREAS IS NOT IMPORTANT.

OBJECTIVES: PROTECT AND PRESERVE NATURAL CHARACTERISTICS AND PROVIDE OPPORTUNITIES FOR RECREATION, EDUCATION AND INVESTIGATION WITHOUT CAUSING DAMAGE TO THE RESOURCE

C. BIOLOGICAL RESERVE

DEFINITION: AREAS THAT ARE GENERALLY NOT ALTERED BY MAN AND CONTAIN FLORA AND/OR FAUNAL SPECIES OF NATIONAL OR INTERNATIONAL INTEREST. SIZE DEPENDS UPON THE HABITAT NEEDS OF THE SPECIES BEING PROTECTED.

OBJECTIVES: TO PROTECT AND PRESERVE SCIENTIFIC VALUES, PROVIDE OPPORTUNITIES FOR EDUCATION AND INVESTIGATION AND TO REDUCE TO A MINIMUM DETRIMENTAL IMPACTS UPON THE ENVIRONMENT.

D. WILDLIFE RESERVE

DEFINITION: AN AREA ENCOMPASSING THE VITAL HABITAT RESOURCES OF ANIMAL SPECIES OR A POPULATION OF NATIONAL OR INTERNATIONAL IMPORTANCE. SIZE DEPENDS ON HABITAT REQUIREMENTS OF THE SPECIES.

OBJECTIVES: TO ASSURE THE SURVIVAL OF SPECIES OR POPULATION AND THEIR PREFERRED HABITAT; TO IMPROVE HABITAT CONDITIONS WHEN POSSIBLE AND TO PERMIT LIMITED SCIENTIFIC EDUCATION AND RECREATION ACTIVITIES.

E. NATIONAL RECREATION AREAS

DEFINITION: RELATIVELY EXTENSIVE AREAS WITH NATURAL LANDSCAPES OF SCENIC VALUE AND WITH POTENTIAL OUTDOOR TOURISM/RECREATION OPPORTUNITIES PREFERABLY NEAR LARGE POPULATION CENTERS.

OBJECTIVES: TO INCREASE RECREATION OPPORTUNITIES IN SEMINATURAL ENVIRONMENTS AND TO PREVENT ENVIRONMENTAL DEGRADATION IN THESE AREAS.

SINCE THE ADOPTION OF THOSE MANAGEMENT CATEGORIES (BASED UPON MILLER 1977) RENARE HAS INTEGRATED A MORE FLEXIBLE POLICY INTO ITS WILDLAND MANAGEMENT GUIDELINES WHICH IN SOME CASES PROVIDES FOR TIGHTLY CONTROLLED BUT MULTIPLE USE OF NATURAL AREAS UNDER MANAGEMENT (SEE BELOW: LA TIGRA AND RIO PLATANO CASE STUDIES). IT HAS ALSO EXPANDED ITS MANAGEMENT CLASSIFICATIONS TO INCLUDE TWO OTHER OPTIONS WHICH SPECIFICALLY ADDRESS THE CONCEPT OF MULTIPLE USE. A THIRD OPTION - FOREST RESERVES - WHICH FALLS UNDER THE AUSPICES OF CONDEFOR, HAS BEEN ADDED TO DEMONSTRATE THE RELEVANCE OF THEIR ROLE IN THE MANAGEMENT OF NATURAL AREAS TO THAT OF RENARE'S.

F. BIOSPHERE RESERVES

DEFINITION: AREAS WHICH NOT ONLY PRESERVE GENETIC RESOURCES BUT ALSO PROVIDE FOR THE STUDY OF MAN'S IMPACT UPON HIS ENVIRONMENT AND THE DEVELOPMENT OF ENVIRONMENTALLY AND CULTURALLY SOUND LAND USE PRACTICES.

OBJECTIVES: TO PROTECT GENETIC AND CULTURAL RESOURCES, PROVIDE FOR EDUCATIONAL AND SCIENTIFIC ACTIVITIES INCLUDING MANIPULATIVE EXPERIMENTATION IN PRESCRIBED ZONES. CONTROLLED RESOURCE HARVESTING CAN BE PERMITTED IN CERTAIN AREAS.

G. MULTIPLE USE AREAS

DEFINITION: AREAS WHERE NATURAL RESOURCES CAN BE HARVESTED BUT ONLY UNDER STRICT REGULATION AND WHERE APPROPRIATE. SEVERAL RESOURCE DEVELOPMENT ACTIVITIES MAY BE CARRIED OUT SIMULTANEOUSLY AS LONG AS THEY ARE NOT AFFECTING CRITICAL AREAS NOR DIMINISHING THE ECOSYSTEMS' CAPABILITIES TO PRODUCE A SUSTAINED YIELD OF GOODS AND SERVICES.

OBJECTIVE: TO MANAGE NATURAL RESOURCE UNITS SUCH AS ENTIRE WATERSHEDS IN SUCH A MANNER THAT OPTIMAL UTILIZATION FROM EACH RESOURCE IS OBTAINED WITH MINIMAL IMPACT IMPORTED. THESE AREAS CAN INCLUDE PROTECTED ZONES AND ZONES FOR FOREST HARVESTING, AGRICULTURE, TOURISM, RECREATION, EDUCATION, ETC.

H. FOREST RESERVES

DEFINITION: GENERALLY LARGE EXPANSES OF WOODLANDS CONTAINING FOREST RESOURCES OF EXCEPTIONAL ECONOMIC AND/OR SCIENTIFIC VALUE.

OBJECTIVES: TO ADEQUATELY PROTECT AND MANAGE THESE AREAS IN SUCH A MANNER THAT A SUSTAINED YIELD OF FOREST PRODUCTS IS ASSURED. CAN SIGNIFY ABSOLUTE PROTECTION IF (AS IN THE CASE OF THE TROPICAL RAINFOREST) EFFICIENT MANAGEMENT PRACTICES HAVE NOT BEEN IDENTIFIED.

TABLE 5

MANAGEMENT AND DEVELOPMENT CATEGORIES FOR NATURAL AND CULTURAL WILDLAND RESOURCES

PRIMARY MANAGEMENT	NATIONAL PARK	NATURAL MONUMENT	BIOLOGICAL RESERVE	WILDLIFE REFUGE	NATIONAL RECREATION AREA	BIOSPHERE RESERVE	MULTIPLE USE AREA	FOREST RESERVE
- CONSERVE VIABLE SAMPLES OF NATURAL ECOSYSTEMS	1	1	1	1	3	1	1	3
- CONSERVE ECOLO- GICAL DIVERSITY AND NATIONAL FLORA AND FAUNA	1	1	1	1	2	1	1	1
- CONSERVE GENETIC RESOURCES	1	1	1	1	3	1	1	1
- PROVIDE INVESTI- GATIVE AND EDU- CATIONAL OPPORTU- NITIES	1	1	1	1	2	1	2	1
- PROTECT IMPORTANT WATERSHEDS	2	3	2	2	2	2	1	2
- CONTROL EROSION	2	3	2	2	2	2	1	2
- PROVIDE TOURIST/ RECREATIONAL OPPORTUNITIES	1	2	3	3	1	2	2	3
- PROTECT CULTURAL HERITAGE SITES	1	3	1	0	1	1	2	3
- PROTECT SCENIC VISTAS	1	1	3	2	1	2	2	3
- PROMOTE APPRO- PRIATE RURAL DEVELOPMENT	2	2	3	2	2	1	1	1
- PERMIT CONTROLLED HARVESTING OF DESIGNATED RESOURCES ON A SUSTAINABLE BASIS	3	3	3	3	2	2	1	1

KEY: 1 - PRIMARY MANAGEMENT OBJECTIVE
 2 - SECONDARY MANAGEMENT OBJECTIVE BUT STILL IMPORTANT
 3 - INCLUDED WHEN MANAGEMENT OBJECTIVES AND ECOSYSTEM RESOURCES ARE APPROPRIATE

SOURCE: MODIFIED FROM RENARE, 1979.

TABLE 6

POTENTIAL WILDLAND MANAGEMENT UNITS IN HONDURAS

A. LA TIGRA NATIONAL PARK: LOWER MONTANE HUMID FOREST AND CLOUD FOREST WITH AN ESTIMATED AREA OF \pm 7,500 HECTARES.

ECOLOGICAL AND ECONOMIC SIGNIFICANCE: IMPORTANT WATERSHED FOR TEGUCIGALPA, SUPPLIES 40% OF ITS POTABLE WATER. CONTAINS PRIMARY CLOUD FOREST HABITAT. QUETZALS, PUMA AND COLLARED PECCARY FOUND THERE. TREMENDOUS RECREATIONAL AND EDUCATIONAL OPPORTUNITIES.

THREATS: UNCONTROLLED FARMING, LOGGING AND CONSTRUCTION OF HOMES IN FRAGILE AREAS. ILLEGAL HUNTING AND COLLECTION OF PLANTS. CONSTRUCTION OF RADIO TOWERS IN SCENIC AREAS.

STATUS: LEGALLY DECLARED A NATIONAL PARK, RENARE IS DEVELOPING TRAILS, VISITOR CENTER AND MAINTAINING VIGILANCE. A MANAGEMENT PLAN HAS BEEN WRITTEN.

COMMENTS: ALTHOUGH LEGALLY PROTECTED, FOREST DESTRUCTION CONTINUES. NEEDS MORE OF A COORDINATED EFFORT ON THE PART OF RENARE AND COHDEFOR.

B. USUCO FOREST RESERVE: LOWER MONTANE RAIN FOREST AND MONTANE RAIN FOREST WITH AN ESTIMATED AREA OF \pm 10,000 HECTARES.

ECOLOGICAL AND ECONOMIC SIGNIFICANCE: IMPORTANT WATERSHED AREA FOR SAN PEDRO SULA. SOME PRIMARY FOREST AND GOOD REGENERATION OF SECONDARY FOREST. QUETZALS, TAPIR, PECCARY AND PUMA RESIDE IN AREA. RECREATIONAL OPPORTUNITIES FOR NEARBY SAN PEDRO SULA RESIDENTS TO ESCAPE THE LOWLAND HEAT.

THREATS: INAPPROPRIATE FARMING IN AREA. SOME HUNTING OF RARE SPECIES.

STATUS: LEGALLY DECLARED A FOREST RESERVE AND MANAGED BY COHDEFOR. RENARE HAS CARRIED OUT A RESOURCE INVENTORY AND HAS IDENTIFIED IT AS A POTENTIAL NATIONAL PARK.

COMMENTS: COHDEFOR HAS DONE LITTLE TO MANAGE THE AREA. MERITS IMMEDIATE DECLARATION AND PROTECTION AS A NATIONAL PARK.

C. AZUL MEAMBER MOUNTAIN: LOWER MONTANE RAIN FOREST AND MONTANE RAIN FOREST WITH AN ESTIMATED AREA OF \pm 10,000 HECTARES.

ECOLOGICAL AND ECONOMIC SIGNIFICANCE: IMPORTANT WATERSHED AREA FOR BOTH THE LAGO YOJOA HYDROELECTRIC PROJECT AND TO A LESSER DEGREE THE EL CAJON PROJECT. OUTSTANDING SCENIC BEAUTY AND PRIMARY MONTANE RAIN FOREST.

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THREATS: ALTHOUGH EXTREMELY STEEP, THIS MOUNTAIN IS NEVERTHELESS BEING DEFORESTED BY SHIFTING AGRICULTURALISTS.

STATUS: THE AREA HAS BEEN PROPOSED AS A NATIONAL PARK AND IS LEGALLY PROTECTED AS PART OF THE LAGO YOJOA WATERSHED.

COMMENTS: THIS MOUNTAIN HAS NOT YET BEEN STUDIED IN THE INVENTORY PROJECT. PROTECTION DOES NOT EXIST BUT BECAUSE OF ITS IMPORTANCE TO HYDROELECTRIC PROJECTS, MEASURES TO MANAGE THIS RESERVE SHOULD BE TAKEN IMMEDIATELY.

D. ISLAS DE LA BAHIA - REEFS AT ROATAN AND SWAN ISLAND: ISLAND - HUMID TROPICAL FOREST AND TROPICAL DECIDUOUS FOREST; REEFS - BARRIER. ESTIMATED AREA IS ± 4,000 HECTARES.

ECOLOGICAL AND ECONOMIC SIGNIFICANCE: OF EXCEPTIONAL TOURIST POTENTIAL. ALSO IMPORTANT IN MAINTAINING VIABLE COMMERCIAL AND ARTESANAL FISHING. CORAL REEFS ARE SOME OF THE FINEST IN THE WORLD. ALSO MANGROVE SWAMPS.

THREATS: DEFORESTATION ROATAN IS DEGRADING THE REEFS BECAUSE OF SIL DEPOSITION. OTHER CONTAMINANTS, BOTH FROM TERRESTRIAL AND MARINE SOURCES ARE AFFECTING THE REEFS. OVERFISHING HAS REDUCED FISH POPULATIONS. UNPLANNED TOURISM DEVELOPMENT COULD DEGRADE ISLAND AND REEF RESOURCES (POND CONSTRUCTION FOR EXAMPLE). MANGROVE IS ALSO BEING CUT. SWAN ISLAND HAS NOT BEEN VISITED.

STATUS: ROATAN HAS BEEN SUPERFICIALLY STUDIED BY RENARE AND PROPOSED AS A NATIONAL PARK. NO PROTECTION OR MANAGEMENT AT THIS TIME.

COMMENTS: BECAUSE OF THE POTENTIAL TOURISM OPPORTUNITIES AND THE ECOLOGICAL IMPORTANCE OF THE REEFS FOR ISLAND FISHERIES, A CONCERTED EFFORT BY RENARE AND TOURISM SHOULD BE MADE TO PROTECT AND MANAGE THIS ZONE.

E. RIO PLATANO BIOSPHERE RESERVE: TROPICAL HUMID FOREST AND SUBTROPICAL RAIN FOREST. ALSO TROPICAL RAIN FOREST, LOWLAND PINE SAVANNAH AND MONTANE RAIN FOREST HAS AN ESTIMATED AREA OF ± 180,000 HECTARES WITHOUT BUFFER ZONE, AND ± 350,000 WITH BUFFER ZONE.

ECOLOGICAL AND ECONOMIC SIGNIFICANCE: PERHAPS THE FINEST REPRESENTATIVE SAMPLE OF TROPICAL RAIN FOREST IN CENTRAL AMERICA. SEVERAL ENDANGERED SPECIES: JAGUAR, TAPIR, HARPY EAGLE, MANATEE AS WELL AS A VARIETY OF HABITAT TYPES. CULTURAL RESOURCES INCLUDE IMPORTANT ARCHEOLOGICAL SITES AND MISKITO AND PAYA INDIANS. AS A BIOSPHERE RESERVE IT REPRESENTS AN IMPORTANT RESEARCH SITE FOR IDENTIFYING SOUND DEVELOPMENT PRACTICES FOR THE HUMID TROPICS.

THREATS: ISOLATION HAS PROTECTED MOST OF THIS ZONE ALTHOUGH LOGGING, CATTLE RANCHING AND MIGRATING AGRICULTURALISTS ARE BEGINNING TO CONVERGE ON THE RESERVE BORDERS. PLANS TO BUILD A HIGHWAY TO PUERTO LEMPIRA COULD BRING ADDITIONAL DISTURBANCE TO THE AREA. GOLDMINING HAS CAUSED SILTING PROBLEMS AND SOME OVERFISHING IN THE HEADWATERS REGION IS OCCURRING (DYNAMITE IS OFTEN USED).

STATUS: THE AREA HAS BEEN LEGALLY DECLARED A BIOSPHERE RESERVE AND OFFICIALLY RECOGNIZED AS SUCH BY UNESCO.

COMMENTS: AS MENTIONED, ISOLATION HAS PROTECTED THIS REGION BUT PRESSURES ARE CERTAIN TO MOUNT. ADEQUATE PROTECTION COMBINED WITH EDUCATION AND EXTENSION (FOR RESIDENTS OF THE RESERVE, MIGRATING AGRICULTURALISTS LIVING ADJACENT TO THE ZONE, DECISION MAKERS AND THE GENERAL PUBLIC) IS NECESSARY TO APPROPRIATELY MANAGE THIS EXCEPTIONAL RESOURCE.

F. SANTA BARBARA MOUNTAIN: LOWER MONTANE RAIN FOREST AND MONTANE RAIN FOREST WITH AN ESTIMATED AREA OF \pm 7,000 HECTARES.

ECOLOGICAL AND ECONOMIC SIGNIFICANCE: CLOUD FOREST HABITAT INCLUDING GUATEMALAN CYPRESS (QUERQUSSUS QUINHAMI) AND GUATEMALAN FIR (ABIES GUATEMALENSIS) WHICH ARE RARELY FOUND IN HONDURAS. THIS FOREST PLAYS AN IMPORTANT ROLE IN PROTECTING A LARGE PORTION OF THE LAGO YOJOA WATERSHED AS WELL AS PROVIDING POTABLE WATER FOR SANTA BARBARA AND OTHER ADJACENT TOWNS.

THREATS: MIGRATING AGRICULTURE IS RAPIDLY MOVING UP THE SIDES OF SANTA BARBARA AND NEARING THE TOP. THE ROSARIO MINING COMPANY PREVIOUSLY CUT MUCH OF THE AREA TO PROVIDE TIMBERS FOR THEIR MINES.

STATUS: ALTHOUGH SLATED FOR STUDY, RENARE HAS NOT CARRIED OUT COMPREHENSIVE INVENTORY OF THE MOUNTAIN. IT IS PROPOSED AS A BIOLOGICAL RESERVE.

COMMENTS: BECAUSE OF ITS IMPORTANCE TO THE LAGO YOJOA HYDROELECTRIC POWER PROJECTS AND IN PROVIDING HIGH QUALITY DRINKING WATER, THIS MOUNTAIN SHOULD BE ADEQUATELY STUDIED AND PROPERLY MANAGED.

G. CERRO DELAQUE: LOWER MONTANE HUMID FOREST AND CLOUD FOREST WITH AN ESTIMATED AREA OF \pm 20,000 HECTARES.

ECOLOGICAL AND ECONOMIC SIGNIFICANCE: EXTENSIVE CLOUD FOREST WITH REPRESENTATIVE FLORA AND FAUNA. SOURCE OF POTABLE WATER FOR THE TOWN OF GRACIAS.

THREATS: WHILE STEEP SLOPES HAVE KEPT DISTURBANCE ON THE TOP OF THIS MOUNTAIN A MINIMUM, IT IS LOCATED IN ONE OF THE MOST DENSELY POPULATED RURAL AREAS OF THE COUNTRY.

STATUS: THE AREA HAS NOT BEEN EXTENSIVELY INVENTORIED BY RENARE ALTHOUGH IT HAS BEEN PROPOSED AS A BIOLOGICAL RESERVE.

COMMENTS: THE AREA SHOULD BE STUDIED AND A MANAGEMENT STRATEGY PROPOSED.

H. PICO BONITO: LOWER MONTANE RAIN FOREST AND SUB-TROPICAL RAIN FOREST; ALSO MONTANE RAIN FOREST WITH AN ESTIMATED AREA OF \pm 20,000 HECTARES.

ECOLOGICAL AND ECONOMIC SIGNIFICANCE: A SPECTACULAR BACKDROP FOR THE CITY OF LA CEIBA. FOREST COVERED RUGGED PEAKS RAISE NEARLY 2,500 METERS FROM SEA LEVEL. IMPORTANT WATERSHED FOR BOTH LA CEIBA ON THE NORTH AND THE AGUAN VALLEY TO THE SOUTHEAST.

THREATS: MIGRATING AGRICULTURALIST FORCED OUT OF THE LOWER COASTAL AREAS BY AGROBUSINESS AND PERIODIC FLOODS ARE MOVING UP THE SLOPES OF THIS MOUNTAIN. UNMANAGED TIMBER CUTTING IN THE REGION HAS ALSO LEFT PARTS OF THIS MOUNTAIN RANGE SEVERELY DEGRADED.

STATUS: THIS PEAK HAS BEEN SELDOM IF EVER CLIMBED AND IS VIRTUALLY UNKNOWN TO SCIENTISTS. PROPOSED BY RENARE AS A BIOLOGICAL RESERVE.

COMMENTS: FOR ITS SCENIC VALUE ALONE THE AREA MERITS PROTECTION. RESOURCE INVENTORIES SHOULD BE CARRIED OUT WITH SUBSEQUENT MANAGEMENT DIRECTIONS CHARTED.

I. PICO_PIVOL: LOWER MONTANE RAIN FOREST AND MONTANE RAIN FOREST WITH AN ESTIMATED AREA OF \pm 7,000 HECTARES.

ECOLOGICAL AND ECONOMIC SIGNIFICANCE: THE BROADLEAF FORESTS OF THIS MOUNTAIN WILL PLAY AN IMPORTANT ROLE IN PROTECTING PORTIONS OF THE WATERSHED AFFECTING THE EL CAJON DAM SITE. ALSO AN IMPORTANT HABITAT FOR THE QUETZAL AND OTHER CLOUD FOREST FAUNA.

THREATS: NOT KNOWN.

STATUS: THIS AREA HAS NOT BEEN EVEN SUPERFICIALLY VISITED BY RENARE ALTHOUGH IT IS KNOWN THAT QUETZALS ARE FOUND THERE. IT HAS BEEN SUGGESTED AS A WILD LIFE REFUGE.

COMMENTS: THE ROLE OF THIS AREA IN RELATION TO THE EL CAJON PROJECT SHOULD BE ASSESSED. IF IT IS OF VITAL IMPORTANCE IT SHOULD BE PROTECTED IMMEDIATELY.

J. IRIENIQ: LOWER MONTANE HUMID FOREST AND CLOUD FOREST WITH AN ESTIMATED AREA OF \pm 10,000 HECTARES.

ECOLOGICAL AND ECONOMIC SIGNIFICANCE: THIS LARGE FORESTED AREA HAS BEEN SUGGESTED AS A TRI-COUNTRY NATIONAL PARK SHARED BY GUATEMALA, EL SALVADOR AND HONDURAS.

THREATS: LITTLE INFORMATION IS AVAILABLE ON THIS AREA ALTHOUGH MILITARY OCCUPATION OF THE ZONE HAS REPORTEDLY DIMINISHED SOME WILD SPECIES.

STATUS: PROPOSED AS A BIOLOGICAL RESERVE BUT VIRTUALLY NO STUDIES HAVE BEEN DONE IN THE AREA DUE TO THE POLITICAL SITUATION IN THAT ZONE.

COMMENTS: AT THIS TIME MANAGEMENT OF THE REGION IS AN IMPOSSIBILITY. IF AT SOME FUTURE DATE TENSIONS CALM IT WOULD MAKE AS SUGGESTED, AN IDEAL FRONTIER PARK SHARED BY THREE NATIONS.

K. LAGO YOJOA MULTIPLE USE AREA: SUBTROPICAL RAIN FOREST AND TROPICAL LOWLAND RAIN FOREST AND MONTANE RAIN FOREST WITH AN ESTIMATED AREA OF \pm 17,000 HECTARES (NOT INCLUDING CERRO AZUL OR CERRO SANTA BARBARA).

ECOLOGICAL AND ECONOMIC SIGNIFICANCE: THIS WATERSHED PROTECTS HONDURAS' LARGEST OPERATING HYDROELECTRIC POWER PROJECT. IT ALSO INCLUDES LAGO YOJOA, THE LARGEST FRESHWATER LAKE IN THE COUNTRY AND A POPULAR FISHING SITE FOR BOTH COMMERCIAL AND SPORT FISHERMEN.

THREATS: RAMPANT DEFORESTATION BY AGRICULTURALISTS AND SOME LOGGING OPERATIONS HAVE LEFT THIS AREA IN SERIOUS CONDITION. HEAVY METAL MINING WASTES FLOW INTO LAGO YOJOA AS DO PESTICIDES AND ORGANIC WASTES FROM SURROUNDING RESIDENTIAL AND BUSINESS ENTERPRISES.

STATUS: THIS AREA HAS BEEN THE FOCUS OF INTENSIVE MULTIAGENCY EFFORTS TO DEVELOP AND IMPLEMENT A MULTIPLE USE PLAN - THE FIRST FOR CENTRAL AMERICA. ALTHOUGH COMPLETED AND IMPLEMENTED, THE PROJECT HAS SINCE STAGNATED AND LITTLE IS BEING DONE.

COMMENTS: BECAUSE OF ITS ECONOMIC IMPORTANCE THIS AREA SHOULD BE THE FOCUS OF AN INTEGRATIVE EFFORT BY VARIOUS GOVERNMENT AGENCIES. FUNDS SHOULD BE REINVESTED IN THE PROJECT AND THE MULTIPLE USE PLAN IMPLEMENTED.

L. MONTANAS DE COLON: TROPICAL HUMID FOREST AND SUBTROPICAL RAIN FOREST AS WELL AS TROPICAL RAIN FOREST WITH AN ESTIMATED AREA OF \pm 200,000 HECTARES.

ECOLOGICAL AND ECONOMIC SIGNIFICANCE: VIRTUALLY UNEXPLORED BY SCIENTISTS, AERIAL SURVEYS DOCUMENT THE EXISTENCE OF SPECTACULAR CLIFFS AND WATERFALLS AND LARGE EXPANSES OF TROPICAL RAIN FOREST.

THREATS: AT THIS TIME QUITE PRISTINE BUT A PROPOSED ROAD TO PUERTO LEMPIRA WILL PASS NEAR THIS AREA.

STATUS: NO INVESTIGATIONS HAVE BEEN PLANNED.

COMMENTS: THIS AREA SHOULD BE AT LEAST SUPERFICIALLY SURVEYED AND A MANAGEMENT STRATEGY ELABORATED.

M. LAGUNAS DE ORIENTE - IBANS, BRUS AND CARATASCA: TROPICAL RAIN FOREST, MARSH, SWAMP AND MANGROVE WITH THE FOLLOWING ESTIMATED AREA:

IBANS	\pm	10,000 HECTARES
BRUS	\pm	15,000 HECTARES
CARATASCA	\pm	100,000 HECTARES

ECOLOGICAL AND ECONOMIC SIGNIFICANCE: ALL THREE OF THOSE LARGE MANGROVE FRINGED LAGOONS ARE VITAL IN PROVIDING NUTRIENTS TO MARINE FISH AND SHELL FISH. THEY SERVE AS RESTING SITES FOR BIRDS AND MANATEE, CROCODILE AND OTHER THREATENED SPECIES ARE FOUND THERE.

THREATS: ALTHOUGH SOME CUTTING OF MANGROVE DOES OCCURE THESE LAGOONS ARE STILL IN VERY GOOD CONDITION. AN ILL-CONCEIVED CANAL BUILDING PROJECT WHICH WOULD HAVE LINED THE THREE AREAS HAS BEEN HALTED.

STATUS: IBANS AND BRUS HAVE BEEN INVESTIGATED AND PARTS OF BOTH ARE INCLUDED IN THE RIO PLATANO BIOSPHERE RESERVE. CARATASTA HAS NOT BEEN EXTENSIVELY INVESTIGATED BUT IS A PROPOSED WILDLIFE REFUGE.

COMMENTS: THE ROLE OF THESE LAGOONS IN THE COMMERCIAL FISHING INDUSTRY OF THAT REGION SHOULD BE QUANTIFIED. COMMERCIAL FISHERMEN COULD HELP SUPPORT PROTECTION EFFORTS IF INDEED THESE LAGOONS WERE MAINTAINING THEIR LIVELIHOOD.

N. LAGUNAS DEL NORTE - MICOS, ALVARADO Y GUAIMORETO: TROPICAL RAIN FOREST AND MANGROVE AND MARSH AND SWAMP WITH THE FOLLOWING ESTIMATED AREA:

MICOS	±	5,000 HECTARES
ALVARADO	±	1,000 HECTARES
GUAIMORETO	±	7,200 HECTARES

ECOLOGICAL AND ECONOMIC SIGNIFICANCE: THESE MANGROVE FRINGED LAGOONS ARE ALSO IMPORTANT TO THE COMMERCIAL AND ARTESANAL FISHERIES OF THE AREA. THEY ARE RESTING SITES FOR SEVERAL BIRD SPECIES AND MANATEE ARE PERIODICALLY OBSERVED.

THREATS: THESE LAGOONS UNDER PRESSURE FROM POTENTIALLY UNSOUND DEVELOPMENT. PORT CONSTRUCTION NEAR GUAIMORETO AT PUERTO CASTILLA COULD HAVE DETRIMENTAL IMPACTS ON THE MARINE RESOURCES OF THE AREA. RESIDENCIAL DEVELOPMENT AT ALVARADO IS DEGRADING WATER QUALITY AND HABITAT, AND AGRICULTURE IS EDGING IN ON THE MICOS LAGOON.

STATUS: ALL THREE OF THESE LAGOONS ARE SLATED TO BE STUDIED IN THE NEAR FUTURE BY RENARE. AT THIS TIME THERE IS LITTLE ACTUAL PROTECTION OF THESE VALUABLE RESOURCES. THEY ARE PROPOSED AS WILDLIFE REFUGES.

COMMENTS: THE PROPOSED LAGOON SURVEY SHOULD BE CARRIED OUT AND SUBSEQUENT APPROPRIATE MANAGEMENT STEPS TAKEN.

O. MANGLARES DEL SUR: TROPICAL DRY FOREST WITH AN ESTIMATED AREA OF ± 6,000 HECTARES.

ECOLOGICAL AND ECONOMIC SIGNIFICANCE: THIS AREA HAS A HIGH VALUE IN MAINTAINING VIABLE POPULATIONS OF COMMERCIALY FISHED MARINE SPECIES. SEA TURTLES (LEPIDICHELYS OLIVACCA) REST ON THE BEACHES.

THREATS: FORMERLY ALMOST 50,000 HECTARES OF MANGROVE FRINGED THE GULF COAST. NOW, BECAUSE OF UNMANAGED CUTTING FOR FIREWOOD AND NO REFORESTATION, PRIMARY MANGROVE SWAMPS HAVE BEEN REDUCED CONSIDERABLY IN TOTAL AREA.

STATUS: A MULTI-INSTITUTIONAL EFFORT TO PROTECT THE REMNANT MANGROVE AREA HAS RECENTLY BEEN LAUNCHED. THE AREA IS LEGALLY DECLARED A RESERVE AND CUTTING OF MANGROVE IS PROHIBITED BY BOTH THE CONDEFOR AND THE DEPARTMENT OF FISHERIES LAWS.

COMMENTS: MANAGEMENT, PROTECTION, IMPLEMENTATION OF STANDING LAWS AND EDUCATION IS NEEDED IMMEDIATELY IF THIS AREA IS TO BE PROTECTED AND RATIONALLY MANAGED.

P. BIO CUERO -- MANATEE REFUGE: TROPICAL RAIN FOREST AND MARSH, SWAMP AND MANGROVE.

ECOLOGICAL AND ECONOMIC SIGNIFICANCE: THIS AREA HAS BEEN DOCUMENTED AS HAVING A HIGH CONCENTRATION OF MANATEE.

THREATS: FISHERMEN AND HUNTERS ARE TAKING THEIR TOLL ON THESE CREATURES AND PROBABLY KEEPING THEIR NUMBERS WELL BELOW THAT WHICH THE COASTAL ECOSYSTEMS CAN SUPPORT.

STATUS: THE AREA HAS BEEN SURVEYED BY AIR AND PRELIMINARY PLANS HAVE BEEN MADE TO BEGIN FIELD WORK IN THE AREA.

COMMENTS: BECAUSE OF THE EXTREME SCARCITY OF THIS ANIMAL IT CAN BE CONSIDERED ONE OF THE MOST THREATENED IN THE COUNTRY. A SMALL RESERVE IN THIS AREA WOULD BE INEXPENSIVE TO MAINTAIN AND COULD BE INSTRUMENTAL IN SAVING THE SPECIES. EDUCATION PROGRAMS SHOULD GO HAND IN HAND WITH PROTECTION EFFORTS.

G. SEVERAL OTHER SMALL SITES HAVE BEEN SLATED FOR INVESTIGATION. THEY INCLUDE: CAVES, WATERFALLS, HOT SPRINGS, PETRIFIED FORESTS, SEVERAL BEACHES AND FOREST RECREATION ZONES.

SOURCE: MODIFIED FROM HELLIE AND GLICK, 1976 AND CONSUPLANE 1979.

4.3.5 LIFE ZONES REPRESENTED IN THE SURVEY

- LOWER MONTANE HUMID FOREST
- LOWER MONTANE RAIN FOREST
- MONTANE RAIN FOREST
- HUMID TROPICAL FOREST
- SUB-TROPICAL RAIN FOREST
- TROPICAL DRY FOREST

APPROXIMATE LAND AREA PROPOSED FOR PROTECTION AT THIS TIME:

- 636,700 HECTARES OR APPROXIMATELY 5.68% OF THE NATIONAL TERRITORY

OF THIS:

- APPROXIMATELY 150,000 HECTARES ARE MARSH, SWAMP, MANGROVE, LAGOON OR CORAL REEF
- APPROXIMATELY 351,000 HECTARES ARE AREAS WITH STEEP SLOPS UNSUITABLE FOR AGRICULTURE
- AND, MUCH OF THE REST OF THE AREA (APPROXIMATELY 135,700 HECTARES) IS TROPICAL RAIN FOREST FOR WHICH ECOLOGICALLY AND ECONOMICALLY SOUND FORESTRY AND AGRICULTURAL PRACTICES HAVE NOT BEEN DEVELOPED.

4.3.6 STATUS OF THE SURVEY:

- FOUR AREAS HAVE BEEN EXTENSIVELY STUDIED: CUSUCO, LA TIGRA, RIO PLATANO AND LAGO YOJOA
- SEVERAL AREAS HAVE BEEN VISITED: ALL OF THE LAGOONS, ROATAN, PICO BONITO, SANTA BARBARA, CELAGUE, AND THE RIO CUERO
- MANAGEMENT PLANS HAVE BEEN WRITTEN FOR 3 AREAS: LA TIGRA, RIO PLATANO AND LAGO DE YOJOA
- ACTIVE MANAGEMENT IS BEING CARRIED OUT AT LA TIGRA AND THE RIO PLATANO.

TO THIS LIST OF PREDOMINANTLY BROADLEAF FORESTED AREAS SHOULD BE ADDED THE LEGALLY DECLARED PINE AND HARDWOOD FOREST RESERVES OF CONDEFOR. THE AREAS ARE IN VARIOUS STAGES OF MANAGEMENT AND EXPLOITATION BUT NEVERTHELESS WHEN COMPLEMENTED WITH RENARE'S PROPOSED WILDLANDS SYSTEM THEORETICALLY ALMOST COMPLETES THE COVERAGE OF MAJOR ECOSYSTEMS IN HONDURAS.

CONDEFOR FOREST RESERVES DECLARED BY LAW
(SOURCE: HELLIE AND GLICK 1976)

NAME	SIZE OF AREA	LIFE ZONE(S)
1. PINES OF GUANAJA, ISLAS DE LA BAHIA		TROPICAL RAIN FOREST
2. RESERVA DE OLANCHO	1,500,000 HECTARES	TROPICAL RAIN FOREST, SUB-TROPICAL RAIN FOREST, TROPICAL HUMID FOREST, TROPICAL DRY FOREST.
3. AGALTECA	100,000 HECTARES	SUB-TROPICAL DRY FOREST HUMID SUB-TROPICAL FOREST LOWER MONTANE HUMID FOREST
4. OTHER RESERVES CORRESPOND TO AREAS PROPOSED AS PART OF RENARE'S WILDLAND SYSTEM. THEY INCLUDE: THE GULF COAST MANGROVES, CUSUCO, THE RIO PLATANO, AND THE LAGO YOJOA WATERSHED.		

4.4 RENARE WILDLAND MANAGEMENT - TWO CASE STUDIES

4.4.1 LA TIGRA CLOUD FOREST NATIONAL PARK

ALTHOUGH NOT INCLUDED IN THE INITIAL IDENTIFICATION OF POTENTIAL WILDLAND REGIONS, ONCE VISITED PLANNERS AT DWER WERE CONVINCED THAT THIS AREA MERITED INTENSIVE INVESTIGATION. IT'S IMPORTANCE IN PROTECTING TEGUCIGALPA'S WATERSHED, SCENIC BEAUTY, ECOLOGICAL IMPORTANCE AND PROXIMITY TO THE CITY MADE IT AN IDEAL PILOT NATIONAL PARK.

IN 1977 INITIAL NATURAL AND CULTURAL RESOURCES INVESTIGATIONS WERE CARRIED OUT, AND LIMITS SET. UTILIZING DATA GATHERED DURING THE RESOURCE INVENTORY A MANAGEMENT PLAN WAS WRITTEN. THE PLAN ITSELF IS UNIQUE IN THAT IT ACCOMODATES FARMERS AND OTHERS LIVING WITHIN THE RESERVE AND PROPOSES INSTEAD OF EXPROPRIATION ACTUALLY UTILIZING THEM AS: PARK EMPLOYEES, INVOLVING THEM IN APPROPRIATE AGRICULTURAL PROJECTS SUCH AS TERRACING AND AGROFORESTRY AND ESTABLISHING PLANT NURSERIES TO GROW ORCHIDS, FERNS AND OTHER PLANTS TO SELL TO PARK VISITORS (BETANCOURT ET. AL. 1979). ENVIRONMENTAL EDUCATION PROGRAMS WERE INITIATED IN NEARBY GRADE SCHOOLS AND A VISITOR'S CENTER WAS CREATED IN THE ABANDONED HOUSING OF THE ROSARIO MINING COMPANY WHICH ONCE INTENSIVELY MINED THE AREA.

IN 1980 THE 7,500 HEC. ZONE WAS OFFICIALLY DECLARED A NATIONAL PARK. ONE HUNDRED THOUSAND DOLLARS FROM COHDEFOR WAS PROMISED FOR DEVELOPMENT OF THE PROJECT AND DWER HAD ORGANIZED SEVERAL INTERINSTITUTIONAL SEMINARS AND MEETINGS ON RESERVE.

HOWEVER, IN 1981 THE MONEY FROM COHDEFOR HAD STILL NOT BEEN RECEIVED AND COMMUNICATIONS BETWEEN THE TWO AGENCIES HAS ALMOST STOPPED. ALTHOUGH THERE ARE SEVERAL FOREST GUARDS AND OTHER PERSONNEL AT THE PARK SITE, LITTLE IS HAPPENING. THE 1981 BUDGET FOR LA TIGRA IS A MERE \$ 6,000 AND THIS LACK OF FUNDING, COUPLED WITH A LACK OF TRAINED HUMAN RESOURCES, IS CAUSING THE PROJECT TO STAGNATE. ACTIVITY IN THE ZONE HAS NOT CEASED COMPLETELY, BUT IT IS NOWHERE NEAR THE LEVEL THAT A NEWLY CREATED PILOT NATIONAL PARK WITH A MANAGEMENT PLAN TO IMPLEMENT SHOULD BE AT. AND, DEGRADATION OF THIS IMPORTANT RESOURCE CONTINUES AS UNCONTROLLED FARMERS CLEAN FOREST VEGETATION AND COHDEFOR ITSELF ATTEMPTS TO CONSTRUCT COMMUNICATION TOWERS IN THE HEART OF THE PARK!

AGRICULTURAL EXTENSION PROGRAMS ARE SLATED TO BE INITIATED IN 1981. HOWEVER, NO OTHER MAJOR ACTIVITIES ARE PLANNED IN THE NEAR FUTURE.

4.4.2 RIO PLATANO BIOSPHERE RESERVE

THE 180,000 HECTARE RIO PLATANO WATERSHED WAS INITIALLY INVESTIGATED BY AN INTERDISCIPLINARY TEAM OF DWER PROFESSIONALS IN 1977 (GLICK, D. 1980). THE TRIP WAS SUPPORTED BY TECHNICAL ASSISTANCE FROM THE WILDLANDS MANAGEMENT UNIT OF CATIE IN TURRIALBA, COSTA RICA. THE UNIQUE COMBINATION OF NATURAL (VAST PRIMARY RAIN FOREST) AND CULTURAL FEATURES (EXTENSIVE ARCHEOLOGICAL SITES AND TWO INDIGENOUS GROUPS) SEEMED TO WARRANT

SPECIAL MANAGEMENT CONSIDERATIONS FOR THE ZONE. IT WAS DECIDED TO UTILIZE UNESCO'S MAN IN THE BIOSPHERE (MAB) BIOSPHERE RESERVE PROGRAM. THIS INTERNATIONAL EFFORT IS ATTEMPTING TO ESTABLISH AND APPROPRIATELY MANAGE REPRESENTATIVE SAMPLE OF THE PLANET'S MAJOR ECOSYSTEMS. THESE AREAS WILL NOT ONLY PROTECT GENETIC RESOURCES BUT CAN BE UTILIZED AS EXPERIMENTAL AREAS FOR DETERMINING MAN'S IMPACT UPON THE ENVIRONMENT AND METHODOLOGIES FOR MITIGATING NEGATIVE EFFECTS. BIOSPHERE RESERVES CAN ALSO ACCOMMODATE HUMAN POPULATIONS, ESPECIALLY IF THEY ARE LIVING ENVIRONMENTALLY SOUND LIFESTYLES.

DWER PERSONNEL MADE SEVERAL SUBSEQUENT TRIPS TO THE RESERVE TO COLLECT FURTHER DATA AND DISCUSS THE PROJECT WITH LOCAL INHABITANTS. ENVIRONMENTAL EDUCATION CAMPAIGNS WERE LAUNCHED BOTH IN THE RESERVE SITE AND IN THE CAPITAL CITY TO GAIN CITIZEN SUPPORT. A NATIONAL MAB COMMITTEE COMPOSED OF REPRESENTATIVES FROM SEVERAL GOVERNMENTAL AND NON-GOVERNMENTAL AGENCIES WAS FORMED AND ASSISTED IN FOCUSING THE MANAGEMENT STRATEGY. ANOTHER INTEGRATIVE TEAM WITH ASSISTANCE FROM BOTH CATIE AND UNESCO ELABORATED A DRAFT MANAGEMENT PLAN FOR THE RESERVE. THIS PLAN INCLUDES BASELINE NATURAL AND CULTURAL DATA, A ZONING SCHEME (CULTURAL ZONE, BUFFER ZONE, SPECIAL USE ZONE AND CORE OR "NATURAL" ZONE) AND RESERVE MANAGEMENT PROGRAMS. THE DRAFT PLAN WAS REVIEWED BY SEVERAL AGENCIES AS WELL AS THE INDIGENOUS INHABITANTS OF THE RESERVE. THE RESULTANT DOCUMENT IS NOW BEING IMPLEMENTED. A RESIDENT OF THE REGION HAS BEEN HIRED AS THE RESERVE DIRECTOR AND HE IS ASSISTED BY A SMALL TEAM OF FOREST GUARDS. A RESERVE HEADQUARTERS HAS BEEN BUILT AS WELL AS A SMALL STRUCTURE IN THE INTERIOR FOR USE BY SCIENTISTS AND GUARDS. IN 1980 THE AREA WAS LEGALLY DECLARED A PROTECTED BIOSPHERE RESERVE BY THE GOVERNMENT. WORLD WILDLIFE FUND HAS DONATED \$ 20,000 ANNUALLY TO THE EFFORT AND CATIE AND UNESCO CONTINUE TO PROVIDE TECHNICAL SUPPORT WHEN NEEDED. RENARE MEANWHILE HAS BUDGETED \$ 4,600 FOR THE PROJECT IN 1981.

THE DEVELOPMENT OF THE SITE APPEARS TO BE MOVING AHEAD DESPITE LOGISTICAL, TECHNICAL AND FINANCIAL PROBLEMS. HOWEVER, AS OUTSIDE PRESSURE FROM LOGGING INTERESTS AND MIGRATING AGRICULTURALISTS MOUNTS, MANAGEMENT AND PROTECTION OF THE REGION WILL BE A MUCH MORE FORMIDABLE TASK. ALSO, IF INTERNATIONAL FUNDING WERE TO BE CUT OFF, IT IS DOUBTFUL THAT THE PROJECT COULD SURVIVE. FUTURE PLANS CALL FOR INCREASED VIGILANCE, ESPECIALLY IN THE UPPER WATERSHED WHERE INVASION IS MOST LIKELY TO OCCUR. AND, ENVIRONMENTAL EDUCATION AND EXTENSION WORK WILL BE CONTINUED. SCIENTISTS FROM OTHER NATIONS HAVE EXPRESSED INTEREST IN UTILIZING THE RESERVE AND SOME GROUPS HAVE ALREADY BEGUN STUDIES. THE PLATANO PROJECT APPEARS IN GENERAL TO BE IN FAIRLY SOUND CONDITION - IF ONLY FOR THE TIME BEING.

4.4.3 FUTURE RENARE WILDLAND PROJECTS

AT THIS TIME RENARE IS NEITHER CONTEMPLATING EXTENSIVE RESEARCH NOR DEVELOPMENT OF ANY OTHER WILDLAND AREAS PROPOSED IN THE INVENTORY. MANAGEMENT ACTIVITIES WILL FOCUS UPON LA TIGRA AND RIO PLATANO AND A WORKSHOP FOR PARK GUARDS ON WILDLAND MANAGEMENT IS PROPOSED FOR THIS FALL. DEVELOPMENT OF A NATIONAL RECREATION AREA HAS BEEN CONTEMPLATED AS A MEANS OF EXPOSING A LARGE NUMBER OF PEOPLE TO THE WILDLANDS SYSTEM CONCEPT BUT NOTHING CONCRETE HAS BEEN PLANNED. WITH RECENT BUDGET CUTS, DWER IS JUST BARELY ABLE TO MAINTAIN ONGOING PROJECTS.

4.5 DEPARTMENT OF WILDLIFE AND ENVIRONMENTAL RESOURCES - ANALYSIS OF WILDLAND MANAGEMENT EFFORTS

IN PRAISE OF DWER IT CAN BE SAID THAT IN RELATION TO PROGRESSIVE ENVIRONMENTAL THINKING AND ACTION IN HONDURAS, THEY FOSTERED THE MOVEMENT. THEY WERE THE FIRST TO BEGIN WILDLIFE AND WILDLANDS PROGRAMS AS WELL AS ENVIRONMENTAL EDUCATION EFFORTS IN THIS COUNTRY. THEY HAVE BEEN INSTRUMENTAL IN COORDINATING INTERINSTITUTIONAL EFFORTS TO MANAGE IMPORTANT SHARED NATURAL RESOURCES. AND THEY HAVE ENCOURAGED OTHER AGENCIES AND INSTITUTIONS TO BECOME INVOLVED IN ENVIRONMENTAL PROJECTS.

BUT UNFORTUNATELY, AT A TIME WHEN THE MESSAGE OF DWER SEEMS MOST OPPORTUNE FOR COMPREHENSION AND ACCEPTANCE BY DECISION MAKERS AND THE GENERAL PUBLIC, THEY APPEAR TO HAVE STAGNATED AND FALLEN BACK FROM THE CUTTING EDGE OF CONSERVATION. THE REASONS FOR THIS ARE VARIOUS, EMANATING FROM BOTH OUTSIDE AND INSIDE OF THE INSTITUTION.

AT THE MINISTRY AND JUNTA LEVEL, THE ACTIVITIES OF DWER ARE NOT WELL KNOWN OR UNDERSTOOD. THE DEPARTMENT HAS FAILED TO CAPTURE THE AUDIENCE OF THE NATION'S DECISION MAKERS. THE FACT THAT DWER AT THIS TIME IS NOT DIRECTLY BRINGING IN LARGE AMOUNTS OF MONEY TO GOVERNMENT COFFERS (ALTHOUGH REVENUE FROM THE SALE OF WILD ANIMALS IS CONSIDERABLE) IS THE PRIMARY REASON FOR GOVERNMENT DISINTEREST IN THE AGENCY. HOWEVER IT IS AT LEAST IN PART THE FAULT OF THE DEPARTMENT FOR NOT CONVEYING TO DECISION MAKERS AND THEIR CONSTITUENTS THE MESSAGE OF THE BENEFITS OF SOUND WILDLAND AND WILDLIFE MANAGEMENT. THIS INCLUDES NOT ONLY AT THE HIGHEST LEVELS OF GOVERNMENT BUT ALSO WITHIN THE ADMINISTRATION OF RENARE ITSELF WHICH HAS DONE LITTLE TO PROMOTE AND SUPPORT DWER EFFORTS. BUDGET ALLOCATIONS REFLECT THIS AS RENARE'S DEPARTMENT OF FISHERIES RECEIVES THE BULK OF THE FUNDING.

TAXES FROM PET SALES ARE NOT EARMARKED FOR DWER AND THE DEPARTMENT DOES NOT BENEFIT FROM THEIR EFFORTS TO MANAGE THIS TRADE IN A SUSTAINED YIELD BASIS. OF THE LITTLE MONEY THAT THEY DO RECEIVE MOST IS USED TO MAINTAIN THE ZOOLOGICAL PARK WHICH THE DEPARTMENT HAS SADDLED WITH. BETWEEN THE ZOO AND THE DEPARTMENT MUSEUM, OVER TWICE AS MUCH MONEY IS BEING SPENT TO CAGE OR STUFF ANIMALS AS IS UTILIZED TO PROTECT THEM AND THEIR HABITAT!

ALTHOUGH A LACK OF TRAINED PERSONNEL IS A SERIOUS PROBLEM, THE UNDERUTILIZATION OF PRESENT EMPLOYEES IS OF EVEN MORE SIGNIFICANCE. THE DEPARTMENT HAS FAILED TO PROPERLY DELEGATE AUTHORITY TO PERSONNEL THEREBY LEAVING A FEW PERSONS OVEREXTENDED AND MANY OTHERS WITH LITTLE OR NOTHING TO DO. AS ONE DEPARTMENT MEMBER STATED "NEW EMPLOYEES COME HERE MOTIVATED BUT LEAVE DISCOURAGED AND WORSE - DESINTERESTED". AN AGENCY THAT FAILS TO EXCITE AND INVOLVE EVEN ITS OWN STAFF WILL UNDOUBTABLY HAVE MINIMAL IMPACT ON OUTSIDE INSTITUTIONS.

ALTHOUGH WRITTEN LAWS IN HONDURAS OFTEN HAVE MINIMAL IMPACT ON THE ACTIONS OF INDIVIDUALS AND ORGANIZATIONS, THE FACT THAT DWER HAS NO WILDLIFE LAW, NO PARKS AND EQUIVALENT RESERVES LAW AND NO ENVIRONMENTAL PROTECTION LAW HAS HINDERED THE AGENCY IN ITS QUEST FOR RECOGNITION. HOWEVER, EVEN IF

PASSED, IT IS DOUBTFUL THAT THE DEPARTMENT WOULD HAVE THE CAPABILITY TO ENFORCE THEM.

COMMUNICATION WITHIN THE DEPARTMENT IS POOR AS HAS RECENTLY BEEN INTERINSTITUTIONAL COOPERATION. A GOOD EXAMPLE OF THIS IS THE \$ 100,000 PROMISED BY CONDEFOR OVER TWO YEARS AGO FOR THE DEVELOPMENT OF LA TIGRA NATIONAL PARK. FAILURE TO PROCURE THIS MONEY IS DUE AT LEAST IN PART, TO A LACK OF FOLLOW-UP ON THE PART OF RENARE.

FINALLY, AS MENTIONED PREVIOUSLY, DWER HAS THUS FAR NOT BEEN ABLE TO CONVINCE THE MASSES OF THE IMPORTANCE OF SOUND NATURAL RESOURCE MANAGEMENT. ALTHOUGH THEY ARE MAKING SOME HEADWAY THEY ARE BEING FAR OUTDISTANCED BY THE RATE OF RESOURCE DEPLETION. THEIR EFFORTS HAVE BEEN TOO FEW AND TOO SCATTERED ALTHOUGH RECENT COLLABORATION WITH THE MINISTRY OF EDUCATION MAY BE INSTRUMENTAL IN LAUNCHING A CONCERTED NATIONAL ENVIRONMENTAL EDUCATION CAMPAIGN. BUT UNTIL THE GENERAL PUBLIC IS PETITIONING DECISION MAKERS TO SUPPORT ENVIRONMENTAL MANAGEMENT EFFORTS, DWER WILL REMAIN AN OBSCURE DEPARTMENT WITH GOOD INTENTIONS BUT FEW RESOURCES TO REALIZE THESE GOALS.

4.6. RELATED WILDLAND CONSERVATION EFFORTS

SEVERAL OTHER HONDURAN GOVERNMENTAL AND NON-GOVERNMENTAL AGENCIES AS WELL AS SOME INTERNATIONAL EFFORTS HAVE BECOME INVOLVED TO VARYING DEGREES IN WILDLANDS CONSERVATION IN HONDURAS. A PARTIAL LIST AND DESCRIPTION OF THEIR INVOLVEMENT IS INCLUDED BELOW:

TABLE 7

WILDLAND CONSERVATION EFFORTS (EXCLUDING RENARE) IN HONDURAS

AGENCY	EFFORTS	COMMENTARY
1. COHDEFOR	HAS COOPERATED PERIODICALLY WITH RENARE ON THE LA TIGRA NATIONAL PARK, THE LAGO YOJOA MULTIPLE AREA AND THE RIO PLATANO BIOSPHERE RESERVE. THEY HAVE RECENTLY ESTABLISHED AND ARE ATTEMPTING TO PROTECT A LARGE REGION OF HARDWOOD FOREST WHICH IS ADJACENT TO THE RIO PLATANO RESERVE. THEY ARE INVOLVED IN FOREST FIRE PROTECTION AND FOREST MANAGEMENT AROUND THE COUNTRY.	COHDEFOR WITH FIELD PERSONNEL IN VIRTUALLY EVERY SECTOR OF THE COUNTRY HAS TREMENDOUS CAPABILITY TO ASSIST IN SOUND RESOURCE MANAGEMENT. FROM TO MANAGEMENT TO EDUCATION (ESNACIFOR IS PLANNING ON INCLUDING PARKS AND WILDLIFE IN THEIR CURRICULUM IN THE NEAR FUTURE) COHDEFOR HAS THE RESOURCES TO BECOME ACTIVELY INVOLVED IN WILDLAND LAND PROTECTION. HOWEVER THIS HAS BEEN OF LOW PRIORITY FOR THE AGENCY AND FOREST EXPLOITATION IS BY FAR RECEIVING THE GREATEST FOCUS OF ATTENTION. THEIR WATERSHED UNIT HAS BEEN ALMOST DISBANDED AND FEW ACTIVITIES OF THIS NATURE ARE BEING CARRIED OUT.
2. INSTITUTE OF TOURISM AND THE INSTITUTE OF ANTHROPOLOGY AND HISTORY	THESE TWO AGENCIES HAVE BOTH ALIED WITH RENARE ON OCCASION TO PROMOTE SEVERAL WILDLAND MANAGEMENT PROJECTS. TOURISM ITSELF IS ATTEMPTING TO INITIATE AN EXTENSIVE ENVIRONMENTAL STUDY OF THE BAY ISLANDS WHILE ANTHROPOLOGY MANAGES THE COPAN RUINS AND IS ATTEMPTING TO SURVEY THE ENTIRE COUNTRY FOR ARCHEOLOGICAL SITES.	WHILE NEITHER OF THESE AGENCIES ARE WELL-VERSED IN ENVIRONMENT MANAGEMENT THEY ARE NEVERTHELESS WILLING SUPPORTERS OF RELATED ACTIVITIES. WHILE NOT OF GREAT POWER, THIS EFFORTS COMBINED WITH RENARE'S HAS BEEN INSTRUMENTAL IN PROMOTING WILDLAND PROTECTION. TOURISM ESPECIALLY IS INTERESTED IN BECOMING MORE INVOLVED IN ENVIRONMENTAL AFFAIRS AFFECTING THEIR DEVELOPMENT OPTIONS.
3. CONSUPLANE	CONSUPLANE HAS ATTEMPTED TO INCORPORATE THE ENVIRONMENTAL VARIABLE INTO ITS ELABORATION OF THE COUNTRY'S CURRENT "FIVE YEAR NATIONAL DEVELOPMENT PLAN". THE PLAN INCLUDES NOT ONLY GUIDELINES FOR ESTABLISHING AN ENVIRONMENTAL "WATCHDOG" AGENCY BUT ALSO SUPPORTS THE CREATION OF A COMPREHENSIVE WILDLANDS SYSTEM. THEY HAVE RECENTLY DRAWN UP A DRAFT ENVIRONMENTAL PROTECTION LAW WHICH INCLUDES GENERAL ASPECTS OF WILDLAND MANAGEMENT.	CONSUPLANE HAS AMBITIONS AND SKILLED PROFESSIONALS WORKING ON ENVIRONMENTAL ISSUES BUT LITTLE ACTUAL POWER OR INFLUENCE AMONG GOVERNMENT AGENCIES. IF THEIR STATUS COULD BE ELEVATED THEY COULD BECOME THE GUIDING FORCE IN ENVIRONMENTAL AFFAIRS IN THE COUNTRY.
4. UNESCO	THE NATIONAL MAB COMMITTEE WAS FORMED INITIALLY TO FACILITATE INTEGRATIVE INPUT FROM DIFFERENT GOVERNMENTAL AND NON-GOVERNMENTAL AGENCIES. IT IS MADE UP OF REPRESENTATIVES FROM A VARIETY OF INSTITUTIONS.	THE MAB COMMITTEE PROVIDES A STANDING INTER-INSTITUTIONAL FORUM FOR COLLABORATION ON NATURAL RESOURCES ISSUES. UNFORTUNATELY THE GROUP HAS BEEN ESSENTIALLY INACTIVE FOR THE LAST YEAR.

AGENCY	EFFORTS	COMMENTARY
5. PEACE CORPS	PEACE CORPS HAS BEEN INVOLVED IN WILDLAND MANAGEMENT EFFORTS FROM THEIR INCEPTION. THOUGH ONCE IN A PLANNING CAPACITY VOLUNTEERS ARE NOW DOING FIELD PROJECTS. THERE IS ONE VOLUNTEER WORKING SPECIFICALLY ON WILDLANDS AT DWER AND SEVERAL OTHERS IN THE DEPARTMENT. SOME 18 PCVS ARE WORKING WITH COHDEFOR, MOSTLY IN SOCIAL FOREST PROGRAMS.	PEACE CORPS CAN PROVIDE TECHNICAL ASSISTANCE BUT ONLY IF THERE IS ADEQUATE SUPPORT FOR THEM FROM THEIR HOST AGENCY. RENARE COULD BENEFIT FROM ADDITIONAL TECHNICAL BACKSTOPPING, BUT AT THIS TIME DOES NOT HAVE THE CAPABILITY TO TAKE ON MORE PERSONNEL.
6. CATIE/WORLD WILDLIFE FUND (WWF)	THE WORLD WILDLIFE FUND HAS SUPPORTED THE RIO PLATANO PROJECT WITH A TOTAL DONATION OF \$ 50,000 THUS FAR. THE MONEY IS MANAGED BY THE WILDLAND MANAGEMENT UNIT AT CATIE WHICH SERVES AS A LAISON BETWEEN RENARE AND WWF. THE WILDLAND UNIT HAS PROVIDED TECHNICAL SUPPORT FOR SEVERAL DWER PROJECTS AND HAS ORGANIZED SEVERAL WILDLAND MANAGEMENT RELATED WORKSHOPS AND SEMINARS WHICH DEPARTMENT PERSONNEL HAVE PARTICIPATED IN.	THE WORLD WILDLIFE FUND IS ONE OF THE FEW INTERNATIONAL CONSERVATION GROUPS WHICH IS FINANCIALLY SUPPORTING WHAT IT ADVOCATES. IT'S CONTRIBUTION HAS KEPT THE PLATANO PROJECT MOVING. CATIE HAS ALSO BEEN INSTRUMENTAL IN GUIDING DWER'S WILDLAND AND WILDLIFE STRATEGY ALTHOUGH THEY THEMSELVES ARE OVER EXTENDED AND HAVE NOT BEEN ABLE TO DEVOTE THE ATTENTION TO HONDURAS THAT IT DESERVES AT THIS CRITICAL TIME.
7. SWISS GOVERNMENT	<p>THE SWISS GOVERNMENT HAS EXPRESSED INTEREST IN SUPPORTING WILDLAND MANAGEMENT IN HONDURAS AND HAS SENT A TEAM TO STUDY THE CURRENT SITUATION. THE TEAM PROPOSED THE FOLLOWING PROJECTS TO BE SUPPORTED BY \$ 1,062,000 FROM THE SWISS GOVERNMENT:</p> <ul style="list-style-type: none"> - CREATION OF A SEPARATE WILDLAND MANAGEMENT AGENCY - DEVELOPMENT OF LA TIGRA - DEVELOPMENT OF RIO PLATANO - DEVELOPMENT OF WATERSHED STUDY OPTION IN ESNACIFOR. 	LACK OF ORGANIZATION AND CONFLICTS OF INTEREST ON THE PART OF HONDURAN PROFESSIONALS INVOLVED IN THIS PROPOSAL HAS LEFT THE OFFER TABLED FOR THE TIME BEING. IT REPRESENTS A TREMENDOUS OPPORTUNITY FOR WILDLAND PROTECTION IN HONDURAS AND SHOULD BE UTILIZED. HOWEVER, HONDURAS MUST FIRST DETERMINE HOW AND WHO IS GOING TO MANAGE THESE RESOURCES IN THE FUTURE.

5.0 FAUNAL RESOURCES

5.1 GENERAL CHARACTERISTICS OF HONDURAN FAUNAL RESOURCES

FROM BOTH AN ECOLOGICAL AND ECONOMIC PERSPECTIVE, HONDURAN FORMAL RESOURCES ARE OF EXCEPTIONAL VALUE. RESPONDING TO THE DIVERSITY OF LIFE ZONES, A WIDE ARRAY OF SPECIES RANGING FROM THE MAGNIFICENT QUETZAL *PHAROMACHRUS MOCINNO* (LA BASTILLE, A. 1978) TO THE ILLUSIVE MANATEE *TRICHECHUS MANATUS* (KLEIN E. 1977) FIND SUITABLE HABITAT WITHIN THE CONFINES OF THIS NATION'S BORDERS. AND THE GEOGRAPHIC LOCATION OF HONDURAS -THE BRIDGE BETWEEN NORTH AND SOUTH AMERICA- IS MANIFESTED IN THE INTERESTING MIX OF TEMPERATE AND TROPICAL SPECIES.

HOWLER MONKEYS (*ALOUATIA VILLOSA*) AND WHITE TAILED DEER (*ODCOILEUS VIRGINIANUS*) SHARE THE SAME WOODLAND, FOR INSTANCE. THE REGION IS ALSO THE TEMPORARY HOME OF MANY MIGRATING SPECIES, INCLUDING THE WHITE WINGED DOVE (*ZENAIIDA ASIATICA*) AND THE GREEN TURTLE (*CHELONIA MYDAS*). ONE HUNDRED AND TWELVE MAMMALIAN SPECIES HAVE BEEN LISTED BY MYTON (MYTON, B. ET.A.) AND OVER 700 BIRD SPECIES HAVE BEEN RECORDED (MONROE, B. 1968, MARCUS, M. 1981, PETERSON, R. ET.A. 1973). CRUZ HAS IDENTIFIED 196 REPTILES AND AMPHIBIANS ALTHOUGH THIS LIST LIKE THE OTHER WILL UNDOUBTABLY BE EXPANDED AS COLLECTING CONTINUES.

ALTHOUGH RECENT INVESTIGATIONS HAVE GIVEN BIOLOGISTS SOME IDEA OF SPECIES DIVERSITY, THERE IS A DEARTH OF INFORMATION ON POPULATION DYNAMICS, RANGE, ECOLOGY AND STATUS. UTILIZING SOME OF THE FEW STUDIES THAT HAVE BEEN DONE ON THE FAUNA OF THIS REGION (MONROE B. 1968 - BIRDS, KLEIN, E. 1977 - MAMMALS AND MERGER, J. 1969 - REPTILES AND AMPHIBIANS) TABLE 7 GIVES A GENERAL LIST OF SOME OF THE MORE THREATENED OR ENDANGERED SPECIES:

TABLE 8

THREATENED OR ENDANGERED HONDURAN WILDLIFE SPECIES

SPECIES	HABITAT	THREAT(S)
- GIANT ANTEATER (<i>MYMECOPHAGA IBIDACTYLA</i>)	TROPICAL RAIN FOREST	HABITAT DESTRUCTION
- RING TAIL CAT (<i>BASSARISCUS SUMICHRASTII</i>)	TROPICAL RAIN FOREST MONTANE RAIN FOREST	HABITAT DESTRUCTION
- GRISON (<i>GALIENIS ALLAUANDI</i>)	TROPICAL RAIN FOREST RIVER	HABITAT DESTRUCTION
- RIVER OTTER (<i>LUIBA ANNECIEUS</i>)	TROPICAL RAIN FOREST RIVER	HABITAT DESTRUCTION OVER HUNTING

SPECIES	HABITAT	THREAT(S)
- JAGUAR (FELIS_ONCA)	TROPICAL RAIN FOREST MONTANE RAIN FOREST (CAN LIVE IN OTHER ZONES BUT GENERALLY NOT FOUND THERE IN HONDURAS)	HABITAT DESTRUCTION OVER HUNTING
- HOWLER MONKEY (ALOUATIIS_VILLOSA)	TROPICAL RAIN FOREST CLOUD FOREST	HABITAT DESTRUCTION HUNTING
- OCELOTE (FELIS_PARDALIS)	TROPICAL RAIN FOREST MONTANE RAIN FOREST	HABITAT DESTRUCTION OVER HUNTING
- MARGAY (FELIS_WIEDII)	TROPICAL RAIN FOREST MONTANE RAIN FOREST AND CLOUD FOREST	HABITAT DESTRUCTION
- MANATEE (TRICHECHUS_MANATUS)	ATLANTIC COASTAL LAGOONS AND RIVER MOUTHS	HABITAT DESTRUCTION OVER HUNTING
- TAPIR (TAPIRUS_BAIRDII)	TROPICAL RAIN FOREST MONTANE RAIN FOREST	HABITAT DESTRUCTION OVER HUNTING
- BROKET DEER (MAZAMA_AMERICANA)	TROPICAL RAIN FOREST	HABITAT DESTRUCTION OVER HUNTING
- QUETZAL (PHASOMACHRUS_MOCIMNO)	CLOUD FOREST AND MONTANE RAIN FOREST	HABITAT DESTRUCTION HUNTING
- HARPY EAGLE (HARPIA_HARPYJA)	TROPICAL RAIN FOREST	HABITAT DESTRUCTION
- SCARLET MACAW (ARA_AMEIGUA)	TROPICAL RAIN FOREST	HABITAT DESTRUCTION OVER CAPTURE
- YELLOW LORED PARROT (AMAZONA_XANTHOLOPHA)	BAY ISLANDS	HABITAT DESTRUCTION
- WEDGED TAILED SABREWING (CAMPYLOPTERUS_CURVIPENNIS)	RAIN FOREST	HABITAT DESTRUCTION
- CRESTED GUAN (PENELOPE_PUBRUBASCEUS)	TROPICAL RAIN FOREST	HABITAT DESTRUCTION OVER HUNTING
- GREAT CURASSOW (CRAX_BURBA)	TROPICAL RAIN FOREST	HABITAT DESTRUCTION OVER HUNTING

SPECIES	HABITAT	THREAT(S)
- BANDED TIGER HERON (<i>TIGRISOMA LINCAIUM</i>)	LOWLAND TROPICAL WETLANDS	HABITAT DESTRUCTION
- SOLITARY EAGLE (<i>HABRY HALIACIUS SOLITARIUS</i>)	TROPICAL RAIN FOREST	HABITAT DESTRUCTION
- CRESTED EAGLE (<i>MORPHNUS GUIANCAIS</i>)	TROPICAL RAIN FOREST	HABITAT DESTRUCTION
- (<i>CAREY CARETTA</i>)	COASTAL ZONES	COLLECTION OF EGGS HUNTING
- GREEN TURTLE (<i>CHELONIA MYDAS</i>)	COASTAL ZONES	COLLECTION OF EGGS HUNTING
- (<i>EREIMOCHELYS IMBESICATUM</i>)	COASTAL ZONES	COLLECTION OF EGGS HUNTING
- (<i>LEPIDOCHELYA OLIVACIA</i>)	COASTAL ZONES	COLLECTION OF EGGS HUNTING
- (<i>DERMOCHELYS FOBIACEA</i>)	COASTAL ZONES	COLLECTION OF EGGS HUNTING
- (<i>CROCODYLUS ACUTUS</i>)	COASTAL ZONES IN LAGOONS SWAMPS AND RIVERS	HUNTING

BESIDES THESE THREATENED ANIMALS THERE ARE SEVERAL OTHER NOTEWORTHY FAUNAL SPECIES RESIDING IN THE VARIED HABITAT ZONES OF HONDURAS. TABLE 9 LISTS SOME OF THESE BY THEIR PREFERRED HABITAT:

TABLE 9

IMPORTANT NON-THREATENED SPECIES

TROPICAL LOWLAND RAIN FOREST

WHITE FACED MONKEY (<i>CEBUS SAPUCINUS</i>)	SUN GREBE (<i>HELIORNIS FULICA</i>)	IGUANA (<i>IGUANA IGUANA</i>)
SPIDER MONKEY (<i>ATELES GEOFFROYI</i>)	RED-LORED PARROT (<i>AMAZONA AUTUMNALIS</i>)	BOA (<i>BOA CONSTRICTOR</i>)
COATIMUNDI (<i>NASUA NARICA</i>)	KEEL-BILLED TOUCAN (<i>RAMPHASTOS SULFURATUS</i>)	CAIMAN (<i>CAIMAN CROCODILUS</i>)

WHITE LIPPED PECCARY
(TAYASSU PECARI)

ORNATE HAWK-EAGLE
(SPIZAEETUS ORNATUS)

FER DE LANCE
(BOTHROPS ASPRES)

SLOTH
(BRADYPUS GRISEUS)

GREEN-IGIB
(MESEMBRINIBIS CAYENNENSIS)

PALM VIPER
(TAMAGAS VERDE)

UPLAND-PINE-FOREST.

PUMA
(FELIS CONCOLOR)

RED TAILED HAWK
(BUTEO JAMAICENSIS)

WHITE TAILED DEER
(ODOCRILEOUS VIRGINIANUS)

RED-BILLED AZURECROWN
(AMAZILIA CYNOCEPHALA)

GREY FOX
(UROCYOM CINARCOARGENTUS)

SPOTTED SCREECH-OWL
(OTUS TRICHOPSIS)

COYOTE
(CANIS LATRANS)

STELLER'S JAY
(CYANOCITTA STELLERI)

RABBIT
(SYLVILEGUS FLORIDENUS)

HEPATIC TANAGER
(PIRANGA FLAVA)

CLOUD-AND-MONTANE-BAIN-FOREST

ARMADILLO
(DASYPUS NOVEMCINCTUS)

ROADSIDE HAWK
(BUTEO MAGNIROSTRIS)

CORAL SNAKE
(MICRUIU NIGROCINCTUS)

PACU
(CUNICULUS PASA)

BLACK CHACHALACA
(PENELCPE NEGRA)

TAMAGAS
(BOTHROPS GODMANI)

COLLARED PECCARY
(TAYASSU TAJAEU)

ENROLD CHINNED HUMING BIRD
(ABEILLIS ABEILLIA)

(BASILISEUS VITTATUS)

VARIGATED SQUIRREL
(SCIURUS VARIEGATOIDES)

EMERALD TOUCANET
(AULACOPHYNCHUS PROSINUS)

MEXICAN TREE FROG
(SMILISCA BANDII)

PUMA
(FELIS CONCOLOR)

SLATE COLORED SOLITAIRE
(MYADESTES UNICCLOR)

GULF COAST TOAD
(BUFO VILLICEPS)

HABITAT DESTRUCTION, ESPECIALLY AT THE TROPICAL RAINFOREST WHICH HARBORS THE WIDEST VARIETY OF SPECIES, IS BY FAR THE GREATEST THREAT TO HONDURAN WILDLIFE. AT THE CURRENT RATE OF DEFORESTATION THE LIST OF THREATENED OR ENDANGERED SPECIES IS LIKELY TO RISE SHARPLY IN THE NEAR FUTURE. THERE ARE ALSO MANY SPECIES SUCH AS THE WHITE TAILED DEER, PACA, TAPIR, ALL OF THE SEA TURTLES, THE MANATEE AND SEVERAL OTHERS (SEE "UTILIZATION OF WILDLIFE" BELOW) WHOSE NUMBERS ARE BEING REDUCED BY OVERHUNTING IN ADDITION TO FOREST

DESTRUCTION. AS A WILDLIFE BIOLOGIST WITH CONSIDERABLE EXPERIENCE IN HONDURAS ONCE STATED "THE HUNTING PHILOSOPHY OF MOST PEOPLE HERE IS: IF IT MOVES, SHOOT IT, AND IF IT'S EDIBLE - EAT IT".

6.0 UTILIZATION OF WILDLIFE

6.1 PROTEIN SOURCE

ALTHOUGH PROPOSED, (CONSUPLANE 1978) NO COMPREHENSIVE NATIONWIDE SURVEY ON THE UTILIZATION OF WILDLIFE AS A FOOD SOURCE HAS BEEN CARRIED OUT. SEVERAL REGIONAL STUDIES (KLEIN E. 1977, PURDY P. 1978, MARCUS, M. 1981) HOWEVER WOULD SEEM TO INDICATE THAT IN RURAL AREAS WILD ANIMAL SPECIES ARE AN IMPORTANT PROTEIN SUPPLEMENT TO THE DIET OF RURAL PEOPLES. EVEN IN URBAN AREAS IT IS NOT UN-COMMON TO FIND SPECIES SUCH AS IGUANA, ARMADILLO AND SEA TURTLE EGGS SOLD IN LOCAL MARKETS. BESIDES THESE, SOME OF THE OTHER MORE PREFERRED SPECIES FOR FOOD ARE: WHITE TAILED DEER, COLLARED AND WHITE LIPPED PECCARY, PACA, TAPIR, MANTEE, CHACHALACA, CARASSOW, BLUE-WINGED TEAL, GREEN AND SCARLET MACAWS, WHITE WINGED DOVE, RABBITS, SQUIRRELS, OCCASIONALLY MONKEYS, SEVERAL TURTLE SPECIES AND A VARIETY OF FISH AND SHELLFISH (SEE CHAPTER ON WATER RESOURCES). HUNTING CLUBS HAVE BEEN ORGANIZED AROUND THE COUNTRY AND ALTHOUGH THERE IS AN ELEMENT OF SPORT HUNTING IN THEIR ORIENTATION, THE PROCUREMENT OF MEAT FOR FOOD IS STILL AN IMPORTANT REASON FOR THEIR EXISTENCE. BESIDES THESE CLUBS THERE ARE INNUMERABLE SOLITARY HUNTERS WHO WORK THE WOODS WITH DOGS IN SEARCH OF GAME. THEIR SMALL CALIBER RIFLES OFTEN ALLOW WOUNDED ANIMALS TO ESCAPE AND MUCH MEAT IS WASTED BECAUSE OF THIS. ALTHOUGH SOME HUNTERS COMPLY WITH HUNTING REGULATIONS, MANY DO NOT AND THE REGULATIONS AND SEASONS THEMSELVES ARE OFTEN BASED ON INSUFFICIENT BASELINE DATA.

OF MAJOR CONCERN IS THE COLLECTION OF SEA TURTLE EGGS ON BOTH COASTS. ALTHOUGH A PERCENTAGE OF THE EGGS COLLECTED ARE CONSUMED BY THE RURAL POOR, A GREATER PORTION ARE SHIPPED TO THE MAJOR CITIES FOR SALE AS "BOCAS" WHICH ARE SERVED WITH DRINKS IN BARS. DURING CERTAIN PERIODS OF THE YEAR A SINGLE TURTLE EGG MAY FETCH A PRICE OF UP TO 75 CENTS.

6.2 SPORT HUNTING

SPORT HUNTING IS GENERALLY CARRIED OUT BY NORTH AMERICANS COMING TO HONDURAS TO HUNT WHITE WINGED DOVES IN THE CHOLUTECA AREA (PURDY P. 1978) ALTHOUGH AS MENTIONED EARLIER, SEVERAL HUNTING CLUBS HAVE BEEN FORMED IN HONDURAS. THE DOVE HUNTERS REPRESENT AN ANNUAL INCOME AVERAGING AROUND \$ 800,000 TO THE COUNTRY OF HONDURAS IN THE FORM OF AIRLINE TICKETS, HOTELS, SERVICES, ETC. THEIR BAG LIMITS ARE REGULATED TO SOME DEGREE AND RELATIVELY EXTENSIVE DATA HAS BEEN COLLECTED ON THE DOVES AND DOVE HUNTING (PURDY, P. 1976).

NATIONAL HUNTING CLUBS, WHILE CONCENTRATING ON FOOD SPECIES, ALSO OCCASIONALLY PURSUE TROPHY ANIMALS SUCH AS JAGUAR, PUMA AND OCELOT. FOREIGN HUNTERS ARE ALSO KNOWN TO OCCASIONALLY HUNT THESE RARE ANIMALS. THE HUNTING CLUBS DO HOWEVER PRESENT A POINT OF FOCUS FOR WILDLIFE EXTENSION WORK AND FOR THE COLLECTION OF HUNTING RELATED DATA.

6.3 PET TRADE

LEGAL EXPORT OF EXOTIC WILDLIFE SPECIES IS BIG BUSINESS IN HONDURAS. IN 1979 ALONE A VARIETY OF ANIMALS WITH A STREET VALUE OF AT LEAST \$ 420,000 WERE SHIPPED OUT OF THE COUNTRY - MOSTLY TO THE UNITED STATES AND HOLLAND. EXPORT TAXES ON THESE SPECIES AMOUNTED TO APPROXIMATELY \$ 47,000 BUT THE MONEY IS NOT EARMARKED FOR CONSERVATION ACTIVITIES AND LITTLE TRICKLES BACK INTO WILDLIFE MANAGEMENT PROGRAMS. ALTHOUGH ALLOWABLE EXPORT OF SOME SPECIES IS BASED UPON STUDIES OF POPULATION DYNAMICS OF THE ANIMAL (KLEIN, E. AND PURDY, P. 1976) MANY OTHERS LEAVE THE COUNTRY WITHOUT DETERMINING THE IMPACT OF THIS HARVESTING. ALSO, IT IS CERTAIN THAT ILLEGAL SHIPMENTS OF RARE OR ENDANGERED SPECIES SUCH AS CATS AND MONKEYS ARE STILL OCCURRING.

WHILE DEALERS IN EXOTIC ANIMAL PETS ARE FETCHING HIGH PRICES FOR THEIR INVENTORY, THOSE THAT ACTUALLY PROCURE THE GAME ARE RECEIVING RELATIVELY LITTLE COMPENSATION FOR THEIR EFFORTS. CAPTURERS GENERALLY RECEIVE FROM 5-100% LESS THAN THE FIRST LEVEL OF MIDDLE MAN AND THESE MIDDLE MEN RECEIVE BETWEEN 10-90% LESS THAN THE EXPORTING MIDDLE MEN (GONZALEZ, J. 1980)

PRINCIPLE SPECIES EXPORTED INCLUDE THE FOLLOWING:

TABLE 10

PRINCIPLE SPECIES EXPORTED

BIRDS:

AMAZONA OCHROCEPHALA, AMAZONA AUTUMNALIS, AMAZONA ALBITRONS, ARATINGA HOLOCHORA.

REPTILES: BASILISCUS VITTATUS, BOA CONSTRICTOR, DRINORIS MARGARITERUS, LAEMANCTUS LONGIPES, CACNOSAURO SIMILIS, IGUANA IGUANA.

MAMMALS:

MASSUA MARICA, PATAS FILONS.

AMPHIBIANS: BUFO MARINAS, ANOPHELMA SIMILISEN, SIMILISEN BOUNDINI.

ASACNIDS:

ANOPHELMA SPECIES.

SOURCE: GONZALEZ 1980.

WHILE LEGAL EXPORTATION OF RARE OR ENDANGERED SPECIES IS BANNED, IT IS NOT ILLEGAL FOR RESIDENTS TO KEEP THEM AS PETS IN THEIR HOMES. MACAWS, MONKEYS, KINKAJOUS AND OCCASIONALLY EVEN CATS SUCH AS MARGAYS OF OCELOTS ARE SEEN IN PRIVATE HOMES, HOTELS AND BUSINESSES.

6.4 SKINS AND FURS

ALTHOUGH THE BAN ON IMPORTS OF ENDANGERED SPECIES PRODUCTS INTO THE UNITED STATES HAS LIMITED EXPORTS OF SKINS TO THAT COUNTRY, THERE IS STILL A HIGH DEMAND FOR SPOTTED CATS, LIZARD, CROCODILE AND CAYMAN SKINS IN THE EUROPEAN MARKET. LEGAL EXPORTS OF CAIMAN_CROCODILUS_FUSCUS AND CROCODILUS_AQUIUS IN 1979 EQUALED ABOUT 1900 INDIVIDUALS.

ILLEGAL SHIPMENTS OF THESE AND THE PROHIBITED CAT SKINS, THOUGH KNOWN TO COMMONLY OCCUR, HAVE NOT BEEN ESTIMATED IN NUMBERS. A COMMERCIAL EFFORT TO "FARM" CROCODILES AND CAIMANS FAILED AFTER BRIEFLY OVER-EXPLOITING THE RESOURCES. IT IS STILL BELIEVE THOUGH THAT SUCH A VENTURE, BASED UPON ECOLOGICALLY SOUND MANAGEMENT, COULD PROVIDE A SUSTAINED AND LUCRATIVE INCOME.

6.5 MARINE AND FRESH WATER FISHERIES

(SEE CHAPTER ON MARINE RESOURCES)

6.6. TOURISM

THOUGH NOT DEVELOPED TO ANY GREAT DEGREE, TOURISM OR "SCIENTIFIC TOURISM" BASED UPON THE OBSERVATION AT WILDLIFE HAS A PROMISING FUTURE. BESIDES THE POPULAR CORAL REEFS OF THE BAY ISLANDS THERE ARE SEVERAL OTHER POTENTIAL SITES FOR TOURISTS INTERESTED IN OBSERVING THE WIDE ARRAY OF TROPICAL FAUNA THAT THIS COUNTRY POSSESSES. HOWEVER, THE LACK OF ORGANIZATION AND INFRASTRUCTURE IS PROHIBITING THE EXPANSION OF THIS INDUSTRY AT THE PRESENT TIME.

6.7 POTENTIAL USES OF WILDLIFE

EXPERIMENTATION IS UNDERWAY TO RAISE SEVERAL WILDLIFE SPECIES IN CAPTIVITY FOR PROTEIN AND OTHER PRODUCTS. SEA TURTLE EGGS ARE BEING COLLECTED AND PROTECTED UNTIL THEY HATCH (SEE DEPARTMENT OF WILDLIFE AND ENVIRONMENTAL RESOURCES - WILDLIFE PROJECTS SECTION). PACAS HAVE BEEN REARED IN CAPTIVITY AND SIMILAR ATTEMPTS HAVE BEEN MADE WITH PECCARY. ALTHOUGH NONE OF THESE PROJECTS HAS MET WITH OVERWELMING SUCCESS, CONTINUED RESEARCH COULD PERFECT TECHNIQUES AND MAY ALSO IDENTIFY OTHER SPECIES FOR SIMILAR EFFORTS.

7.0 PROTECTION AND CONSERVATION OF WILDLIFE

7.1 LEGISLATION

AS WITH THE CASE OF WILDLANDS IN HONDURAS, THERE IS NO COMPREHENSIVE LAW FOR THE PROTECTION AND CONSERVATION OF HONDURAN FAUNAL RESOURCES. FURTHERMORE, THERE ARE FEW COMPONENTS OF OTHER LAWS WHICH RELATE DIRECTLY TO WILDLIFE MANAGEMENT.

A DRAFT WILDLIFE LAW ELABORATED IN 1975 BY THE DEPARTMENT OF WILDLIFE IN RENARE HAS NOT YET BEEN PASSED. IN A PROPOSED ENVIRONMENTAL LAW, CONSUPLANE MENTIONS WILDLIFE BUT GIVES FEW SPECIFICS AS TO HOW AND WHO WILL MANAGE FAUNAL RESOURCES.

SOME SPECIES HAVE BEEN PERIODICALLY PROTECTED BY DWER "VEDAS" OR HUNTING PROHIBITIONS WHICH HAVE BEEN PASSED TO PROTECT SEVERAL ENDANGERED SPECIES (ALL OF SPOTTED CATS FOR INSTANCE, MANATEES, MACAWS AND, DURING CERTAIN TIMES OF THE YEAR, SEA TURTLE EGGS) AND ALSO SOME ECONOMICALLY IMPORTANT SPECIES (WHITE TAILED DEER AND WHITE WINGED DOVES). UNFORTUNATELY WHAT LITTLE LEGISLATION EXISTS IS DIFFICULT TO ENFORCE. WILDLIFE INSPECTORS FROM RENARE (SEE ANALYSIS AT DWER WILDLIFE MANAGEMENT PROGRAMS BELOW) ARE FEW IN NUMBER.

7.2 INSTITUTIONAL INVOLVEMENT IN WILDLIFE MANAGEMENT

RENARE'S DEPARTMENT OF WILDLIFE AND ENVIRONMENTAL RESOURCES IS THE PRINCIPAL MANAGING AGENCY FOR THE COUNTRY'S FAUNA. ALTHOUGH SEVERAL OTHER INSTITUTIONS ARE INDIRECTLY MANAGING OR ALTERING WILDLIFE HABITAT, THE RESPONSIBILITY FOR THE PROTECTION AND UTILIZATION OF WILD ANIMALS IS THE RESPONSIBILITY OF THIS DEPARTMENT.

AS MENTIONED EARLIER, THE ORGANIZATIONAL STRUCTURE OF THE DWER INCLUDES: WILDLAND MANAGEMENT, WILDLIFE MANAGEMENT, EXTENSION AND ENVIRONMENTAL EDUCATION, ENVIRONMENTAL MANAGEMENT AND INSPECTION. THOUGH ALL OF THE UNITS ARE INVOLVED TO SOME DEGREE WITH FAUNA PROTECTION, "WILDLIFE MANAGEMENT" AND "INSPECTION" HAVE DEVOTED THE MOST EFFORT TO THIS TASK. THERE ARE CURRENTLY THREE BIOLOGISTS INVOLVED IN THE MANAGEMENT ASPECTS OF THIS PROGRAM AND SOME 35 WILDLIFE AND FISHERIES INSPECTORS ARE SCATTERED THROUGHOUT THE COUNTRY. THE DEPARTMENT MANAGES THE METROPOLITAN ZOO AND A WILDLIFE MUSEUM. AS MENTIONED BEFORE, MOST OF THE INADEQUATE BUDGET OF THE DEPARTMENT IS SPENT ON MAINTAINING THE ZOO WHERE 23 PERSONS ARE EMPLOYED.

THE STRATEGY OF DWER HAS BEEN TO DIVIDE THEIR MANAGEMENT EFFORTS BETWEEN TWO CLASSES OF WILDLIFE: THE FIRST BEING THOSE SPECIES WHICH ARE MOST THREATENED AND THE OTHER BEING THOSE SPECIES WHICH HAVE THE MOST COMMERCIAL VALUE. THE PROTECTION OF HABITAT FOR BOTH OF THOSE GROUPS IS EMPHASIZED IN WILDLANDS MANAGEMENT PROGRAM PREVIOUSLY DISCUSSED. TABLE 9 SHOWS COMPLETED PROJECTS AND STUDIES RELATED TO THOSE TWO THEMES.

TABLE 11

DEPARTMENT OF WILDLIFE AND ENVIRONMENTAL RESOURCES -
WILDLIFE MANAGEMENT PROJECTS

1. PROJECT_NAME: ELABORATION OF A WILDLIFE LAW.

PROJECT_DESCRIPTION: THIS PROJECT, WITH BOTH NATIONAL AND INTERNATIONAL ASSISTANCE OUGHT TO DEVELOP A LAW WHICH WOULD PROVIDE LEGAL SUPPORT TO THE RATIONAL PROTECTION AND UTILIZATION OF FAUNAL RESOURCES.

PROJECT_SUCCESS: ALTHOUGH THE LAW WAS WRITTEN AND HAS BEEN REVIEWED, IT HAS NOT BEEN PASSED BY THE HONDURAN GOVERNMENT.
2. PROJECT_NAME: STUDY OF WHITE-TAILED DEER.

PROJECT_DESCRIPTION: THIS ON-GOING STUDY IS COLLECTING INFORMATION ON THE ECOLOGY OF WHITE TAILS AND ANALYZING HARVESTING DATA FROM DEER HUNTERS. BIOLOGICALLY BASED HUNTING SEASONS ARE A PRINCIPAL GOAL OF THE INVESTIGATION.

PROJECT_SUCCESS: DATA HAS BEEN COLLECTED FOR SEVERAL YEARS BUT IS STILL DEFICIENT. THERE HAVE BEEN PROBLEMS WITH THE WILDLIFE INSPECTORS NOT RECORDING AND SUBMITTING INFORMATION FROM HUNTER KILLS.
3. PROJECT_NAME: STUDY OF WHITE-WINGED DOVE.

PROJECT_DESCRIPTION: MATERIAL COLLECTED IN THIS LONG TERM STUDY WAS USED TO ELABORATE MANAGEMENT GUIDELINES FOR THE WHITE-WINGED DOVE SPORT HUNTING IN HONDURAS.

PROJECT_SUCCESS: THE STUDY WAS FAIRLY SUCCESSFUL ALTHOUGH BUDGET AND EQUIPMENT PROBLEMS CAUSED THE PROJECT TO BE ABANDONED.
4. PROJECT_NAME: IGUANA MANAGEMENT STUDY.

PROJECT_DESCRIPTION: THIS INVESTIGATION ATTEMPTED TO DETERMINE THE POPULATION DYNAMICS OF THE HEAVILY HUNTED IGUANAS OF THE CHOLUTECA AREA. INFORMATION WAS USED TO SET HUNTING SEASONS AND BAG LIMITS

PROJECT_SUCCESS: THIS PROJECT WAS SUCCESSFUL AND MONITCRING OF IGUANA SALES IN CITY MARKETS CONTINUS.
5. PROJECT_NAME: FAUNAL COMPONENT OF WILDLANDS INVENTORY.

PROJECT_DESCRIPTION: WILDLIFE HAS BEEN AN IMPORTANT ASPECT OF THE NATIONAL WILDLANDS INVENTORY. BASELINE WILDLIFE INVENTORIES IN THREE MANAGED WILDLAND AREAS HAVE BEEN CARRIED OUT.

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PROJECT_SUCCESS: BECAUSE THE WILDLAND INVENTORY HAS COME TO A STANDSTILL, SO HAVE THE FAUNAL STUDIES IN PROPOSED PARK UNITS.

6. **PROJECT_NAME:** INVENTORIES OF PSITTACIDAE IN SEVERAL REGIONS OF THE COUNTRY.

PROJECT_DESCRIPTION: THIS INVENTORY HAS BEEN CARRIED OUT PRINCIPALLY TO DETERMINE APPROPRIATE HARVESTING LEVELS FOR THESE BIRDS.

PROJECT_SUCCESS: THIS STUDY HAS BEEN VALUABLE IN MANAGING THE EXPORT OF THESE SPECIES. TRADE IN SEVERAL SPECIES SUCH AS THE RED AND GREEN MACAW WAS RESTRICTED AS A RESULT OF THESE INVESTIGATIONS.

7. **PROJECT_NAME:** STUDY OF QUETZAL POPULATIONS IN THE LA TIGRA CLOUD FOREST.

PROJECT_DESCRIPTION: THE LA TIGRA NATIONAL PARK CONTAINS A VIABLE POPULATION OF QUETZALS. THEIR NUMBERS AND ECOLOGY WERE STUDIED OVER A SEVERAL YEAR PERIOD.

PROJECT_SUCCESS: THE STUDY WAS SUCCESSFUL IN GATHERING BASIC DATA ON THIS RARE SPECIES. INFORMATION IS TO BE USED IN DETERMINING MANAGEMENT GUIDELINES IN THE PARK.

8. **PROJECT_NAME:** MANATEE STUDY.

PROJECT_DESCRIPTION: THIS AERIAL AND GROUND SURVEY OF THE CARIBBEAN COAST IDENTIFIED CONCENTRATIONS OF MANATEE AND THREATS TO THEIR SURVIVAL.

PROJECT_SUCCESS: A MANATEE WILDLIFE REFUGE WAS PROPOSED ALTHOUGH LITTLE HAS BEEN DONE IN THIS DIRECTION.

9. **PROJECT_NAME:** STUDY OF THE PROPOSED PROJECT TO FARM CROCODILES AND CAIMANS.

PROJECT_DESCRIPTION: A WILDLIFE BIOLOGIST FROM DWER WAS SENT TO LA MOSQUITIA TO INVESTIGATE A COMMERCIAL PROJECT ATTEMPTING TO COLLECT THE EGGS OF CROCODILES AND CAIMANS, RAISING AND HARVESTING A CERTAIN PROPORTION AND RELEASING THE REST.

PROJECT_SUCCESS: THE STUDY WAS COMPLETED BUT THE "RANCH" FAILED.

10. **PROJECT_NAME:** WILDLIFE SURVEY OF THE EL CAJON HYDROELECTRIC POWER PROJECT REGION.

PROJECT_DESCRIPTION: THIS SURVEY WAS PART OF AN MULTI-INSTITUTIONAL EFFORT TO DETERMINE THE IMPACT OF THE EL CAJON PROJECT.

PROJECT_SUCCESS: THE INVESTIGATION WAS GREATLY SCALED DOWN FROM THE ORIGINAL PLANS BECAUSE OF A LACK OF FUNDING AND SUPPORT ON THE PART OF THE MINISTRY OF NATURAL RESOURCES.

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11. PROJECT_NAME: NATIONAL WILDLIFE INVENTORY OF SEVERAL SPECIES.

PROJECT_DESCRIPTION: THIS SURVEY, UTILIZING THE WILDLIFE INSPECTORS, SEEKS TO COLLECT BASIC POPULATION AND RANGE STATISTICS ON SEVERAL IMPORTANT SPECIES (QUETZAL, RED AND GREEN MACAW, CHACHALACA, CURASSOW, TAPIR, PUMA, MARGAY CAT, JAGUAR AND OTTER, OCELOT, BROCKET DEER, MANATEE, WHITE FACED, SPIDER AND HOWLER MONKEYS, AND THE GIANT ANTEATER).

PROJECT_SUCCESS: BECAUSE OF A LACK OF PARTICIPATION ON THE PART OF THE INSPECTORS, LITTLE HAS BEEN ACCOMPLISHED WITH THIS PROJECT.

12. PROJECT_NAME: SEA TURTLE PROTECTION PROJECT.

PROJECT_DESCRIPTION: UNTIL RECENTLY, ALMOST 100% OF THE EGGS LAID BY *LEPIDOCHELYS OLIVACEA* ON THE SOUTH COAST OF HONDURAS WERE COLLECTED BY EGG HUNTERS OR EATEN BY PREDATORS. THIS PROJECT SEEKS TO: 1) PROTECT NESTING TURTLES AND 2) ENCOURAGE CAMPESTINOS AND FISHERMEN IN THE AREA TO GUARD THE NESTS IN ORDER TO ENSURE A SUSTAINED SUPPLY OF TURTLE EGGS FOR THE FUTURE.

PROJECT_SUCCESS: THIS PROJECT HAS HAD SOME SUCCESS BUT STILL NEEDS TO BE REINFORCED WITH STRICTER CONTROLS OVER THE COLLECTION OF TURTLE EGGS, IF THIS SPECIES IS TO SURVIVE.

7.3 FUTURE WILDLIFE PROJECTS

THE DEPARTMENT WOULD LIKE TO RENEW ITS EFFORTS TO CARRY OUT A NATIONAL WILDLIFE INVENTORY ALTHOUGH THE PROJECT APPEARS TO HAVE BEEN DROPPED FOR THE TIME BEING. ANOTHER ACTIVITY OF HIGH PRIORITY IS THE DETERMINATION OF THE DOMESTIC USE OF WILDLIFE AS A FOOD SOURCE. THIS WOULD ALSO BE ON A NATIONAL SCALE AND WOULD BE A LONG TERM EFFORT.

UNFORTUNATELY IN 1981 THERE ARE VIRTUALLY NO WILDLIFE STUDIES UNDERWAY. DEPARTMENT BIOLOGISTS ARE EITHER OUT OF THE COUNTRY PURSUING GRADUATE DEGREES OR HAVE BEEN SHIFTED TO FISHERIES PROJECTS. WILDLIFE PLANS FOR 1982 HAVE NOT YET BEEN DETERMINED.

7.4 INSTITUTIONAL ANALYSIS OF DWER WILDLIFE MANAGEMENT EFFORTS

MOST OF THE PROBLEMS PREVIOUSLY DISCUSSED UNDER "DWER, ANALYSIS OF WILDLAND MANAGEMENT EFFORTS" ALSO APPLY TO THEIR WILDLIFE MANAGEMENT PROGRAM. LACK OF SUPPORT BY THE MINISTRY OF NATURAL RESOURCES IS MANIFESTED IN LOW BUDGETS AND SHORTAGES OF PERSONNEL AND EQUIPMENT. HOWEVER, ONCE AGAIN THE DEPARTMENT ITSELF MUST BE HELD PARTIALLY RESPONSIBLE FOR NOT BEING ABLE TO TURN THE HEADS OF HIGH GOVERNMENT OFFICIALS.

THE MEAGER FINANCIAL RESOURCES AVAILABLE ARE OFTEN MISUSED, PERHAPS FROM

NECESSITY RATHER THAN BY CHOICE AS IN THE CASE OF THE ZOOLOGICAL PARK WHICH CONSUMES MOST OF THE BUDGET. PROBABLY THE BEST EXAMPLE OF UNDER-UTILIZATION IS THE CASE OF THE WILDLIFE AND FISHERIES INSPECTORS WHO, FROM LACK OF TRAINING AND A LACK OF MOTIVATION, ARE IN GENERAL DOING A SUBSTANDARD JOB AND IN SOME CASES ACTUALLY CAUSING MORE DAMAGE THAN GOOD TO THE IMAGE OF RENARE. THE INSPECTORS HAVE TREMENDOUS POTENTIAL FOR PROVIDING ADEQUATELY PROTECTION FOR THE FAUNA OF HONDURAS AND ALSO FOR ASSISTING BIOLOGISTS IN THE COLLECTION OF INVALUABLE BASELINE DATA. THUS FAR THEY HAVE DONE NEITHER AND WITHOUT EXTENSIVE TRAINING AND MOTIVATION WILL PROBABLY NOT DO SO IN THE FUTURE.

THE FACT THAT DWER HAS NOT BEEN ABLE TO IMPLEMENT ITS WILDLIFE LAW IS ANOTHER INDICATION OF LACK OF POWER AND PRESTIGE. ALTHOUGH PASSAGE OF THIS LEGISLATION WILL NOT BRING ABOUT IMMEDIATE COMPLIANCE TO WILDLIFE LAWS IT WOULD GIVE THE DEPARTMENT MORE POWER TO ENFORCE MANAGEMENT POLICY. COUPLED WITH ADEQUATE ENVIRONMENTAL EDUCATION AND EXTENSION, AND PROTECTION OF HABITAT, FAUNAL POPULATIONS COULD BEGIN AN UPWARD CLIMB FROM THE HEADLONG PLUNGE THEY HAVE RECENTLY BEEN TAKING.

ON THE POSITIVE SIDE, EVEN IF THE DEPARTMENT HAS NOT BEEN SUCCESSFUL IN ALL OF ITS EFFORTS IT HAS TRIED TO IMPLEMENT WILDLIFE MANAGEMENT ACTIVITIES IN A LOGICAL MANNER. AFTER DRAFTING A LAW, NATIONAL INVENTORIES WERE ATTEMPTED. BOTH COMMERCIALY VALUABLE AND THREATENED SPECIES WERE STUDIED. HUNTING SEASONS OR BANS ON HUNTING WERE INITIATED FOR SOME SPECIES AND NOW THE NEXT LOGICAL STEP, THE CREATION OF WILDLIFE REFUGES (THE RIO CUERO MANATEE REFUGE) IS BEING CONTEMPLATED. UNFORTUNATELY SEVERAL TANGENTS WHICH THE DEPARTMENT HAS BECOME MIRED IN I.E., THE ZOO, THE SERPENTARIUM AND THE MUSEUM HAVE ALL TAKEN THEIR TOLL OF DEPARTMENT FUNDS AND ENERGIES.

WILDLIFE MANAGEMENT HAS NOT SEEN THE INTERINSTITUTIONAL COMMUNICATION THAT WILDLANDS MANAGEMENT EFFORTS HAVE PROMPTED. DWER NEVERTHELESS HAS ATTEMPTED SOME INTERDEPARTMENTAL COMMUNICATION ON FAUNA RELATED MATTERS. THEY RELATE PARTICULARLY TO THE EXPORTATION OF ANIMALS (DEPARTMENT OF EXTERIOR COMMERCE) AND SPORT HUNTING (INSTITUTE OF TOURISM).

ENVIRONMENTAL EDUCATION RELATED TO WILDLIFE PROTECTION HAS BEEN ATTEMPTED. HOWEVER, TWO OF THEIR BEST OPPORTUNITIES TO CONVEY A CONSTRUCTIVE CONSERVATION MESSAGE TO THE PUBLIC -- THE WILDLIFE MUSEUM AND THE ZOOLOGICAL PARKS -- ARE, UNFORTUNATELY, UNDERUTILIZED AND COULD BE ACTUALLY PROMOTING THE CAPTURE AND HUNTING OF WILDLIFE FOR PETS AND MANTLE PIECES.

7.5 RELATED WILDLIFE CONSERVATION EFFORTS

AS MENTIONED, THE INSTITUTE OF TOURISM HAS COOPERATED WITH RENARE IN MANAGING SPORT HUNTING AND SPORT HUNTERS. CONSUPLANE HAS INCLUDED WILDLIFE MANAGEMENT IN THEIR CURRENT FIVE YEAR DEVELOPMENT PLAN FOR THE COUNTRY (CONSUPLANE, 1978) LISTING SEVERAL PRIORITY STUDIES AND ACTIVITIES THAT SHOULD BE REALIZED IMMEDIATELY (E.G. NATIONAL WILDLIFE INVENTORY, STUDIES ON RARE OR COMMERCIALY IMPORTANT SPECIES, STUDIES ON CRITICAL HABITAT, COORDINATION OF NATIONAL AND INTERNATIONAL ENTITIES DEALING WITH WILDLIFE MATTERS AND

INCORPORATING THE WILDLIFE VARIABLE INTO LAND USE PLANNING). THE U.S. PEACE CORPS HAS BEEN ACTIVE IN FAUNAL MANAGEMENT IN HONDURAS FOR APPROXIMATELY 8 YEARS. ALTHOUGH EMPHASIS HAS SHIFTED FROM VOLUNTEERS WORKING IN A POLICY CAPACITY ON A NATIONAL SCALE TO FOCUSING PRINCIPALLY ON REGIONALIZED FIELD PROBLEMS THEY STILL PROVIDE PROFESSIONAL BACKSTOPPING TO DWER. THERE ARE CURRENTLY TWO VOLUNTEERS WORKING IN THIS CAPACITY. THE RARE ANIMAL RELIEF FUND (RARE) IS DONATING SEVERAL THOUSAND DOLLARS WORTH OF AUDIO VISUAL EQUIPMENT TO RENARE FOR USE IN WILDLIFE AND WILDLAND EDUCATIONAL PRESENTATIONS. AS WAS MENTIONED PREVIOUSLY, THE WILDLAND UNIT OF CATIE HAS PROVIDED TECHNICAL ASSISTANCE AND TRAINING OPPORTUNITIES RELATED TO BOTH WILDLANDS AND WILDLIFE PROGRAMS. AND, WORLD WILDLIFE FUND HAS BEEN SUPPORTING HABITAT PROTECTION IN THE FORM OF FUNDING FOR THE RIO PLATANO BIOSPHERE RESERVE.

8.0 ENVIRONMENTAL EDUCATION

8.1 ENVIRONMENTAL EDUCATION IN HONDURAS - DESCRIPTION

ENVIRONMENTAL EDUCATION IN HONDURAS, PERHAPS THE KEY TO ACHIEVING A SUCCESSFUL NATURAL RESOURCE MANAGEMENT PROGRAM IS BEGINNING TO GAIN A FOOT HOLD. THIS COULD BE DUE TO INCREASED COORDINATION AMONG RELEVANT AGENCIES OR THE FACT THAT ENVIRONMENTAL AWARENESS IS A CONCEPT WHOSE TIME HAS FINALLY COME HERE. BOTH THE GENERAL PUBLIC AND DECISION MAKERS ARE BEGINNING TO REALIZE THAT ENVIRONMENTAL PROBLEMS ARE NOT LIMITED TO JUST THE INDUSTRIALIZED NATIONS AND WHAT IS MORE THAT THESE PROBLEMS THAT ARE THREATENING FUTURE DEVELOPMENT OPPORTUNITIES IN THIRD WORLD COUNTRIES SUCH AS HONDURAS.

AS DEPLETION OF FOREST RESOURCES LOOMS OMINOUSLY ON THE HORIZON, AS WATER QUALITY AND FLOW RATES FLUCTUATE WILDLY AS INVALUABLE TOP SOILS BECOME CHOKING SEDIMENTS IN RIVERS AND STREAMS, AND AS THE QUALITY OF LIFE FOR MANY ACTUALLY WORSENS, THE NEED FOR APPROPRIATE NATIONAL RENEWABLE RESOURCES MANAGEMENT BECOMES OBVIOUS. THE ROLE OF ENVIRONMENTAL EDUCATION IN THIS COUNTRY SHOULD NOT BE LIMITED TO ORIENTING THE CITIZENS ON ENVIRONMENTAL CONCEPTS AND ISSUES, BUT TO GIVE THEM THE TOOLS TO BE ABLE TO REPAIR AND PERHAPS EVEN ENHANCE THE QUALITY OF THEIR ENVIRONMENT.

THIS HAS IN FACT BEEN THE APPROXIMATE EVOLUTION OF ENVIRONMENTAL EDUCATION PROGRAMS IN THIS COUNTRY. LAUNCHED PRINCIPALLY BY RENARE IN 1978 INITIAL EFFORTS FOCUSED UPON ECOLOGICAL CONCEPTS AND THEORY. THE MEDIUM WAS A GROUP OF TRAVELING SOCIAL EXTENSIONISTS THAT VISITED SCHOOLS AND COMMUNITY GROUPS THROUGHOUT THE COUNTRY PRESENTING MOVIES AND INFORMAL TALKS. LATER, THE CREATION OF MANAGED WILDLAND UNITS -LA TIGRA AND RIO PLATANO- GAVE ENVIRONMENTAL EDUCATORS AN OPPORTUNITY TO CONCENTRATE THEIR EFFORTS AND REFINE THEIR METHODOLOGY. INFLUENCED BY DWER'S ECODEVELOPMENT APPROACH TO WILDLAND MANAGEMENT, ENVIRONMENTAL EDUCATION ALSO TOOK ON A MORE PRAGMATIC APPROACH -OFFERING SOLUTIONS, NOT JUST EXPLAINING PROBLEMS. CURRENT EFFORTS ARE BRINGING DWER TOGETHER WITH THE MINISTRY OF PUBLIC EDUCATION IN A PROGRAM OF REGIONAL ENVIRONMENTAL EDUCATION WORKSHOPS FOR TEACHERS. AND RECENTLY A "NATIONAL ENVIRONMENTAL EDUCATION SEMINAR" WAS HELD. RECOMMENDATIONS AND CURRICULUM SUGGESTIONS FROM BOTH THE SEMINAR AND THE REGIONAL WORKSHOPS ARE

BEING ADOPTED BY THE MINISTRY OF EDUCATION. PERHAPS THE TURNING POINT IN HONDURAS CONSERVATION AWARENESS OCCURED JUNE 5TH -EARTH DAY- 1981 WHEN THE COMBINED EFFORTS OF RENARE, THE MINISTRY OF EDUCATION AND THE NON-GOVERNMENTAL CONSERVATION GROUPS BROUGHT SOME 4,000 STUDENTS OUT TO MARCH IN AN ENVIRONMENTALLY ORIENTED PARADE.

COHDEFGR HAS ALSO BEEN ACTIVE IN FOREST EXTENSION AND CONSERVATION EDUCATION FOR SEVERAL YEARS. THEIR MOBILE EXTENSION UNIT TRAVELED TO FORESTED REGIONS AROUND THE COUNTRY DISTRIBUTING WRITTEN MATERIALS AND DELIVERING TALKS AND SLIDE SHOWS. AT ESNACIFOR SOME CONSERVATION CONCEPTS WERE INCORPORATED INTO COURSES AND THERE ARE PLANS FOR OFFERING A NEW MAJOR IN "WATERSHED MANAGEMENT", INCLUDING WILDLIFE AND WILDLANDS.

NON-GOVERNMENTAL EFFORTS IN ENVIRONMENTAL EDUCATION ARE CONCENTRATED IN TWO ORGANIZATIONS. THE FIRST, THE FLEDGLING HONDURAN ECOLOGICAL ASSOCIATION WITH APPROXIMATELY 215 MEMBERS, RECENTLY WAS GRANTED \$ 25,000 FROM A.I.D. FOR USE IN THEIR PROGRAM DEVELOPMENT. THE ASSOCIATION IS DIVIDED INTO FOUR WORK GROUPS: FAUNA, WILDLANDS, ENVIRONMENT AND ENVIRONMENTAL EDUCATION WITH THE FIRST THREE GROUPS COLLECTING INFORMATION AND DEVELOPING PROGRAMS FOR THE LAST GROUP TO DISSEMINATE.

THE OTHER PRINCIPAL NGO -THE NATIONAL AUTONOMOUS UNIVERSITY OF HONDURAS' DEPARTMENT OF BIOLOGY HAS GROWN FROM 5 STUDENTS IN 1975 TO APPROXIMATELY 120 IN 1981. THERE ARE 45 INSTRUCTORS AND 15 TEACHERS AND MANY ARE ALSO MEMBERS OF THE ECOLOGICAL ASSOCIATION. ALTHOUGH THERE ARE NO SPECIFIC CLASSES IN WILDLIFE OR WILDLANDS, FACETS OF THOSE SUBJECTS ARE AT LEAST SUPERFICIALLY INCORPORATED INTO MORE TRADITIONAL BIOLOGY, BOTANY AND ECOLOGY COURSES. THERE IS A GREAT INTEREST HOWEVER, IN IMPLEMENTING PROGRAMS OF THIS TYPE IF FUNDING OR TECHNICAL ASSISTANCE CAN BE PROCURED. A DEMONSTRATION OF THE STUDENTS INTEREST IN SUCH MATTERS WAS THE RECENT CREATION AND RAPID GROWTH OF THE ASSOCIATION OF YOUNG ENVIRONMENTALISTS OF HONDURAS. THIS ORGANIZATION IS A SPLINTER GROUP OF REGIONAL ASSOCIATION OF SCIENCE STUDENTS THAT RECENTLY HELD THEIR ANNUAL MEETING IN HONDURAS AND SPENT SEVERAL DAYS AT THE LA TIGRA NATIONAL PARK. THIS ORGANIZATION ALTHOUGH SUPPORTED PRINCIPALLY BY STUDENTS IS OPEN TO EVERYONE.

8.2. ENVIRONMENTAL EDUCATION IN HONDURAS - ANALYSIS

THE ADVENT OF SEVERAL DIFFERENT ENVIRONMENTALLY RELATED NGO'S IN HONDURAS SIGNIFIES A GROWING INTEREST IN SOUND NATURAL RESOURCE UTILIZATION. A MAJOR PROBLEM THOUGH, IS THAT THE SUBJECT "ENVIRONMENT" IS STILL IN A SENSE AN ACADEMIC CONCEPT LIMITED TO STUDENTS AND A SMALL CADRE OF PROFESSIONALS. WHILE THIS IS AN IMPORTANT GROUP, THE PROGRAM SHOULD BE EXPANDED TO REACH THE GENERAL PUBLIC, DECISION MAKERS, AND RURAL POOR WHO ARE ACTUALLY MOST IN CONTACT WITH THE RESOURCES. TARGETING DECISION MAKERS ESPECIALLY FOR INTENSIVE EDUCATION EFFORTS COULD BE INSTRUMENTAL IN GAINING THE INSTITUTIONAL SUPPORT NEEDED TO INITIATE AN ENVIRONMENTAL AWARENESS CAMPAIGN THAT IS TRUELY NATIONAL IN SCOPE. FOR REACHING THE GENERAL PUBLIC MASS MEDIA -TELEVISION, RADIO, NEWSPAPERS- CAN BE VERY AFFECTIVE BUT HAS NOT BEEN UTILIZED TO ANY GREAT DEGREE BY THOSE GROUPS.

FUNDING AND LACK OF TECHNICAL BACKSTOPPING IS, AS WITH WILDLIFE AND WILDLAND CONSERVATION EFFORTS, A MAJOR STAMBLING BLOCK. THE ANNUAL BUDGET FOR DNER'S ENVIRONMENTAL EDUCATION PROGRAM IS \$ 2,500 AND THEIR PERSONNEL ACTIVELY INVOLVED IN THIS PROJECT NUMBERS THREE INDIVIDUALS. BUT LACK OF HUMAN RESOURCES IS NOT THE PROBLEM WITH THIS AGENCY. AS MENTIONED BEFORE, IT IS A MATTER OF NOT FULLY UTILIZING THE PEOPLE THAT ARE THERE. THE HONDURAN ECOLOGICAL ASSOCIATION APPEARS TO BE SUFFERING FROM JUST THE OPPOSITE PROBLEM. HERE THEY HAVE ADEQUATE FINANCING (\$ 25,000 FROM A.I.D.) BUT THIS MONEY IS NOT TO BE USED TO PAY FOR THE SERVICES OF A FULL TIME OR PART TIME ASSOCIATION DIRECTOR. FEW MEMBERS HAVE ADEQUATE SPARE TIME TO DEVOTE TO THE NECESSARY MANAGERIAL ASPECTS OF DIRECTING A LARGE NGO EFFORT AND CONSEQUENTLY THE GROUP IS NOT AS EFFECTIVE AS IT COULD BE.

THE UNIVERSITY OF HONDURAS' BIOLOGY DEPARTMENT HAS GREAT POTENTIAL TO BEGIN ORIENTING STUDENTS IN THE ENVIRONMENTAL SCIENCES. HOWEVER, AT THIS TIME COURSES SELDOM ARE ORIENTED TOWARDS APPLIED SCIENCE AND RESEARCH. ONLY RECENTLY THE STUDENT BODY BEGUN TO LOOK INTO ENVIRONMENTAL PROBLEMS AND NATURAL RESOURCE ISSUES. ALTHOUGH THEY DO LACK FACULTY WITH THIS EXPERTISE, THE INCORPORATION OF SUCH CONCEPTS AS WILDLAND MANAGEMENT AND WILDLIFE COULD BE INCORPORATED, AT LEAST IN A SUPERFICIAL WAY, INTO THE CURRENT CURRICULUM. IT IS THE SAME SITUATION WITH ESNACIFGR.

FINALLY, ALTHOUGH THERE HAS BEEN SOME NOTABLE COOPERATION BETWEEN THESE GROUPS (EARTH DAY FOR EXAMPLE) THEY ARE ALSO SUFFERING TO SOME DEGREE FROM A LACK OF COORDINATION BETWEEN THEIR PROGRAMS. THERE IS DUPLICATION OF EFFORTS AND MAJOR GAPS THAT NO ONE IS FILLING (ENVIRONMENTAL PROGRAMS WITH CAMPESINOS FOR INSTANCE).

IN GENERAL THOUGH THEY HAVE MADE A GOOD START AND WILL UNDOUBTABLY EXPAND THEIR ACTIVITIES, THE DIRECTION AND EFFECTIVENESS OF THOSE EFFORTS IS, HOWEVER, STILL TO BE SEEN.

9.0 CONCLUSIONS AND RECOMMENDATIONS RELATED TO WILDLANDS, WILDLIFE AND ENVIRONMENTAL EDUCATION IN HONDURAS

9.1 CREATION OF AN ENVIRONMENTAL COORDINATING COMMITTEE

A CENTRALIZED COORDINATING BODY THAT WILL GUIDE, MONITOR AND EVALUATE THE DIVERSE NATURAL RESOURCES EFFORTS IN THE COUNTRY NEEDS TO BE CREATED AND SUPPORTED. THIS MULTIDISCIPLINARY TEAM WOULD WORK CLOSELY WITH ENVIRONMENTALLY RELATED PROGRAMS AND SERVE AS A COMMUNICATIONS LINK BETWEEN THEM. THEY WOULD ESTABLISH AN ENVIRONMENTAL DATA BANK WHICH WOULD GATHER AND DISSEMINATE ALL RELEVANT INFORMATION RELATED TO NATURAL RESOURCE MANAGEMENT IN HONDURAS. TWO ENTITIES WHICH CURRENTLY EXIST COULD BE UTILIZED FOR THIS TASK. CONSUPLANE, BECAUSE OF THEIR ROLE IN NATIONAL DEVELOPMENT PLANNING, WOULD APPEAR TO BE THE MOST LOGICAL INSTITUTION TO ASSUME THIS PROGRAM. THEY MAINTAIN CONTACT WITH VIRTUALLY THE ENTIRE SCOPE OF GOVERNMENTAL AND NON-GOVERNMENTAL DEVELOPMENT EFFORTS IN THE COUNTRY AND SEEM TO HAVE INCORPORATED A STRONG ENVIRONMENTAL ELEMENT INTO THEIR ORIENTATION. THE NATIONAL MAN AND THE BIOSPHERE (MAB) COMMITTEE WHICH IS MADE UP OF

REPRESENTATIVES FROM ALMOST MAJOR ORGANIZATIONS INVOLVED IN ENVIRONMENTALLY RELATED PROJECTS COULD SERVE AS THEIR CONTACTS IN THESE ORGANIZATIONS. THUS, RATHER THAN CREATE A NEW INSTITUTION TO SERVE AS THE COORDINATING "WATCHDOG" AGENCY IT WOULD BE MORE A MATTER OF BRINGING TOGETHER AND REINFORCING THE CAPABILITIES OF TWO CURRENTLY ESTABLISHED BODIES.

9.2 SUPPORT AND EXPANSION OF LAND USE PLANNING ACTIVITIES

DETERMINATION OF ACTUAL AND POTENTIAL LAND USE AND LATER ACTUALLY USING THIS INFORMATION TO ELABORATE DEVELOPMENT STRATEGIES IS EXTREMELY IMPORTANT IN HONDURAS. FURTHERMORE THE INCORPORATION OF WILDLANDS AND WILDLIFE AS NOT ONLY A POSSIBLE ALTERNATIVE BUT OFTEN THE BEST ALTERNATIVE FOR APPROPRIATE LAND USE SHOULD BE MANDATORY. WILDLANDS MUST NOT BE PERCEIVED AS ISOLATED PIECES OF NATURAL FOREST WITH LITTLE RELEVANCE OR CONNECTION TO SURROUNDING URBAN AND AGRICULTURAL AREAS. INSTEAD THEY SHOULD BE RECOGNIZED AS THE FACTORIES WHICH PRODUCE MANY OF THE RAW MATERIALS (WATER, WILDLIFE, SOILS, BUILDING MATERIALS, FIREWOOD, GENETIC RESOURCES, ETC.) WHICH SUSTAIN REGIONAL DEVELOPMENT. ALTHOUGH SOME LAND USE PLANNING IS BEING CARRIED OUT, EFFORTS SHOULD BE EXPANDED TO COVER THE ENTIRE COUNTRY. AND, WITH THE INCORPORATION OF WILDLANDS AN ENTIRE "SYSTEM" OF LAND USE FOR THE NATION WHICH INCLUDE THE PROTECTION OF IMPORTANT NATURAL AREAS COULD THEN GUIDE NATURAL RESOURCE PROTECTION AND DEVELOPMENT EFFORTS.

9.3 IMPLEMENTATION OF A NATIONAL ENVIRONMENTAL EDUCATION CAMPAIGN

A CONCERTED EFFORT ON THE PART OF BOTH GOVERNMENTAL AND NON-GOVERNMENTAL AGENCIES TO ESTABLISH A NATIONAL ENVIRONMENTAL EDUCATION CAMPAIGN SHOULD BE INITIATED IMMEDIATELY. THIS EFFORT WOULD FIRST DRAFT AN ENVIRONMENTAL EDUCATION STRATEGY AND THEN ORGANIZE AND IMPLEMENT PROGRAMS. THE EFFORT SHOULD FOCUS UPON FOUR MAJOR TARGET GROUPS INCLUDING: DECISION MAKERS, STUDENTS, THE GENERAL PUBLIC AND FINALLY RURAL PEOPLES THAT ARE MOST IN TOUCH WITH THE RESOURCES. THE ORIENTATION OF THE PROGRAM MUST BE VERY PRAGMATIC WITH SOLID AND APPROPRIATE SOLUTIONS TO MAJOR NATURAL RESOURCE PROBLEMS EMPHASIZED. THIS PROGRAM WOULD ALSO INCLUDE ELEMENTS OF TRAINING AND PROFESSIONAL PREPARATION AND WOULD INCLUDE THE INTRODUCTION OF EXTENSIVE NATURAL RESOURCE MANAGEMENT ORIENTED COURSES INTO THE CURRICULUM AT THE UNIVERSITY OF HONDURAS, ESNACIFOR, AND CURLA. RELEVANT INTERNATIONAL PROGRAMS WOULD BE UTILIZED TO THE FULLEST EXTENT POSSIBLE, ESPECIALLY THOSE ESTABLISHED IN LATIN AMERICAN COUNTRIES (COSTA RICA'S ENVIRONMENTAL INFORMATION CENTER FOR EXAMPLE). NATIONAL PARKS AND EQUIVALENT RESERVES WOULD BE UTILIZED AS CENTERS FOR OUTDOOR EDUCATION ACTIVITIES AND INTEGRATED INTO THE DEVELOPMENT OF THIS CAMPAIGN FROM THE ONSET.

9.4 CREATION OF WILDLIFE AND WILDLAND MANAGEMENT LAWS

A VITAL COMPONENT IN ACHIEVING APPROPRIATE PROTECTION AND MANAGEMENT OF WILDLIFE AND WILDLANDS IN HONDURAS IS THE CREATION OF A LEGAL MANDATE AND LAWS RELATED TO THEIR GOAL. ALTHOUGH THE ESTABLISHMENT OF LAWS ALONE WILL NOT GUARANTEE ADEQUATE RESOURCES PROTECTION THEY WILL, IF COUPLED WITH EDUCATION AND MANAGEMENT PROGRAMS, BE IMPORTANT IN BOTH POLITICAL AND PHYSICAL DEFENSE

OF FLORAL AND FAUNAL SPECIES. THE ELABORATION OF THESE LAWS SHOULD INCLUDE INPUT FROM ALL AGENCIES IMPACTING WILDLIFE AND WILDLANDS. IT SHOULD ALSO SPECIFICALLY STATE WHO THE MANAGING AGENCY WILL BE, WHAT CONTROL THEY WILL HAVE OVER LAND USE IN PROTECTED NATURAL AREAS AND HOW THEIR EFFORTS WILL BE COORDINATED WITH RELATED DEVELOPMENT PROJECTS.

9.5 CREATION OF A WILDLANDS AND WILDLIFE MANAGING AGENCY

BECAUSE OF THE GREAT IMPORTANCE OF WILDLAND RESOURCES IN HONDURAS AND THE DEPARTMENT OF WILDLIFE AND ENVIRONMENTAL RESOURCES' GENERAL IN ABILITY TO ADEQUATELY CREATE AND MANAGE A COMPREHENSIVE SYSTEM OF NATIONAL PARKS AND EQUIVALENT RESERVES, IT IS SUGGESTED THAT A NEW WILDLANDS AND WILDLIFE UNIT BE FORMED. AS LONG AS DWER REMAINS UNDER THE BUDGETARY SHADOW OF RENARE'S DEPARTMENT OF FISHERIES AND IS BURDENED WITH SUCH EXPENSIVE AND TIME CONSUMING TASKS SUCH AS MANAGING THE ZOOLOGICAL PARK, THE MUSEUM, AND THE ENVIRONMENTAL MONITORING PROGRAM, WILDLIFE AND WILDLANDS WILL NEVER RECEIVE THE FINANCIAL OR TECHNICAL BACKING THAT IT NEEDS TO GROW.

TWO ALTERNATIVES FOR RESTRUCTURING ARE SUGGESTED HERE: THE FIRST WOULD BE TO REMOVE IT FROM RENARE, AND TRANSFER THE ZOO, THE SERPENTARIUM, THE MUSEUM AND THE ENVIRONMENTAL MONITORING ACTIVITIES (WHICH IT DOES NOT HAVE THE EQUIPMENT, EXPERIENCE OR PEOPLE TO MANAGE) TO OTHER MORE APPROPRIATE AGENCIES. THIS WOULD LEAVE THE PARKS WILDLIFE AND ENVIRONMENTAL EDUCATION PROGRAM WITHOUT COMPETITION FOR FUNDS OR PERSONNEL. AN INSTITUTE OF WILDLIFE AND WILDLANDS MANAGEMENT WOULD THEN EITHER BE LEFT WITHIN THE MINISTRY OF NATURAL RESOURCES OR COULD BECOME A SEMIAUTONOMOUS AGENCY.

THE SECOND ALTERNATIVE IS SIMILAR TO THE FIRST EXCEPT THAT THEY NEWLY RETIRED DEPARTMENT WOULD BE PLACED INTO COHDEFOR. COHDEFOR COULD CREATE A SEPARATE DEPARTMENT OF PARKS AND WILDLIFE INTO WHICH THEY WOULD ALSO PLACE THEIR WATERSHED UNIT, THOSE SOCIAL FORESTRY AND EXTENSION PROGRAMS. THIS WOULD BE IDEAL FROM AN ECODEVELOPMENT APPROACH WHICH HAS BEEN ADOPTED FOR WILDLAND MANAGEMENT IN HONDURAS AND EMPHASIZED AN INTEGRATION OF SOCIAL AND ECOLOGICAL CONCEPTS TO THE PLANNING AND MANAGEMENT OF WILDLAND AREAS.

IN EITHER ALTERNATIVE IT IS IMPORTANT THAT ADEQUATE FUNDING, EQUIPMENT AND PERSONNEL NEEDS ARE INCLUDED IN THE RESTRUCTURING OF THE DEPARTMENT.

IN ADDITION TO THE REMOVAL OF THE ZOO AND OTHER NON ESSENTIAL PROGRAMS, THERE MUST BE THE ESTABLISHMENT OF A SOLID CHAIN OF COMMAND THAT WILL ENSURE ACTIVE PARTICIPATION ON THE PART OF ALL DEPARTMENT EMPLOYEES. THIS WILL ALSO NECESSITATE INTENSIVE TRAINING EFFORTS TO ENSURE THAT PERSONNEL NOT ONLY KNOW WHAT TO DO BUT ALSO HOW TO DO IT CORRECTLY AND EFFICIENTLY.

THERE ARE BOTH POSITIVE AND NEGATIVE ASPECTS TO THESE SUGGESTED INSTITUTIONAL PLACEMENTS. CREATING A NEW INSTITUTE WOULD NECESSITATE LARGE AMOUNTS OF FUNDING MERELY TO ORGANIZE BASIC INFRASTRUCTURE, AND WOULD ALLOW THE DEPARTMENT TO CHOOSE ITS OWN DIRECTION. PLACEMENT IN COHDEFOR WOULD

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IMMEDIATELY PUT A TREMENDOUS NATIONAL INFRASTRUCTURE AT ITS DISPOSAL, BUT MIGHT INHIBIT WILDLAND PROTECTION STRATEGY AND ACTIONS IF THEY CONFLICT WITH FOREST EXPLOITATION ACTIVITIES.

IN ANY CASE ACTION SHOULD BE TAKEN IMMEDIATELY TO ELEVATE WILDLAND AND WILDLIFE MANAGEMENT TO THE PRIORITY LEVEL IT DESERVES AND PROVIDE CORRESPONDING FINANCIAL AND TECHNICAL SUPPORT.

9.6 INITIATION OF A WILDLANDS INVENTORY AND SUBSEQUENT DEVELOPMENT OF A WILDLANDS SYSTEM

ALTHOUGH ORIGINAL PLANS FOR A NATIONAL INVENTORY OF POTENTIAL WILDLAND UNITS WERE DRAWN UP OVER 5 YEARS AGO, MOST OF THE AREAS IDENTIFIED FOR STUDY HAVE STILL NOT BEEN INVESTIGATED. THIS INVENTORY SHOULD BE COMPLETED AS SOON AS POSSIBLE SO THAT AREAS CHOSEN AS PRIORITY SITES FOR CONSERVATION CAN BE PROTECTED. BECAUSE OF TIME AND MONEY CONSTRAINTS IT IS NOT NECESSARY TO CARRY OUT EXHAUSTIVE STUDIES ON EACH AREA. INSTEAD, GENERAL INFORMATION SHOULD BE GATHERED THAT CAN BE UTILIZED TO DETERMINE EACH REGION'S SUITABILITY AS A MANAGED WILDLAND UNIT AS WELL AS ITS PRESENT SURVIVAL STATUS.

PRIORITY AREAS FOR PROTECTION AND DEVELOPMENT WILL BE THE MAJOR FOCUS OF DEPARTMENT PROGRAMS. MANAGEMENT PLANS WHICH INVOLVES INHABITANTS OF THE ZONE (IF THEY EXIST) AND RELATED AGENCIES SHOULD BE ELABORATED AND IMPLEMENTED. OTHER AREAS WILL RECEIVE ONLY PROTECTION AND MINIMAL DEVELOPMENT UNTIL THE DEPARTMENT IS ABLE TO EXTEND ITS MANAGEMENT PROGRAMS IN THOSE AREAS.

AT THIS TIME THE TWO AREAS OF HIGHEST PRIORITY ARE THE LA TIGRA CLOUD FOREST NATIONAL PARK AND THE RIO PLATANO MAB BIOSPHERE RESERVE. PROTECTION OF BOTH OF THESE REGIONS SHOULD BE REINFORCED AND MANAGEMENT PLANS PUT INTO ACTION. THE ECODEVELOPMENT ORIENTATION IS AN APPROPRIATE MODEL FOR DEVELOPMENT OF PROTECTED NATURAL AREAS CONSIDERING THE SOCIO ECONOMIC CLIMATE OF HONDURAS. THIS STRATEGY SHOULD BE CONTINUED IN FUTURE PLANNING ACTIVITIES.

9.7 NATIONAL WILDLIFE INVENTORY AND SUBSEQUENT IMPLEMENTATION OF WILDLIFE INVESTIGATIONS

AS IS THE CASE OF WILDLANDS, LITTLE IS KNOWN ABOUT THE STATE OR CHARACTERISTICS OF HONDURAN FAUNAL RESOURCES. A NATIONAL INVENTORY OF WILDLIFE SPECIES WHICH IDENTIFIED POPULATION NUMBERS, RANGE, ECOLOGY, POPULATION DYNAMICS AND UTILIZATION BY MAN WOULD PROVIDE A FIRM BASE UPON WHICH TO PLAN FUTURE WILDLIFE INVESTIGATIONS AS WELL AS MANAGEMENT POLICIES. PRIORITY STUDIES WHICH BUILD UPON THE INVENTORY RESULTS WOULD FOCUS UPON ENDANGERED SPECIES, SPECIES OF COMMERCIAL VALUE AND HABITAT STUDIES. WILDLIFE INSPECTORS BESIDES ENFORCING WILDLIFE LAWS WOULD BE TRAINED IN EXTENSION AND ENVIRONMENTAL EDUCATION AND WOULD ALSO BE CAPABLE OF ASSISTING BIOLOGISTS IN THEIR COLLECTION OF DATA. ALSO VIGILANCE IN RELATION TO ILLEGAL HUNTING PRACTICES WOULD BE STEPPED UP CONSIDERABLY.

9.8 FLORAL AND FAUNAL INVESTIGATIVE UNIT

AS THE PACE OF DEVELOPMENT IN HONDURAS QUICKENS, THE NEED TO SWIFTLY AND EFFICIENTLY ASSESS THE IMPACTS OF DEVELOPMENT ACTIVITIES OR ASSIST PLANNERS IN THE DEVELOPMENT OF ENVIRONMENTALLY SOUND PROJECTS BECOMES EVEN MORE IMPORTANT. A SPECIAL ENVIRONMENTAL IMPACT ASSESSMENT UNIT IN THE WILDLIFE AND WILDLAND AGENCY COULD PROVIDE SUCH A SERVICE AND BE A SOURCE OF INCOME FOR THE DEPARTMENT. NOT ONLY COULD THEY BE INVOLVED IN FIELD STUDIES, BUT THEY COULD ALSO SERVE AS CONSULTANTS FROM THE ONSET OF PROJECTS.

10.0 REFERENCES CITED OR CONSULTED

- AGUILAR, W. 1981. PLAN DE MANEJO DE LA IIGBA PARQUE NACIONAL. RENARE, TEGUCIGALPA.
- BETANCOURT J. AND DULIN P., 1978. PLAN DE USO MULTIPLE LAGO YQJQA. CONDEFOR, TEGUCIGALPA.
- BETANCOURT, J., WILD, K. HANSEN D. 1979
LA IIGBA -- HONDURAS. -- BENEFICIOS PUBLICOS POR INTERMEDIO DE LA CONSERVACION DE LOS RECURSOS NATURALES. PARQUES VOL 4 NO. 2 USPS, WASHINGTON, D.C.
- CONDEFOR, 1980. MEMORIA CONDEFOR 1979. CONDEFOR.
- CONSUPLANE, 1979. PLAN NACIONAL DE DESARROLLO. CONSUPLANE, TEGUCIGALPA.
- CARR A., 1950. OUTLINE OF A CLASSIFICATION OF ANIMAL HABITATS IN HONDURAS. BULLETIN OF THE AMERICAN MUSEUM OF NATURAL HISTORY. VOL 94, ART. 10.
- CRUZ G. ET.AL., 1978 EL RIO PLATANO. RENARE, TEGUCIGALPA.
- EIU, 1977. AN EVALUATION OF THE MANGROVE FOREST RESOURCE IN THE GULF OF FONSECA, REPUBLIC OF HONDURAS, C.A. ECONOMIST INTELLIGENCE UNIT. LONDON.
- ESPINAL, M. LISTA DE ALGUNAS PLANTAS MEDICINALES DE HONDURAS. MNR, TEGUCIGALPA.
- GLICK D., 1980. THE RIO PLATANO -- A CASE STUDY. INTEGRATIVE STUDIES CENTER. UNIVERSITY OF MICHIGAN, ANN ARBOR.
- GOLDMAN C., 1972. EL CAJON PROYECT -- ECOLOGY. ENEE, TEGUCIGALPA.
- GONZALEZ, J. 1980. COMERCIALIZACION DE ANIMALES SILVESTRES EN HONDURAS. RENARE, TEGUCIGALPA.
- HELLIE, R. AND GLICK, D. 1976.
INVENTARIOS DE AREAS POTENCIALES PARA UN SISTEMA NACIONAL DE AREAS SILVESTRES EN HONDURAS. RENARE, TEGUCIGALPA.
- HOLDRIDGE, L., 1962. MABA ECOLOGICO DE HONDURAS: ORGANIZATION OF AMERICAN STATES.

KLEIN, D., 1977. LOS MAMÍFEROS DE HONDURAS. RENARE, TEGUCIGALPA.

KLEIN, E. AND PURDY, P. 1976.

OBSERVACIONES PRELIMINARES SOBRE LA FAMILIA PSITTACIDAE EN HONDURAS. RENARE, TEGUCIGALPA.

LABASTILLE A., 1973. AN ECOLOGICAL SURVEY OF THE PROPOSED VOLCAN BARU NATIONAL PARK, PANAMA. IUCN/WWF, RENARE, PANAMA

MARCUS M., 1981. APROVECHAMIENTO DE FAUNA SILVESTRE Y AVIFAUNA DE LA RESERVA DE LA BIOSFERA PIO PLATANO. RENARE, TEGUCIGALPA.

MEYER J., ET.AL. 1969. CLAVE DE LOS ANFIBIOS Y REPTILES EN HONDURAS. UNAH.

MILLER, K. 1979. PLANNING NATIONAL PARKS FOR ECONOMIC DEVELOPMENT. INSTITUTO DE LA CAZA FOTOGRAFICA Y CIENCIAS DE LA NATURALEZA, MADRID, SPAIN.

MONROE B., 1968 A DISTRIBUTIONAL SURVEY OF THE BIRDS OF HONDURAS. ORNITHOLOGICAL MONOGRAPHS NO. 7. THE AMERICAN ORNITHOLOGICAL UNION.

MYERS N., 1979 THE SINKING ASK. PARAGAMCN PRESS. GREAT BRITAIN.

MYTON B., CLAVE DE LOS MAMÍFEROS DE HONDURAS. UNAH.

PURDY, P. 1978. ESTUDIO SOBRE LAS PALOMAS MIGRATORIAS. RENARE, TEGUCIGALPA.

RENARE - 1977. REPOSICION DE LOS RECURSOS NATURALES Y CULTURALES DE LA TIERRA. RENARE, TEGUCIGALPA.

RENARE 1980. INFORME ANUAL. RENARE, TEGUCIGALPA.

RENARE 1980. PLAN DE MANEJO DEL RIO PLATANO. RENARE/CATIE, TEGUCIGALPA.

SILLIMAN ET.AL. 1981. DRAE ENVIRONMENTAL PROFILE OF HONDURAS. UNIVERSITY OF ARIZONA, TUCSON.

TROENSEGUARD, J. 1980 PAUTAS PARA LA ORDENACION FORESTAL EN HONDURAS. COHDEFOR, TEGUCIGALPA.

UNEP, 1976.

EXPLORATORY STUDY OF THE ENVIRONMENTAL SITUATION IN CENTRAL AMERICA. MEXICO CITY, UNEP.

USAID, 1980. HONDURAS COUNTRY DEVELOPMENT STRATEGY STATEMENT. USAID, WASHINGTON, D.C.

USAID, 1980. HONDURAS PROJECT PAPER: NATURAL RESOURCES DEVELOPMENT. USAID, WASHINGTON, D.C.

UNDUARDY N., A CLASSIFICATION OF THE BIOGEOGRAPHICAL PROVINCES OF THE WORLD. IVERN OCCASIONAL PAPER NO. 18, MORGENS, SWITZERLAND.

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HONDURAS

ENVIRONMENTAL PROFILE

CHAPTER VIII

WATER SUPPLY AND WASTE MANAGEMENT

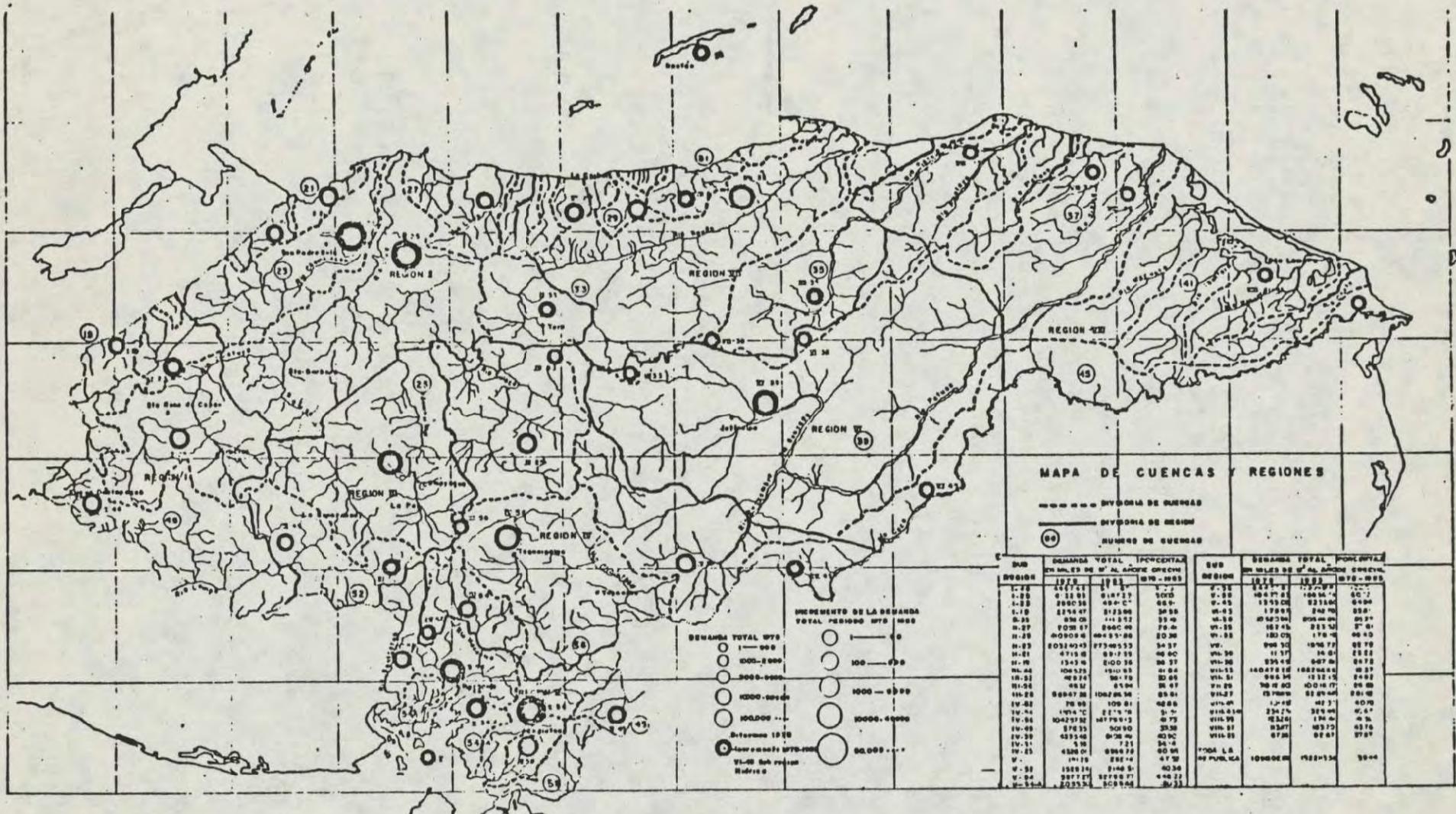
RAFAEL RIOS

JRB ASSOCIATES

AID CONTRACT

JULY 1981

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MAPA DE CUENCAS Y REGIONES

--- DIVISION DE CUENCAS
 --- DIVISION DE REGION
 (C) NUMERO DE CUENCAS

INCREMENTO DE LA DEMANDA
 TOTAL PERIODO 1970-1980

DEMANDA TOTAL M³/DIA

1-500
 1000-2000
 3000-5000
 10000-15000
 20000-30000
 40000-50000
 60000-70000

1-50
 100-200
 300-400
 500-600
 700-800
 900-1000

1970-1975
 1975-1980
 1970-1980

VI-02 Sub-region
 Hidrica

REGION	DEMANDA TOTAL EN MILES DE M ³ AL AÑO DE 1970	INCREMENTO EN MILES DE M ³ AL AÑO DE 1970-1980	IPC CENTRAL	REGION	DEMANDA TOTAL EN MILES DE M ³ AL AÑO DE 1970	INCREMENTO EN MILES DE M ³ AL AÑO DE 1970-1980	IPC CENTRAL
I-20	1277.21	17.81	1.39	V-35	127.21	17.81	1.39
I-25	422.81	61.23	14.48	V-36	184.71	166.54	90.2
I-30	2800.36	42.47	1.52	V-37	133.02	231.60	173.7
I-35	2756.47	273.00	9.90	V-38	178.01	242.70	136.0
I-40	320.00	111.52	34.85	V-39	1067.00	806.00	75.6
I-45	2028.17	2840.00	140.00	V-40	167.45	213.50	128.1
I-50	4090.04	40455.80	1036.00	V-41	182.00	178.10	98.4
I-55	2031.00	273.00	13.44	V-42	908.30	1970.70	217.0
I-60	4715.00	8312.30	176.00	V-43	11.77	14.04	119.2
I-65	1343.40	2100.30	156.37	V-44	335.42	607.80	181.5
I-70	1005.20	1911.93	190.24	V-45	1607.00	1827.00	113.7
I-75	409.14	30.10	7.36	V-46	94.30	122.15	129.6
I-80	48.32	6.94	14.37	V-47	30.40	100.17	330.0
I-85	889.67	1062.50	119.41	V-48	23.70	52.80	222.8
I-90	70.30	100.81	143.40	V-49	1.40	48.31	3450.0
I-95	1474.72	217.70	14.76	V-50	234.74	320.00	136.3
I-100	1042.52	1477.01	141.70	V-51	82.60	194.00	233.6
II-05	370.30	500.00	135.00	V-52	23.07	62.70	271.9
II-10	423.00	87.00	20.56	V-53	67.00	82.67	123.4
II-15	5.30	7.21	135.8	V-54	1.00	1.00	100.0
II-20	4300.00	8260.70	192.10	V-55	152.10	214.0	140.0
II-25	141.10	281.4	199.4	V-56	287.70	277.00	96.3
II-30	152.10	214.0	140.0	V-57	2075.70	2075.70	100.0
II-35	152.10	214.0	140.0	V-58	2075.70	2075.70	100.0

1.0 INTRODUCTION

THIS SECTION REVIEWS ENVIRONMENTAL PROBLEMS AND THE HUMAN HEALTH CONSEQUENCES OF POLLUTION IN HONDURAS.

CONSIDERATION IS GIVEN TO WATER RESOURCES AND SUPPLY, WASTEWATER COLLECTION AND TREATMENT, AGRICULTURAL AND INDUSTRIAL POLLUTION, AIR QUALITY, AND SOLID WASTE MANAGEMENT. A REVIEW IS MADE OF EACH AREA, EVALUATING AVAILABLE DATA AND PRACTICES TO ARRIVE AT RECOMMENDATIONS FOR ACTION. THESE RECOMMENDATIONS ARE PARTICULARLY TAILORED TO THE ECONOMIC AND TECHNICAL REALITIES OF THE COUNTRY.

THE REPUBLIC OF HONDURAS OCCUPIES A SURFACE AREA OF 112,088 KM², DIVIDED IN 18 DEPARTMENTS, 283 MUNICIPALITIES AND 20,792 COMMUNITIES. IN 1978 ITS POPULATION WAS ESTIMATED AT 3,439,000 INHABITANTS, OF WHICH 34.4% WERE LIVING IN AN URBAN ENVIRONMENT AND THE REMAINING 65.6% WERE LIVING IN THE RURAL AREAS. THESE PERCENTAGES ARE EXPECTED TO CHANGE TO 51 AND 49% RESPECTIVELY BY THE YEAR 2000. ACCORDING TO THE LATEST OFFICIAL CENSUS (1974) THERE WERE 13 URBAN AREAS WITH A POPULATION GREATER THAN 10,000 PERSONS.

THE MAJOR URBAN CENTERS ARE LOCATED AT THE CAPITAL CITY OF TEGUCIGALPA, AND AT SAN PEDRO SULA, LA CEIBA, EL PROGRESO, CHOLUTECA AND PUERTO CORTES. SAN PEDRO SULA ALSO CONSTITUTES THE MAJOR INDUSTRIAL CENTER, INCLUDING ALMOST ALL MAJOR INDUSTRY IN THE COUNTRY WITH THE EXCEPTION OF HONDURAS' ONLY REFINERY AT PUERTO CORTES.

2.0 WATER RESOURCES

RELATIVE TO ITS LAND AREA AND ITS SMALL POPULATION, HONDURAS HAS ABUNDANT WATER RESOURCES. THE FOLLOWING PAGES DESCRIBE THE SPECIFIC USE OF WATER BY SECTOR IN EACH INDIVIDUAL WATERSHED AND COMPARES IT WITH THE AVAILABLE WATER TO COMPLETE A WATER BALANCE. THE AVAILABLE WATER IS ALMOST EXCLUSIVELY SURFACE WATER SINCE THE AVAILABILITY OF GROUND WATER IS VIRTUALLY UNKNOWN. (CONSULANE, 1979) FIGURE 1 SHOWS THE COUNTRY AS DIVIDED IN WATERSHEDS AND ECONOMIC REGIONS. THE CLASSIFICATION SYSTEM USED IN HONDURAS DIVIDES THE COUNTRY IN HYDROLOGICAL SUBREGIONS, NUMBERED ACCORDING TO BOTH THE HYDROLOGICAL AND THE ECONOMIC REGION TO WHICH THEY BELONG. FOR EXAMPLE, THE CHOLUTECA WATERSHED IS NUMBER 56 AND CUTS ACROSS THREE ECONOMIC REGIONS. THEREFORE, THE THREE SUBREGIONS ARE NUMBERED III-56, IV-56 AND V-56.

2.1 WATER USE:

2.1.1 HUMAN SUPPLY

ACCORDING TO THE 1974 CENSUS, THE NUMBER OF PERSONS PER URBAN DWELLING WAS 5.20 AND 6,147 PER RURAL DWELLING. IN 1974 THE SUPPLY SITUATION WAS AS FOLLOWS:

PIPED WATER:		1,169,500 PERSONS, OR 39.1 %
WELLS:	951,800 PERSONS, OR 31.82%	
NO SERVICE:		870,000 PERSONS, OR 29.08%

BY 1978 THE SITUATION HAD CHANGED AS FOLLOWS:

PIPED WATER:		1,404,800 PERSONS OR 40.85%
WELLS:	OR 35.35%	1,215,500 PERSONS
NO SERVICE:		818,700 PERSONS OR 23.80%

THIS BASICALLY SHOWS A SMALL IMPROVEMENT FOR THE FOUR YEAR PERIOD. IN TERMS OF URBAN AND RURAL DISTRIBUTION, THE FIGURES FOR 1978 ARE:

	URBAN_ZONE	RURAL_ZONE
PIPED WATER:	859,400 (72.64%)	545,400 (24.18%)
WELLS:	57,600 (4.87%)	1,157,900 (51.32%)
NO SERVICES:	266,100 (22.49%)	552,700 (24.50%)

SINCE ONLY THE PIPED WATER RECEIVES TREATMENT, THIS INDICATES THAT APPROXIMATELY 76% OF THE RESIDENTS OF RURAL AREAS USE WATER THAT IS NOT DESINFECTED. THESE FIGURES ARE IMPORTANT IN REFERENCE TO THE INFANT AND IN GENERAL MORTALITY RATES IN THE RURAL AREAS WHICH ARE SHOWN IN A LATER SECTION.

IN SUMMARY, IN 1974 TOTAL HUMAN CONSUMPTION IN THE COUNTRY WAS 116,576,600 M3, GIVING A PER CAPITA CONSUMPTION OF 38.97 M3/YEAR. THIS FIGURE INCREASED TO 155,864,500 BY 1978 AND WAS EXPECTED TO REACH 227,378,600 BY 1983.

2.1.2 AGRICULTURAL USE:

IRRIGATION SYSTEMS WERE NOT USED IN HONDURAS UNTIL THE END OF THE LAST CENTURY. IT STARTED WITH PRIVATE SYSTEM USED IN BANANA PLANTATIONS AND EXTENDED TO SUGARCANE USE. IT WAS NOT UNTIL 1957 THAT THE GOVERNMENT HAD ITS FIRST SYSTEM. EVEN NOW, OUT OF 54,450 HA. UNDER IRRIGATION, 36,000 HA. BELONG TO BANANA AND SUGARCANE COMPANIES.

THE POTENTIALLY IRRIGABLE SURFACE IS ABOUT 400,000 HA., OF WHICH 13.6% ARE CURRENTLY UNDER IRRIGATION. THESE REQUIRE A FLOW OF 55 M3/SEC. DURING A PERIOD OF SIX MONTHS. DUE TO SERIOUS PROBLEMS IN THE SYSTEMS, THEIR MAXIMUM

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UTILIZATION IS 30%. DURING THE PERIOD 1974 TO 1978, THE IRRIGATED SURFACE AREA INCREASED BY 2,950 HA. THIS IS WELL BELOW THE INCREASE THAT HAS BEEN REGISTERED IN OTHER CENTRAL AMERICAN COUNTRIES. HOWEVER, PROJECTIONS CALL FOR AN INCREASE UP TO 76,930 HA. UNDER IRRIGATION BY 1983. THIS WOULD REQUIRE AN INCREASE IN IRRIGATION WATER FROM 847.7X10 M3/YEAR IN 1978 TO 1,181.6X10 M3/YEAR IN 1983.

IN ADDITION TO IRRIGATION WATER, AGRICULTURE ALSO REQUIRES WATER FOR ANIMAL CONSUMPTION. THESE REQUIREMENTS ARE ESTIMATED AS:

1974 21,530,600 M3/YEAR
1978 24,486,400 M3/YEAR
1983 30,128,200 M3/YEAR

2.1.3. INDUSTRIAL USE:

THERE ARE ONLY A FEW LARGE INDUSTRIES IN THE COUNTRY, WHICH MEANS THAT INDUSTRIAL DEMAND IS LOW, REACHING 5.8% OF THE TOTAL DEMAND IN 1978. THE TYPE OF INDUSTRIES FOUND ARE:

A. A PLANNED PULP AND PAPER MILL NEAR TOCOA WHICH WILL NOT BE A FACTOR UNTIL AFTER 1983.

B. EL MOCHITO MINE IN THE VICINITY OF LAGO YOJOA, WHICH IS DISCUSSED SEPARATELY IN THE SECTION ON INDUSTRIAL POLLUTION. IN ANY EVENT, THIS MINE HAS A NET PRODUCTION OF WATER DUE TO THE WATER THAT COMES OUT WITH THE MINERALS.

C. THERMOELECTRIC PLANTS ARE SMALL IN GENERAL. THE LARGEST ONE IS AT LA CEIBA AND HAS A USAGE OF 6 M3/MIN. WHEN WORKING. SINCE IT RECIRCULATES ITS WATER, ITS NET USAGE IS ESSENTIALLY ZERO.

D. THE METALURGICAL AND PETROCHEMICAL INDUSTRY IS VIRTUALLY NON EXISTENT.

E. THE REFINERY AT PUERTO CORTES USES A VERY SMALL AMOUNT OF WATER (60-70 GAL/MIN).

F. THERE ARE 8 SUGAR MILLS WHICH ARE LARGE WATER USERS.

THE FIGURES FOR INDUSTRIAL WATER DEMAND ARE THEN:

1978 63,549,300 M3/YEAR
1983 82,989,300 M3/YEAR

THIS DEMAND IS ESSENTIALLY LOCATED AT THE CHOLUTECA, ULUA AND CHAMELECON WATERSHEDS.

2.1.4 OTHER USES OF WATER:

A. THE RECREATIONAL USE OF WATER IS VIRTUALLY NON EXISTENT IN HONDURAS. NAVIGATIONAL USE IS LIMITED DUE TO THE WIDE VARIATION IN THE FLOW OF THE RIVERS.

THE ABOVE DATA IS SUMMARIZED IN TABLE 1. THE DISTRIBUTION OF DEMAND BY WATERSHED IS GIVEN IN TABLE 2.

B. WATER BALANCE: THE WATER BALANCE FIGURES GIVEN HERE ARE A COMPARISON OF THE WATER DEMAND PREVIOUSLY GIVEN WITH THE WATER AVAILABILITY. IT IS CONSIDERED THAT THE AVAILABLE WATER IS EQUAL TO THE SURFACE RUNOFF AVAILABLE WITH A 75% RECURRENCE, BASED ON AVERAGE MEASUREMENTS TAKEN FOR AT LEAST FIVE YEARS. REFERENCE (3) GIVES A VERY DETAILED WATER BALANCE, BY SUBREGION AND BY MONTH OF THE YEAR, FOR EACH OF THE WATERSHEDS PREVIOUSLY MENTIONED. THE WATER BALANCE FOR THE MAJOR RIVERS IS SUMMARIZED BELOW:

1. AGUAN RIVER: THERE IS NO ACTUAL OR FUTURE WATER DEFICIT, IN THE TOTAL WATERSHED OR IN ANY OF THE SUBREGIONS. EVEN IN THE WORST CASE, THE SUPPLY IS TWICE THE REQUIREMENTS FOR 1983.

2. CHAMELECCN RIVER: A DEFICIT APPEARS IN THE LOWER REACHES DURING APRIL AND MAY. THIS CORRESPONDS TO THE END OF OPERATIONS FOR THE SUGAR MILLS. THE PROJECTED 1983 DEFICIT IS 37,291,000 M3 SPREAD OVER MARCH, APRIL AND MAY. IT IS PROPOSED TO USE GROUNDWATER TO COVER THE DEFICIT AND AT THE SAME TIME START EVALUATING THE POSSIBILITY OF A DAM IN THE UPPER REACHES. THIS DAM COULD ALSO HELP IN SOLVING THE FLOOD PROBLEM IN THIS WATERSHED.

3. CHOLUTECA RIVER: THIS IS THE MOST CRITICAL SITUATION IN THE COUNTRY. BY 1978 TWO OUT OF ITS THREE SUBREGIONS WERE OPERATING AT A DEFICIT. BY 1983 THIS DEFICIT IS EXPECTED TO REACH 36%. THE MAIN CAUSES FOR THE DEFICIT ARE THE HIGH DEMANDS OF TEGUCIGALPA, THREE SUGAR MILLS, AND THE IRRIGATION DISTRICT AT SAN JUAN DE FLORES. PROPOSED SOLUTIONS TO THE PROBLEM ARE:

- A. WATER REUSE AT THE SUGAR MILLS
- B. IMPROVE IRRIGATION EFFICIENCY
- C. MAKE BETTER LONG RANGE DEMAND PROJECTIONS
- D. BUILD A MULTIPLE USE RESERVOIR TO COVER THE DEMAND UP TO 2000, AT LEAST.

4. NACAOME RIVER: THIS WATERSHED WILL SHOW A SMALL DEFICIT BY 1983 IF THE PROPOSED NEW IRRIGATION SYSTEM IS IMPLEMENTED. THIS DEFICIT WILL BE ABOUT 19% RELATIVE TO THE REQUIREMENTS. IT IS PROPOSED TO USE GROUNDWATER TO COVER IT.

5. PATUCA RIVER: THERE ARE SIGNIFICANT AMOUNTS OF WATER AVAILABLE, AND NO DEFICITS ARE PREDICTED.

6. SICO-PAULAYA RIVER: CURRENT AND FUTURE REQUIREMENTS ARE INSIGNIFICANT RELATIVE TO THE AMOUNT OF WATER AVAILABLE.

7. ULUA RIVER: WATER AVAILABILITY IS NOT EXPECTED TO BE A PROBLEM. THE CURRENT FLOODING PROBLEM SHOULD BE SOLVED ONCE THE EL CAJON PROJECT IS COMPLETED.

8. OTHER RIVERS: WATER DEFICITS ARE EXPECTED TO OCCUR AT THE FOLLOWING IRRIGATION DISTRICTS: SAN JUAN DE FLORES, SELGUAPA AND FLORES. PROPOSED SOLUTIONS ARE INCREASES IN IRRIGATION EFFICIENCY AND THE CONSTRUCTION OF SOME SMALL DAMS.

WATER REQUIREMENTS DISCUSSED ABOVE DO NOT INCLUDE THE FRESHWATER REQUIREMENTS TO MAINTAIN THE APPROPRIATE SALINITY GRADIENT IN THE ESTUARIES RECEIVING THE RIVERS TO MAINTAIN FISHERY PRODUCTIVITY. THIS PROBLEM IS POTENTIALLY SERIOUS IN THE CHOLUTECA ESTUARY.

2.2 INSTITUTIONAL FRAMEWORK, AGENCIES AND LAWS

2.2.1 POLLUTION CONTROL

A) MINING: ARTICLE 244 OF THE 1950 MINING CODE REQUIRES MINING ENTERPRISES TO FILTER OR TREAT THEIR TOXIC WASTES OR WASTE WATERS BEFORE DISCHARGING THEM INTO A RECEIVING WATER. IT SUGGESTS THE USE OF PONDS AS AN APPROPRIATE TECHNOLOGY AND SET THE TOTAL SOLIDS CONCENTRATION THAT MAY BE DISCHARGE AS 2,000 MG/L. DEL CID (1976)

ARTICLES 130 AND 149 SETS CIVIL AND CRIMINAL RESPONSIBILITY ON THE EXECUTIVE OF AN ENTERPRISE WHICH "DISCHARGES POISONOUS OR TOXIC SUBSTANCES TO RIVERS, LAKES, OR WELLS, PROVIDED THAT THESE SUBSTANCES MAY CAUSE SERIOUS DAMAGES TO THIRD PARTIES".

AS SHOWN LATER IN THE CASE OF ROSARIO RESOURCES CORPORATION, THESE PROVISIONS ARE LOOSELY ENFORCED.

B) INDUSTRIAL: THERE IS NO CLEARLY DEFINED GOVERNMENT AGENCY OR LAW TO REGULATE WASTEWATER DISCHARGES FROM THE INDUSTRIAL SECTOR. THE SANITARY CODE (DECREE NO. 75, JANUARY 5-6, 1967, ARTICLES 77 AND 78) CONTAINS A GENERAL PROHIBITION AGAINST AIR POLLUTION AND OTHER DANGERS. THE POLICE LAW (DECREE NO. 7, FEBRUARY 8, 1906, ARTICLES 310 AND 314) CONTAINS GENERAL PROVISION FOR THE PROTECTION OF POTABLE WATER SOURCES. IN REALITY, NONE OF THESE ARE ENFORCED.

C) MUNICIPAL: THE MUNICIPAL SECTOR DOES NOT HAVE A REGULATING AGENCY. THE PUBLIC HEALTH MINISTRY IS CHARGED UNDER THE SANITARY CODE WITH GENERAL ENVIRONMENTAL SANITATION, INCLUDING POTABLE WATER SUPPLY AND DISPOSAL OF HUMAN EXCREMENT AND WASTEWATERS. HOWEVER, THEIR FUNCTION IS NOT TO REGULATE THESE MATTERS, BUT TO HELP RESOLVE THEM IN COOPERATION WITH SANAA AND THE MUNICIPALITIES.

2.2.2 WATER SUPPLY AND SEWERAGE

2.2.2.1 PUBLIC HEALTH MINISTRY: THE PUBLIC HEALTH AND SOCIAL ASSISTANCE MINISTRY, THROUGH ITS ENVIRONMENTAL ATTENTION DIRECTORATE, AND ITS EIGHT SANITARY REGIONS, TAKES ACTIONS CONCERNING:

- A) WATER SUPPLY IN RURAL TOWNS OF LESS THAN 500 PERSONS.
- B) COLABORATION WITH SANAA IN URBAN WATER SUPPLY.
- C) LATRINE PROGRAMS IN RURAL TOWNS OF MORE THAN 50 PERSONS AND IN THE MARGINAL URBAN AREAS.
- D) FINAL DISPOSAL OF SOLID WASTES.
- E) FOOD CONTROL.
- F) VECTOR CONTROL.

THE MOST IMPORTANT PROGRAM IS THE BASIC SANITATION PROGRAM, WHOSE FUNDAMENTAL ACTIONS ARE THE AREA OF POTABLE WATER SUPPLY IN APPROPRIATE QUANTITY AND QUALITY, DISPOSAL OF HUMAN EXCREMENT, SANITARY AND STORM SEWERS, SANITARY IMPROVEMENT OF HOUSING, AND GENERAL SANITATION EDUCATION.

THE OBJECTIVES OF THE PROGRAM ARE:

- A. TO OFFER BETTER HEALTH PROTECTION, IN PARTICULAR TO THE INFANT POPULATION, IN ORDER TO DIMINISH THE MORTALITY ATTRIBUTED TO WATERBORNE DISEASES.
- B. TO CREATE A POSITIVE CHANGE IN THE SANITARY HABITS AND ATTITUDES OF THE POPULATION.
- C. TO REDUCE THE EXPENSES REQUIRED FOR THE TREATMENT OF WATERBORNE DISEASES, AND THE LOST WORK AND STUDY DAYS DUE TO SUCH DISEASES.

THESE OBJECTIVES ARE TO BE IMPLEMENTED THROUGH THE FOLLOWING MEANS, ESSENTIALLY THE RESPONSIBILITY OF THE ENVIRONMENTAL ATTENTION DIRECTORATE.

- A INCREASE THE CONSTRUCTION OF WELLS AND AQUEDUCTS IN THE RURAL AREAS AND IN THE MARGINAL URBAN ZONES, AND INSURE THAT THEY ARE PROPERLY OPERATED AND MAINTAINED.
- B. CONSTRUCT NEW WATER SUPPLY SYSTEMS AND IMPROVE EXISTING ONES IN THE URBAN AREAS, INSURING THAT THE WATER QUALITY IS ADEQUATE.
- C. PROVIDE SANITARY LATRINES OR SIMILAR DISPOSAL METHODS TO THE RESIDENTS OF URBAN AREAS.

D. CONSTRUCT NEW SEWER SYSTEMS AND IMPROVE EXISTING ONES IN THE URBAN AREAS, AND CONSIDER THE POSSIBILITY OF TREATMENT IN SOME CASES.

E. COOPERATE IN AIR, WATER AND LAND CONTAMINATION CONTROL BY APPLYING EXISTING LAWS AND PERFORMING STUDIES TO PRIORITIZE PROBLEMS.

F. COORDINATE AND PROMOTE PROGRAMS AND ACTIVITIES OF THE INSTITUTIONS THAT ARE RESPONSIBLE FOR THE HANDLING AND USE OF PESTICIDES.

TO DO ALL THIS AND ITS OTHER OBLIGATIONS IN 1978, THE MINISTRY HAD 209 PERSONS WORKING IN ITS BASIC SANITATION PROGRAM. THESE INCLUDED 60 SANITARY INSPECTORS AND 121 PROMOTERS. THIS IS TOO FEW PEOPLE FOR THE SIZE OF THE TASK REQUIRED.

IN 1978 THE BASIS SANITATION PROGRAM AT THE MINISTRY HAD TOTAL EXPENSES OF \$1,466,500, ABOUT EVENLY DIVIDED BETWEEN CAPITAL AND OPERATING EXPENSES. OF THIS AMOUNT, APPROXIMATELY \$500,000 WERE PROVIDED BY EXTERNAL FUNDS. PROJECTED PROGRAMS AND FUNDING FOR THE PERIOD 1979-83 ARE AS FOLLOWS:

A) NATIONAL HEALTH SERVICE PROGRAM (PRONASSA)	\$19,642,500
B) BASIC SANITATION PROGRAM (PRCSABA)-A.I.D.	2,018,000
C) BASIC SANITATION PROGRAM-UNICEF	
637,500	
D) BASIC SANITATION PROGRAM-SWISS GOVERNMENT	385,000

2.2.2.2. NATIONAL AUTONOMOUS AQUEDUCT AND SEWER SERVICE (SANAA) WAS CREATED AS AN AUTONOMOUS AND DECENTRALIZED AGENCY BY LEGISLATIVE DECREE NO. 91 OF APRIL 26, 1961, WITH THE GENERAL OBJECTIVE OF PROMOTING THE DEVELOPMENT AND OPERATION OF AQUEDUCTS AND SEWERS. TO ACCOMPLISH THIS OBJECTIVE SANAA HAS THE AUTHORITY TO PLAN, BUILD AND OPERATE RESERVOIRS, PIPELINES, TREATMENT PLANTS AND DISTRIBUTION SYSTEMS. IT CAN ALSO DESIGN, BUILD AND OPERATE STORM AND SANITARY SEWERS.

DURING THE YEAR 1980 SANAA HAD EXPENSES TOTALLING \$15.8 MILLION, OF WHICH \$11.25 MILLION WERE CAPITAL EXPENDITURES AND \$4.65 WERE OPERATIONAL EXPENSES. ITS MAJOR ACTIVITIES DURING THE YEAR WERE TO:

- A. PLAN AND DESIGN WATER SUPPLY SYSTEMS FOR 240 RURAL COMMUNITIES.
- B. PLAN AND DESIGN POTABLE WATER SUPPLIES FOR 9 URBAN COMMUNITIES.
- C. PLAN AND DESIGN IMMEDIATE IMPROVEMENTS FOR 12 URBAN AND RURAL AQUEDUCTS.
- D. PLAN, DESIGN AND BUILD TWO IMPROVEMENTS TO THE SANITARY SEWER SYSTEM.
- E. BUILD 40 RURAL AQUEDUCTS THROUGH THE SANAA-CARE COMUNIDAD PROGRAM.
- F. BUILD 20 RURAL AQUEDUCTS THROUGH THE SANAA-BID COMUNIDAD PROGRAM.

IN ACCORDANCE TO THE POLICIES SET BY THE CURRENT NATIONAL HEALTH PLAN, SANAA IS GIVING PRIORITY TO THE RURAL AREAS WHILE STILL GIVING ADEQUATE ATTENTION TO THE URBAN ZONES. THIS POLICY IS AMPLY JUSTIFIED BY THE MORTALITY FIGURES GIVEN IN A LATER SECTION. IMPLEMENTATION IS BASED ON THE FOLLOWING PROGRAMS TO PLAN AND CONSTRUCT AQUEDUCTS IN THE RURAL AREAS:

SANAA-BID-COMUNIDAD
SANAA-CARE-COMUNIDAD
SANAA-AID-COMUNIDAD

THESE PROGRAMS INVOLVE THE LOCAL COMMUNITY, THROUGH THE PROVISION OF LABOR, IN THE CONSTRUCTION OF THEIR AQUEDUCTS. SANAA EXPECTS TO BUILD 120 AQUEDUCTS WITH THESE PROGRAMS.

THE WATER SUPPLY/WASTEWATER DISPOSAL SITUATION FOR TEGUCIGALPA IS HANDLED SEPARATELY THROUGH THE MASTER PLAN, FINANCED BY BID THROUGH A GRANT OF \$1,120,000 (PLUS \$130,000 FROM SANAA) FOR TECHNICAL ASSISTANCE AND A LOAN OF \$4,500,000 (PLUS \$900,000 FROM THE GOVERNMENT) TO BUILD 30 KMS. OF MAIN DISTRIBUTION LINES AND DESIGN OF THE FIRST STAGE OF THE PROPOSED POTABLE WATER SUPPLY.

THE TECHNICAL ASSISTANCE FUNDS HAVE BEEN USED FOR A FEASIBILITY STUDY ON WATER SUPPLY, SANITARY AND STORM SEWERS, AND WASTEWATER TREATMENT FACILITIES. THE WATER SUPPLY STUDY PROPOSES SEVEN STEPS TO GUARANTEE ENOUGH WATER FOR THE CITY UNTIL 2010. BY THAT TIME THE DEMAND IS EXPECTED TO INCREASE FROM 80 MILLION M³/YEAR TO IN 1980 TO 550 MILLION M³/YEAR IN 2010. OTHER RESULTS FROM THE MASTER PLAN ARE DISCUSSED LATER.

SANAA HAS APPROXIMATELY 800 EMPLOYEES, INCLUDING 34 SANITARY ENGINEERS. THIS DOES NOT INCLUDE THE PERSONNEL WORKING WITH THE MASTER PLAN, THE BID-AID-CARE-COMUNIDAD PROJECT, AND THE THREE AND FOUR CITIES PROJECTS. THIS NUMBER OF PERSONNEL IS CONSIDERED SATISFACTORY, ALTHOUGH THE PROPORTION OF TECHNICAL AND PROFESSIONAL PERSONNEL COULD BE INCREASED.

2.2.2.3 OTHER ORGANIZATIONS:

A. NATIONAL INFANT PATRONAGE (PATRONATO NACIONAL DE LA INFANCIA)

THIS ORGANIZATION DEPENDS ORGANICALLY ON THE PUBLIC HEALTH MINISTRY AND FINANCES THE HUMAN RESOURCES AND MATERIALS REQUIRED FOR THE RURAL PENETRATION PROGRAMS OF THE MINISTRY.

B. LOCAL GOVERNMENTS

THE LOCAL GOVERNMENTS OF 282 MUNICIPALITIES WHO ARE SUPPORTED BY THE DIRECTORATE OF MUNICIPAL TECHNICAL ASSISTANCE OF THE GOVERNMENT AND JUSTICE MINISTRY, DEAL WITH THEIR OWN WATER SUPPLY AND SEWERS IN COORDINATION WITH SANAA AND MSP.

C. MUNICIPAL AUTONOMOUS BANK

THIS ENTITY FINANCES THE PUBLIC WORKS PROJECT OF THE MUNICIPALITIES.

3. SOLID WASTES

GENERAL PLANNING RESPONSIBILITIES IN THE HEALTH ASPECTS OF SOLID WASTE MANAGEMENT RESIDE IN CONSUPLANE, IN PARTICULAR THE HEALTH DEPARTMENT, WHICH IS A PART OF THE SOCIAL PLANNING DIRECTORATE. THIS DEPARTMENT COORDINATES THE PREPARATION OF THE 5-YEAR NATIONAL HEALTH PLAN, WHICH INCLUDES THE NATIONAL GOALS AND OBJECTIVES IN THE MANAGEMENT OF SOLID WASTES. IMPLEMENTATION OF THE OBJECTIVES IS THE RESPONSIBILITY OF THE AGENCIES THAT FOLLOW.

SOLID WASTE OPERATIONS ARE THE RESPONSIBILITY OF THE DIFFERENT MUNICIPALITIES, AS ESTABLISHED BY THE POLICE ACT (DECREE NO. 7, FEBRUARY 8, 1906, ARTICLES 225, 229, 245 AND 264) AND THE SANITARY CODE (DECREE NO. 75, JANUARY 5-6, 1967, ARTICLES 20, 68 AND 71). THE ENVIRONMENTAL SANITATION REGULATIONS DEFINES SOLID WASTES, AND GENERALLY REGULATES SOLID WASTE MANAGEMENT SYSTEMS.

TECHNICAL ASSISTANCE AND CONTROL OF THE MUNICIPAL SOLID WASTE MANAGEMENT SYSTEMS IS THE RESPONSIBILITY OF THE DIRECTORATE FOR MUNICIPAL TECHNICAL ASSISTANCE OF THE GOVERNMENT AND JUSTICE MINISTRY AND OF THE PUBLIC HEALTH AND SOCIAL ASSISTANCE MINISTRY. THE FIRST AGENCY IS CONCERNED PRIMARILY WITH THE PROPER ADMINISTRATION OF THE SYSTEMS, AND TO THIS EFFECT OFFERS SEMINARS AND SHORT COURSES TO PUBLIC OFFICIALS. THE SECOND AGENCY, THROUGH ITS DIRECTORATE FOR ENVIRONMENTAL SANITATION, HAS AS ITS RESPONSIBILITIES: THE ADMINISTRATION OF PROGRAMS AND PROJECTS; PARTICIPATION IN THE HEALTH PLANNING PROCESS; OBTAIN FUNDS FOR SPECIFIC PROJECTS; PREPARE CRITERIA AND REGULATE ENVIRONMENTAL MATTERS, AND COLLABORATE IN THE SELECTION AND TRAINING OF PERSONNEL. THE HEALTH REGIONS ARE CHARGED WITH PERFORMING SPECIFIC FUNCTIONS TO IMPLEMENT THE ABOVE RESPONSIBILITIES, DIRECTING AND COORDINATING THE FIELD WORK, AND PARTICIPATING IN THE PLANNING FOR THEIR SPECIFIC AREAS.

ALTHOUGH THE ABOVE SEEMS LIKE A REASONABLE ORGANIZATION, (DEL CID ET AL 1980) INDICATE THAT ALTHOUGH THE STRUCTURE EXISTS, THE OPERATING FUNCTIONS ARE NOT WELL DEFINED, MAKING DIFFICULT THE ACTUAL OPERATIONAL ACTIVITIES. THIS IS PARTICULARLY TRUE IN THE CASE OF THE PUBLIC HEALTH MINISTRY.

FINANCING OF MUNICIPAL SOLID WASTE MANAGEMENT SYSTEMS IS THE FUNCTION OF THE MUNICIPAL AUTONOMOUS BANK. THIS INSTITUTION PROVIDES FINANCING OF ACTIVITIES THAT CONTRIBUTE TO MUNICIPAL DEVELOPMENT AND ALSO PROVIDES TECHNICAL REVISION OF ALL PROJECTS FOR WHICH IT IS REQUESTED FUNDING. PART OF THE BANK'S FINANCING COMES FROM THE MUNICIPALITIES THEMSELVES, SINCE THEY MUST DO THEIR BANKING AT THIS INSTITUTION. IT ALSO OBTAINS LOANS FROM EXTERNAL SOURCES FOR ALL TYPES OF MUNICIPAL PUBLIC WORKS. THE BANK IS ASSOCIATED WITH THE EXECUTIVE BRANCH THROUGH THE GOVERNMENT AND JUSTICE MINISTRY, WHOSE SECRETARY PARTICIPATES IN INSTITUTIONAL POLICY MAKING.

THE LARGEST AND BEST ORGANIZED AND OPERATED SOLID WASTE MANAGEMENT SYSTEM IN THE COUNTRY IS THE ONE AT TEGUCIGALPA. IT IS THE RESPONSIBILITY OF THE CLEANING DEPARTMENT OF THE INFRASTRUCTURE DIVISION, WHICH IN ITSELF IS A PART OF THE METROPOLITAN COUNCIL OF THE CENTRAL DISTRICT. THE ORGANIZATIONAL CHART

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IS SHOWN AS FIGURE 2. THE OBJECTIVE OF THE DEPARTMENT IS THE COLLECTION, TRANSPORTATION AND FINAL DISPOSAL OF THE SOLID WASTES GENERATED IN TEGUCIGALPA, THE CLEANING OF ITS STREETS AND PARKS. (CMDC, 1980). IT DOES NOT HAVE A CLEARLY DEFINED LEGAL BASIS, AND OPERATES FROM A VARIETY OF ORDINANCES AND GENERAL REFERENCES FROM THE LAWS PREVIOUSLY MENTIONED. ONE OF THESE ORDINANCES IS THE PEDESTRIAN ZONE REGULATIONS, APPROVED ON DECEMBER 17, 1979 BY THE COUNCIL. THE RELEVANT ARTICLES ARE ARTICLES 3, 14, 15 AND 20, WHICH SET RESPONSIBILITIES AND HOURS OF OPERATION. ANOTHER ORDINANCE, APPROVED ON OCTOBER 25, 1976 SETS RESPONSIBILITIES AND FIXES PENALTIES FOR OTHER AREAS OF THE CITY.

AS AN OPERATIONAL BRANCH OF THE INFRASTRUCTURE DIVISION, THE CLEANING DEPARTMENT NEEDS ADMINISTRATIVE SUPPORT FROM OTHER UNITS OF THE COUNCIL. ITS OWN OPERATIONAL BUDGET FOR 1980 WAS ESTIMATED AS \$1,153,600, (CMDC, 1980) WHICH IS EQUIVALENT TO \$2.6 PER CAPITA PER YEAR. IT IS HEADED BY AN ENGINEER WHO IS IN CHARGE OF BOTH OPERATIONAL AND TECHNICAL MATTERS. THIS ENGINEER HAS AN ASSISTANT. THE NEXT LEVEL IS OCCUPIED BY THE HEAD OF CLEANING, WHO HAS DIRECT RESPONSIBILITY FOR THE OPERATION. HE SUPERVISES THE DRIVERS AND THE OPERATORS, SINCE THERE IS NO INTERMEDIATE MANAGEMENT LEVEL. OVERALL, THE DEPARTMENT HAD IN EARLY 1980 A TOTAL OF 343 EMPLOYEES, OF WHICH 133 WERE INVOLVED IN GARBAGE COLLECTION, 189 IN STREET SWEEPING, 8 IN THE SANITARY LANDFILL AND 20 IN OTHER ACTIVITIES. CHARGES FOR GARBAGE COLLECTING ARE BASED ON THE ASSESSED VALUE OF THE PROPERTY TIMES 0.001488, WITH A MINIMUM OF \$12 AND A MAXIMUM OF \$60. THE DEPARTMENT HAS NO FORMAL TRAINING PROGRAMS, AND RECEIVES TECHNICAL ASSISTANCE FROM THE LOCAL PANAMERICAN HEALTH ORGANIZATION OFFICE.

4. AIR POLLUTION:

THERE ARE NO LAWS OR REGULATION CONCERNING AIR POLLUTION IN HONDURAS. A PROPOSED LAW WAS SUBMITTED TO THE COUNCIL OF MINISTERS RECENTLY BUT IT WAS NOT CONSIDERED DUE TO ITS TECHNICAL COMPLEXITY. A NEW DRAFT IS BEING PREPARED TO GIVE RENARE GENERAL JURISDICTION ON THE ISSUE WITH THE INTEND OF PREPARING A DETAILED SET OF REGULATIONS AFTERWARDS. RENARE IS THE ONLY AGENCY THAT IS CURRENTLY TAKING AIR POLLUTION MEASUREMENTS, USING VERY SIMPLE INSTRUMENTS AND PROCEDURES.

5. TRAINING CAPABILITIES IN SANITARY ENGINEERING:

THE UNIVERSIDAD NACIONAL AUTONOMA DE HONDURAS OFFERS A SIX YEAR, APPROXIMATELY 260 CREDIT PROGRAM LEADING TO THE BACHELORS DEGREE IN CIVIL ENGINEERING. BESIDES INCLUDING THE USUAL CIVIL ENGINEERING COURSES, THIS CURRICULUM INCLUDES A TWO SANITARY ENGINEERING COURSES, ONE IN POTABLE WATER TREATMENT AND DISTRIBUTION AND ANOTHER ONE IN THE DESIGN OF PHYSICAL FACILITIES IN SEWER SYSTEMS. THIS IS SUFFICIENT FOR A CIVIL ENGINEER, BUT NOT ENOUGH TO ACQUIRE THE SPECIALIZED KNOWLEDGE REQUIRED TO DESIGN AND OPERATE THE WATER AND WASTEWATER PLANTS THAT WILL BE NEEDED IN THE FUTURE.

GRADUATE TRAINING IN SANITARY ENGINEERING IS NOT AVAILABLE IN HONDURAS. HOWEVER, ENGINEERS RECEIVE THE TRAINING AT UNIVERSITIES IN THE UNITED STATES, MEXICO OR BRAZIL.

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AN EXCELLENT SOURCE OF TRAINING IS THE PAN AMERICAN HEALTH ORGANIZATION THROUGH ITS SHORT COURSES HELD AT CENTRO PANAMERICANO DE INGENIERIA SANITARIA (CEPIS) OR AT SPECIFIC COUNTRIES. A REGULAR PROGRAM IS AVAILABLE AND SPECIAL COURSES CAN BE DESIGNED AND OFFERED. THESE COURSES COVER MAINLY THE FIELDS OF WATER SUPPLY AND SOLID WASTE MANAGEMENT.

APPARENTLY NO CAPABILITY EXISTS TO GIVE SHORT COURSES IN SANITARY ENGINEERING IN HONDURAS. IT IS RECOMMENDED THAT SUCH A CAPABILITY BE DEVELOPED, DRAWING UPON THE UNIVERSITY, SANAA AND CEPIS OR A FOREIGN UNIVERSITY.

6. PRINCIPAL PROBLEMS AND THEIR HEALTH CONSEQUENCES.

6.1 WATER SUPPLIES AND EXCREMENT HANDLING

HUMAN EXCREMENT DISPOSAL IS THE WORST ENVIRONMENTAL PROBLEM FACING HONDURAS TODAY. AS STATED IN THE NATIONAL HEALTH PLAN.: (CONSUPLANE, 1979)

"HEALTH CONDITIONS ARE AMONG THE WORST AMONG THE 22 LATINAMERICAN AND CARIBBEAN COUNTRIES. THE COUNTRY HAS THE THIRD WORST GENERAL MORTALITY RATE (11.81/1000) AND THE THIRD WORST INFANT MORTALITY RATE (98.52/1000 LIVE BIRTHS)".

"... WATERBORNE DISEASES CONTINUE TO BE THE MOST IMPORTANT CAUSE OF DEATH"

THESE STATISTICS ARE MORE SIGNIFICANT WHEN DIVIDED BETWEEN THE URBAN AND RURAL AREAS:

	URBAN	RURAL
GENERAL MORTALITY	9.0	16.5
INFANT MORTALITY	85.6	127.2

THESE FIGURES ROUGHLY CORRELATE WITH THE FIGURES FOR URBAN AND RURAL SANITATION AND WATER SUPPLY THAT ARE GIVEN BELOW. AS A CAUSE OF DEATH, WATERBORNE DISEASES ACCOUNTED FOR 12.4% IN 1972 AND 13.2% IN 1976, INDICATING ROUGHLY NO IMPROVEMENT.

THE ABOVE NUMBERS ONLY GIVE A DESKTOP VIEW OF THE SITUATION. FIGURE 3 SHOWS A MAN AT ONE OF THE MARGINAL AREAS OF TEGUCIGALPA, BARRIO CHILE, TAKING A BATH IN A SEWAGE DITCH. THE DISCHARGE FROM THE BROKEN MAIN SEWER OF THE CITY IS SHOWN IN FIGURE 4, AND AT ABOUT 200 METERS DOWNSTREAM IS SHOWN SAND EXTRACTION (FIGURE 5) FOR USE IN THE CITY. IN BARRIO CHILE THE SEWAGE FLOWS FREELY IN OPEN DITCHES, AS SHOWN IN FIGURE 5. THE CHILD IN THE PICTURE WAS OBSERVED PLAYING IN THE WATER IMMEDIATELY AFTER THE PICTURE WAS TAKEN. AVAILABLE INFORMATION INDICATES THAT THE SITUATION IS SIMILAR IN OTHER MARGINAL AREAS OF THE CITY.

IN 1978 THE WATER SUPPLY COVERAGE WAS CALCULATED AS 51.2% FOR THE ENTIRE COUNTRY, INCLUDING 91.3% OF THE URBAN AREA AND 30.3% OF THE RURAL SECTOR. IT WAS ESTIMATED THAT 26.6% OF THE POPULATION HAD DOMESTIC CONNECTION, 51.9% IN THE URBAN AREA AND 13.4% IN THE RURAL. APPROXIMATELY 43.5% OF THE URBAN POPULATION HAS SANITARY SERVICES AND ONLY 0.1% OF THE RURAL HAD THEM. SANITARY LATRINE USAGE IS 18.3% OF THE RURAL POPULATION AND 6.2% OF THE URBAN AND MARGINAL ZONE RESIDENTS.

IN 1979 (CONSULANE-SAN 1979) SANAA WAS IN CHARGE OF 102 AQUEDUCTS AND THE SEWER SYSTEM OF TEGUCIGALPA. THE MUNICIPALITIES WERE OPERATING ABOUT 460 AQUEDUCTS AND 33 SEWER SYSTEMS. THERE SEEMS TO BE A FEW SEWAGE TREATMENT PLANTS, LOCATED AT SCATTERED URBAN DEVELOPMENTS. IT WAS POSSIBLE TO LOCATE ONE ON THE OUTSKIRTS OF SAN PEDRO SULA ON THE ROAD TO PUERTO CORTES. ALTHOUGH AN ATTEMPT WAS BEING MADE TO OPERATE THE PLANT PROPERLY (TRICKLE FILTER), IT WAS PRODUCING AN EFFLUENT OF VERY POOR QUALITY. THIS WAS DUE TO THE TOTAL ABSENCE OF A SECONDARY CLARIFIER. WITHOUT THIS TANK IT IS IMPOSSIBLE TO OBTAIN AN EFFLUENT OF EVEN MARGINAL QUALITY. THE FACT THAT THIS PLANT WAS BUILT, AND CONTINUES TO BE OPERATED WITH SUCH A GROSS TECHNICAL ERROR GIVES AN INDICATION OF THE SANITARY ENGINEERING EXPERTISE AVAILABLE.

THE QUALITY OF THE WATER SUPPLY SYSTEM LEAVES SOMETHING TO BE DESIRED. ACCORDING TO CONSULANE, IN 1978 THE SERVICE HAS DEFICIENCIES SUCH AS HIGH TURBIDITY AND COLIFORM COUNTS, UNRELIABILITY OF SERVICE, AND LOW PRESSURE. THE CAUSE OF THESE DEFICIENCIES IS THAT THE MAJORITY OF THE SYSTEMS DO NOT HAVE ANY TREATMENT AND DESINFECTION IS DONE ONLY IN SOME OF THE MAJOR CITIES. OPERATION AND MAINTENANCE PRACTICES ARE NOT MODERN AND VERY FEW OPERATORS HAVE ANY TRAINING. FINALLY, A SIGNIFICANT NUMBER OF AQUEDUCTS ARE OPERATED BEYOND THEIR DESIGN CAPACITY, A VERY PRECARIOUS CONDITION.

THE SITUATION OF THE FEW EXISTING SEWER SYSTEMS IS SOMEWHAT SIMILAR, ALTHOUGH PERHAPS WORSE, SINCE OUTSIDE OF TEGUCIGALPA VERY FEW MUNICIPALITIES HAVE THE REQUIRED ENGINEERING STAFF TO PROPERLY MAINTAIN THE SEWERS.

THE ABOVE SITUATION INDICATES A GRIM PICTURE OF WHICH CONSULANE AND SANAA ARE AWARE. TABLE 3 PRESENTS THE PLANNING GOALS FOR THE NEXT DECADE IN WATER SUPPLY AND EXCREMENT DISPOSAL. THESE GOALS ARE HIGHLY AMBITIOUS AND WILL REQUIRE A CONSIDERABLE INFUSION OF CAPITAL, MOST LIKELY FROM EXTERNAL SOURCES. IT IS PROJECTED THAT THE TOTAL INVESTMENT FOR THE PERIOD 1979-1983 WILL BE \$84 MILLION OF WHICH \$48.4 MILLION ARE EXPECTED FROM EXTERNAL SOURCES AND \$35.6 MILLION FROM LOCAL FUNDS. IF THE EXPENSES ARE ESTIMATED UP TO 1990, AN ADDITIONAL AMOUNT OF \$68.5 MILLION ARE REQUIRED. PREVIOUS EXPERIENCE WITH EXTERNAL FINANCING HAS BEEN GOOD, REACHING 50.4% OF THE TOTAL DURING THE PERIOD 1974-78. IT IS EXPECTED THAT IT WILL GO UP TO 57% FOR THE 1979-83 PERIOD.

THE CURRENT INSTITUTIONAL ARRANGEMENT COULD BE IMPROVED. SANAA SEEMS TO BE A REASONABLY GOOD ORGANIZATION, BUT IT IS NOW HANDLING ONLY A SMALL PART OF THE AQUEDUCTS AND ONLY THE TEGUCIGALPA SEWER SYSTEM. THE MUNICIPALITIES, WITH THE EXCEPTION OF SAN PEDRO SULA, DO NOT HAVE THE ENGINEERING AND TECHNICAL EXPERTISE TO PROPERLY OPERATE AND MAINTAIN THEIR WATER AND SEWAGE SYSTEMS. THE

WORK BY THE MSP HAS BEEN MOSTLY IN BUILDING SMALL AQUEDUCTS AND THE SANITARY LATRINE PROGRAM. IN VIEW OF THIS DILUTION OF EFFORT, IT IS RECOMMENDED THAT CONSIDERATION BE GIVEN TO HAVING JUST ONE AGENCY, SANAA, RESPONSIBLE FOR ALL WATER AND WASTEWATER MATTERS IN THE COUNTRY. THIS WOULD REQUIRE THE TRANSFERING OF PERSONNEL FROM OTHER AGENCIES AND AN ASSIGNMENT OF STAFF, BUT WOULD PROVIDE FOR A MORE COORDINATED EFFORT IN THE IMPROVEMENT OF PUBLIC HEALTH.

6.1.1. CASE HISTORY IN WASTEWATER TREATMENT: TEGUCIGALPA

AS PREVIOUSLY INDICATED, THE UNTREATED WASTEWATER FROM TEGUCIGALPA ARE DISCHARGED TO THE CHOLUTECA RIVER IN THE VICINITY OF BARRIO CHILE. A VISIT INDICATED THAT THE PIPELINE IS BROKEN IN MANY PLACES AS IT GOES ALONG THE RIVER. THE WASTEWATER COMING OUT WAS OBSERVED TO HAVE A GREENISH COLOR. THERE ARE INDICATION OF SOME INDUSTRIAL DISCHARGES INTO THE SEWER, INCLUDING TEXTILE FACTORIES AND A CHEMICAL INDUSTRY.

IN VIEW OF THE ABOVE SITUATION, A WASTEWATER TREATMENT PLANT IS BEING RECOMMENDED FOR THE CITY IN THE MASTER PLAN. INFORMATION OBTAINED AT THE MASTER PLAN PROJECT OFFICE INDICATES THAT TWO PLANTS ARE PLANNED, ONE TO BE LOCATED 2.5 KMS. FROM THE URBAN LIMITS ON THE CHOLUTECA RIVER AND A SECOND ONE TO BE BUILD NEAR THE CONFLUENCE OF CHOLUTECA AND SAN JOSE RIVERS. PLANT NO. 1 WILL HANDLE UP TO 75% OF THE 2010 FLOW AND PLANT NO. 2 WILL HANDLE THE OTHER 25%. THE FIRST STAGE OF PLANT NO. 1 WAS PLANNED FOR ABOUT 1985, BUT DUE TO THE HIGH INVESTMENT REQUIRED, THIS DATE WILL BE POSTPONED. PLANT NO.2 IS PLANNED BY 2005. THE COMMENTS THAT FOLLOW CONCERN PLANT NO. 1 UNLESS OTHERWISE NOTED.

THE PLANT WILL CONSIST OF 4 MODULES, 2 SCHEDULED FOR 1985 AND THE OTHERS FOR 1995 AND 2000. DESIGN FLOWS ARE (M³/D):

1980	112,348
1990	202,757
2000	317,248
2010	599,486

THE DESIGN EFFLUENT BOD IS 25MG/L AND THE SS ARE 10MG/L. THE RECOMMENDED TREATMENT SYSTEM IS A CARROUSEL TYPE ACTIVATED SLUDGE SYSTEM PRECEDED BY SERVICES AND A GRIT CHAMBER. NO DESINFECTATION IS CONTEMPLATED. SLUDGE HANDLING IS TO BE DONE BY AEROBIC DIGESTION, A THICKENER AND THEN A COMBINATION OF DRYING BEDS AND A FILTER PRESS.

THE COST OF THE TREATMENT, INCLUDING BOTH PLANTS, IS AS FOLLOWS:

1980-1990	\$31,464,400
1990-2000	16,942,650
2000-2010	34,722,250
	83,129,300

BASED ON THE AVAILABLE INFORMATION, WHICH IS OF NECESSITY INCOMPLETE, IT IS NOT BELIEVED THAT SUCH AN INVESTMENT HAS BEEN PROPERLY JUSTIFIED. THE REASONS ARE AS FOLLOWS:

A. A SECONDARY PLANT IS DESIGNED MAINLY TO REMOVE OXYGEN DEMANDING SUBSTANCES FROM SEWAGE IN ORDER TO PREVENT LOW DISSOLVED OXYGEN VALUES IN THE RECEIVING WATER. THIS IS NECESSARY FOR THE PRESERVATION OF HIGHER FORMS OF AQUATIC LIFE. IT HAS NOT BEEN SHOWN THAT THIS IS THE DESIRED USE OF THE CHOLUTECA RIVER.

B. THE ACTUAL CONDITION OF THE RECEIVING WATER HAS NOT BEEN DETERMINED. A SAMPLING PROGRAM WAS INITIATED BUT RESULTS WERE NOT RELIABLE. WITHOUT KNOWLEDGE OF EXISTING QUALITY OR GOAL FOR FUTURE QUALITY, IT IS NOT POSSIBLE TO ESTABLISH WATER TREATMENT CRITERIA.

C. THE SEWAGE HAS NOT BEEN PROPERLY CHARACTERIZED. AGAIN, A SAMPLING PROGRAM FAILED TO YIELD RELIABLE RESULTS. FOR EXAMPLE DATA INDICATED A COD RANGE OF 0.4 TO 0.6 MG/L (AN ACCEPTABLE RANGE WOULD HAVE BEEN 500-1000 MG/L). EVEN WITH THESE HIGHLY UNRELIABLE DATA, SOME TOTALLY ARTIFICIAL ASSUMPTIONS APPARENTLY WERE MADE TO OBTAIN INFLUENT DESIGN DATA.

D. NO DESINFECTION IS PROVIDED. THIS PLANT WILL THEREFORE NOT PROTECT THE HEALTH OF THE PEOPLE WHO USE THE RIVER DOWNSTREAM.

E. THREE ALTERNATIVES WERE CONSIDERED, ALL VARIATIONS OF THE ACTIVATED SLUDGE PROCESS. EVEN ASSUMING THAT SECONDARY TREATMENT WAS NECESSARY, SIMPLER AND CHEAPER PROCESSES SUCH AS TRICKLING FILTERS AND PONDS SHOULD HAVE BEEN ANALYZED. THE ACTIVATED SLUDGE PROCESS IS HIGHLY EFFICIENT, BUT REQUIRES VERY SPECIALIZED OPERATIONAL KNOWLEDGE THAT IS NOT PRESENTLY AVAILABLE IN THE COUNTRY AND HUGE AMOUNTS OF ENERGY. IT IS ESTIMATED THAT PLANT NO. 1 WILL REQUIRE 5010 KVA BY 2000 AND PLANT NO. 2 AN ADDITIONAL 2250 KVA. EVEN WITH CHEAP ELECTRICITY FROM EL CAJON AVAILABLE, THIS REPRESENTS A VERY LARGE OPERATIONAL EXPENSE (ROUGHLY \$4.2 MILLION/YR IF ELECTRICITY COSTS \$0.05/KW-HR).

IT IS RECOMMENDED THAT BEFORE ANY MORE MONEY IS INVESTED IN THIS PROJECT A DETAILED REVIEW BE MADE OF THE PLANNING LOGIC IN VIEW OF THE ABOVE COMMENTS AND OTHERS THAT MIGHT EMERGE FROM SUCH A REVIEW.

6.2. SOLID WASTE MANAGEMENT

A. CURRENT SITUATION IN THE COUNTRY.

THE BEST AVAILABLE DATA ON SOLID WASTE MANAGEMENT SYSTEMS IN HONDURAS PRESENTS A SITUATION OF REASONABLE COVERAGE AND COLLECTION BUT OF POOR FINAL DISPOSAL PRACTICES. TABLE 4 SHOWS THE AMOUNTS OF SOLID WASTES GENERATED IN 1979 AND THE URBAN COVERAGE OF THE COLLECTION SYSTEMS. A CONSIDERABLE DISPERSION OF THE DATA EXISTS, AND THE SOURCES (DEL CID 1980) STATES THAT IT IS POSSIBLE THAT THE COVERAGE AND THE AMOUNTS ARE NOT PROPERLY ESTIMATED. PERHAPS THE BEST FIGURES ARE THOSE FOR TEGUCIGALPA AND SAN PEDRO SULA, WHICH HAVE BETTER TECHNICAL STAFFS. THE PER CAPITA GENERATION IS LOW

COMPARED WITH THE UNITED STATES (2.2 KG/PLD) BUT THIS CAN BE EXPLAINED BY THE LOWER LEVEL OF DEVELOPMENT AND IN PARTICULAR BY THE MINOR USE OF NON RETURNABLE CONTAINERS AND FANCY PACKAGING IN HONDURAS. THE RELATIVELY LOW COVERAGE IN TEGUCIGALPA IS DUE TO THE EXTREMELY DIFFICULT TASK OF PROVIDING COLLECTION IN THE ECONOMICALLY MARGINAL AREAS OF THE CITY, WHERE THE CROWDING AND STEEP SLOPES MAKES IT ALMOST IMPOSSIBLE TO USE MECHANICAL EQUIPMENT.

THE ONLY COMPOSITION DATA AVAILABLE IS FOR TEGUCIGALPA, AND IS SHOWN IN TABLE 5. THIS FIGURES ARE TYPICAL OF LATINAMERICAN CITIES WHICH USE RETURNABLE GLASS CONTAINERS FOR MOST OF THEIR BEVERAGES AND DO NOT HAVE THE FANCY PACKAGING OF MORE DEVELOPED COUNTRIES. THE FIGURES GIVEN TEND TO INDICATE THAT DUE TO ITS PROBABLE LOW HEATING VALUE (THE ORGANIC MATTER IS MOSTLY HUMID FOOD WASTES) CONTROLLED INCINERATION FOR ENERGY PRODUCTION IS NOT A FEASIBLE ALTERNATIVE FOR FINAL DISPOSAL. THE SAME REASON ALSO RULES OUT PYROLYSIS. HOWEVER, COMPOST PRODUCED FROM THIS GARBAGE IS LIKELY TO HAVE A BETTER NUTRIENT CONTENT THAN IN THE UNITED STATES. THIS WOULD FAVOR THIS ALTERNATIVE FROM A PURELY TECHNICAL STANDPOINT, WITH THE ECONOMICS REMAINING TO BE WORKED OUT.

DATA FROM 1979 FOR TEGUCIGALPA AND SAN PEDRO SULA INDICATES THE USE OF VARIOUS TYPES OF CONTAINERS FOR AT SITE STORAGE OF WASTES. THESE RESULTS ARE SHOWN IN TABLE 6 AND INDICATE A WIDE VARIATION BETWEEN THE TWO CITIES. WHILE 80% OF THE PEOPLE IN SAN PEDRO USE THE 200 LITER (55 GALLON) DRUM, ITS USE IS REDUCED TO 13% IN THE CAPITAL. TO AN EXTENT THIS IS A FUNCTION BOTH OF THE TOPOGRAPHY AND OF THE TYPE OF VEHICLES USED. WHILE TEGUCIGALPA USES MAINLY CONVENTIONAL COMPACTOR TRUCKS, SAN PEDRO SULA IS MAINLY DEPENDENT ON OPEN TRUCKS (SEE TABLE 7) WHICH FACILITATE THE USE OF THE HEAVY 200 LITER DRUMS. THESE DRUMS ARE ALSO HARDER TO HANDLE IN THE STEEP SLOPES OF TEGUCIGALPA. THE LARGER VOLUME DRUMS ARE ALSO REQUIRED DUE TO THE LESS FREQUENT COLLECTION IN SAN PEDRO SULA (ONCE PER WEEK, AS OPPOSED TO THREE TIMES PER WEEK). ALTHOUGH THE USE OF PLASTIC BAGS FACILITATES THE COLLECTION, ITS USE MUST BE CONSIDERED IN TERMS OF THEIR NON-BIODEGRADABILITY AND THE POSSIBLE LONG RANGE EFFECTS ON THE SANITARY LANDFILL OF THE CITY. THE OTHER DISADVANTAGE OF PLASTIC BAGS, MAINLY ITS VULNERABILITY TO ATTACK BY DOGS AND STRAY ANIMALS, IS NOT A FACTOR IN TEGUCIGALPA, WHERE THE BAG IS TAKEN OUT IN THE SIDEWALK JUST BEFORE THE TRUCK COMES IN FOR THE PICKUP.

GARBAGE COLLECTION IS DONE USING A VARIETY OF VEHICLES, AS SHOWN IN TABLE 7. VISITS TO SEVERAL CITIES INDICATED THAT THE ONLY WORKING COMPACTOR TRUCKS WERE THOSE OF TEGUCIGALPA. SAN PEDRO SULA IS USING MAINLY OPEN TRUCKS WHICH ARE UNDER CONTRACT WITH THE MUNICIPALITY TO PICK UP THE GARBAGE AT SPECIFIC AREAS. AT COMAYAGUA THE USE OF A DUMP TRUCK WAS OBSERVED, WITH A SIGNIFICANT SCATTERING OF PAPERS AND LIGHT GARBAGE BY THE WIND. SINCE THESE VEHICLES ARE NOT USUALLY COVERED ON THE WAY TO THE DISPOSAL SITE, THEIR MAIN PROBLEM IS THAT A SIGNIFICANT AMOUNT OF THE GARBAGE IS LOST ALONG THE WAY.

AS OPPOSED TO SOME LATIN AMERICAN CITIES (BOGOTA OR MEXICO FOR EXAMPLE), THERE DOES NOT SEEM TO BE AN APPRECIABLE SEPARATION AND RECYCLE OF THE GARBAGE. THIS DOES NOT HAPPEN IN NEITHER THE COLLECTION OR FINAL DISPOSAL PHASES. WITH THE EXCEPTION OF TEGUCIGALPA, WHICH OPERATES A REASONABLE SANITARY LANDFILL, SHOWN IN FIGURE 7, THE FINAL DISPOSAL METHOD USED IS OPEN DUMP BURNING. THE DUMP AT

SAN PEDRO SULA WAS BURNING DURING A SITE VISIT AND THERE WERE A LARGE NUMBER OF VULTURES AND FLIES AROUND. AT THE SAME TIME, SOME CHILDREN WERE SEPARATING A FEW THINGS FROM THE GARBAGE BEFORE ITS BURNING. FIGURE 8 SHOWS THIS DUMP AS SEEN FROM ITS ENTRANCE. WITHOUT QUESTION THIS DUMP IS A HEALTH HAZARD. AT LA CEIBA THE DUMP WAS NOT BURNING, BUT THE VULTURES AND FLIES WERE ALSO PRESENT IN LARGE NUMBERS. THIS DUMP HAD AN INORDINATE AMOUNT OF PUTRESCIBLE MATTER WHICH CREATED A SIGNIFICANT STINK. FORTUNATELY, IT IS LOCATED AT A SIGNIFICANT DISTANCE FROM THE CITY IN A SCARCELY POPULATED AREA. IT IS ALSO VERY SMALL, SINCE ITS SIZE IS CONTROLLED BY THE FLOODING OF THE ADJACENT RIVER. AT THE TIME OF THE VISIT, A FLOOD HAD OCCURED RECENTLY AND HAD WASHED AWAY MOST OF THE GARBAGE. THIS OPEN DUMP BURNING METHOD IS ALSO USED AT RDATAN, PART OF THE BIGGEST TOURIST COMPLEX IN THE COUNTRY. HOWEVER, DUE TO THE SMALL SIZE OF THE POPULATION AND WHAT APPEARED TO BE FREQUENT BURNING, THERE WERE NO ANIMALS AT THE SITE.

AS OBSERVED, THE GENERAL SOLID WASTE SITUATION IN THE COUNTRY CAN BE SUMMARIZED AS FOLLOWS: GARBAGE IS GENERALLY STORED REASONABLY WELL AT THE POINT OF ORIGIN AND IT GETS PICKED UP WITH ADEQUATE FREQUENCY. HOWEVER, TRANSPORTATION IN OPEN TRUCKS SCATTERS SOME OF IT, AND FINAL DISPOSAL (EXCEPT AT TEGUCIGALPA) CONSTITUTES A HEALTH HAZARD AND AN AIR POLLUTION SOURCE.

B. CURRENT SITUATION IN TEGUCIGALPA:

THE CAPITAL CITY HAS A WELL RUN SOLID WASTE MANAGEMENT SYSTEM. SOME OF ITS TECHNICAL CHARACTERISTICS ARE AS FOLLOWS, (CMDC 1980).

THE RESIDENTIAL GARBAGE CONTRIBUTION WAS ESTIMATED IN 1980 AS 27 TONS/D FROM THE UPPER ECONOMIC CLASS, 95.6 FROM THE MIDDLE CLASS, AND 67.6 FROM THE LOWER CLASS, FOR A TOTAL OF 190.2 TONS/DAY. ITS COMPOSITION IS AS PREVIOUSLY SHOWN IN TABLE 5. IN ITS RESIDENTIAL CONTAINERS THE SPECIFIC WEIGHT OF THE GARBAGE IS 179 KG/M³, OR A COMPACTION RATIO OF 2.3. THIS IS HIGHER THAN THE GENERAL VALUE OF 2 OBTAINED IN THE UNITED STATES DUE TO THE LARGE AMOUNT OF EASILY COMPACTED FOOD WASTES. BASED ON THIS FIGURE AND OTHER AVAILABLE DATA, IT IS CONCLUDED (CMDC 1980), THAT THE 15.3 M³ VEHICLES ARE BEING USED AT CLOSE TO 100% CAPACITY, THE 12.2 M³ AT 88% AND THE 9.9 M³ AT 123%.

AS PREVIOUSLY INDICATED IN TABLE 6, A VARIETY OF RESIDENTIAL CONTAINERS ARE USED. OF THESE, ONLY 20% HAVE A LID. PROBLEMS EXISTS AT THE MARKETS, WHERE THE GARBAGE IS SIMPLY DUMPED ON THE GROUND AND IT MUST BE SHOVELED TO THE TRUCKS. THE PROCEDURE FOR RESIDENTIAL COLLECTION IS FOR THE TRUCK TO GO BY THE STREET RINGING A BELL FOR THE HOMEOWNERS TO TAKE THE GARBAGE OUT AND THEN COMING AROUND TO PICK IT UP WITH TWO 2-MAN CREWS. THIS SYSTEM WORKS BECAUSE THE CLEANING DEPARTMENT IS APPARENTLY DEPENDABLE IN SHOWING UP AT ABOUT THE SAME TIME ON EACH PICKUP DAY AT EACH LOCATION. THE COLLECTION ROUTES, ALTHOUGH THEY HAVE CHANGED VERY LITTLE IN QUITE SOME TIME, ARE DOCUMENTED UP TO THE MACRO LEVEL. COMMERCIAL ROUTES ARE DOCUMENTED AT THE MICRO LEVEL. ON THE AVERAGE, EACH CREW HANDLES TWO ROUTES PER DAY AND EACH VEHICLE RUNS 1670 KM/MONTH.

STREET SWEEPING OF THE CENTRAL PAVED AREA AND THE PRINCIPAL AVENUES IS DONE DAILY, SOME DURING THE DAY AND SOME AT NIGHT, USING 318 SWEEPERS AND ONE WORKING MECHANICAL SWEEPER. AVERAGE DISTANCE PER SWEEPER IS 1.11 KMS PER 8 HOUR DAY, WHILE THE MECHANICAL SWEEPER CAN DO 32 KMS. THE MATERIAL COLLECTED IS TAKEN TO 20 LARGE CONTAINERS OF 2.5 M3 EACH AND FROM THERE TAKEN TO THE SANITARY LANDFILL.

THE CITY'S SANITARY LANDFILL IS LOCATED 6.5 KMS. FROM THE CITY LIMITS ON THE ROAD TO OLANCHO. IT HAS A SURFACE OF 33 HA., OF WHICH APPROXIMATELY 5 HAVE BEEN USED SINCE ITS INAUGURATION AT THE BEGINNING OF 1978. THE TERRAIN IS HILLY AND THE COVER MATERIAL IS EXTRACTED BY CUT. THE AREA METHOD IS USED IN TWO AREAS, ONE FOR THE WET SEASON AND ANOTHER ONE FOR THE DRY SEASON. DURING A SITE VISIT IT WAS OBSERVED THAT SOME OF THE MECHANICAL EQUIPMENT WAS OUT OF SERVICE AND THAT UNCOVERED GARBAGE WAS LAYING ON THE GROUND. THIS IS NOT THE NORMAL SITUATION, AS EVIDENCED BY THE SMALL AMOUNT INVOLVED. THERE WERE A FEW PERSONS SCAVENGING AND SOME VULTURES AND FLIES. IN ONE SECTION OF THE LANDFILL A SMALL FIRE WAS GOING ON. IT WAS EXPLAINED THAT THE TIRES AND WOOD SHAVINGS WERE BURNED AT THE SURFACE RATHER THAN BEING BURIED AND THEN CATCHING FIRE, WHICH WOULD BE WORSE. THE LANDFILL IS MISSING A PORTABLE FENCE FOR PREVENTING THE WIND FROM BLOWING LIGHT GARBAGE AND NO PROTECTIVE CLOTHING OR SANITARY FACILITIES ARE PROVIDED FOR THE EMPLOYEES. IT SEEMS THAT SOME METHANE IS BEGINNING TO BE PRODUCED IN THE AREAS THAT WERE LANDFILLED FIRST, INDICATING ANAEROBIC ACTIVITY.

AS STATED INITIALLY, AND IN SPITE OF THE ABOVE MENTIONED MINOR FAULTS, THE SYSTEM OPERATES SATISFACTORILY. THIS IS PARTICULARLY TRUE WHEN IT IS COMPARED TO OTHER FACILITIES, IN PARTICULAR THE DUMP AT SAN PEDRO SULA.

6.3 AIR POLLUTION

THERE IS NO DATA AVAILABLE ON THE HEALTH CONSEQUENCES OF AIR POLLUTION OR ON ITS EFFECT ON PLANTS AND ANIMALS. NO PRECISE AIR QUALITY MEASUREMENTS ARE MADE. RENARE IS NOW BEGINNING TO TAKE SIMPLE MEASUREMENTS OF SETTLEABLE PARTICLES IN THE TEGUCIGALPA AREA, IS PLANNING TO MEASURE SULPHUR COMPOUNDS USING SIMPLE INSTRUMENTS, AND HAS A PLANNED PROGRAM FOR INSPECTING VISUAL EMISSIONS FROM INDUSTRY, (GEIGER 1980). HOWEVER, THERE ARE SOME INDICATIONS OF PROBLEMS IN SPECIFIC GEOGRAPHIC LOCATIONS. IN ITS JULY 8, 1981 EDITION, THE NEWSPAPER "EL HERALDO" STATED THAT THE 30,000 VEHICLE IN TEGUCIGALPA CONSTITUTE A "...WASTE OF ENERGY AND ENVIRONMENTAL POLLUTION.." THIS PROBLEM OF AIR POLLUTION CAUSED BY THE TRANSPORTATION SECTOR IS INCREASED BY THE LACK OF ANY EMISSION CONTROLS IN VEHICLES AND BY THE TOPOGRAPHY OF THE AREA. THE INDUSTRIAL SECTOR DOES NOT SEEM TO MAKE A SIGNIFICANT CONTRIBUTION TO THE PROBLEM IN TEGUCIGALPA, BUT THIS IS NOT THE CASE IN SAN PEDRO. A CONSTANT HAZE WAS OBSERVED DURING A VISIT TO THIS CITY, AND CERTAIN SPECIFIC PROBLEMS WERE OBSERVED SUCH AS THE EMISSION FROM THE CEMENT PLANT WHICH IS SHOWN IN FIGURE 9.

THE VEGETATION OF THE AREA WAS SUFFERING EXTENSIVE DAMAGE DUE TO THE DUST. IN OTHER PARTS OF THE COUNTRY THE INDUSTRIAL AIR POLLUTION PROBLEM IS AT WORST HIGHLY LOCALIZED AND COMMONLY NOT OF MAJOR IMPORTANCE.

PROBABLY THE ONLY AVAILABLE ESTIMATE OF THE AMOUNTS OF AIR POLLUTANTS EMITTED IN HONDURAS IS THE ONE MADE BY (GEIGER 1981) AND SHOWN HERE AS TABLE 8. THESE FIGURES WERE CALCULATED BASED ON EMISSION FACTORS FOR THE DIFFERENT SOURCES INVOLVED AND SHOW THAT THE BURNING OF WOOD IN ITS DIFFERENT FORMS CONSTITUTES THE MAJOR AIR POLLUTION PROBLEM IN THE COUNTRY. THIS IS OF PARTICULAR CONCERN DUE TO PLANNED INCREASES IN THE USE OF FIREWOOD IN THE COMING YEARS AND AN APPARENT UNCONTROLLED BURNING IN PINE FORESTS. APPROXIMATELY HALF OF THE AMOUNTS GIVEN FOR GASOLINE AS A SOURCE ARE GENERATED IN TEGUCIGALPA, EXPLAINING THE EARLIER CITED NEWSPAPER STATEMENT. MOST OF THE REMAINING 50% IS GENERATED IN SAN PEDRO, AND THE REST IS SPREAD OVER THE COUNTRY.

AT THIS TIME AIR POLLUTION SHOULD NOT BE CONSIDERED AS A PROBLEM IN HONDURAS. HOWEVER, SEVERAL MEASURES SHOULD BE TAKEN TO DEVELOP A DATA BASE THAT WILL ALLOW FOR A BETTER EVALUATION OF AIR QUALITY. THIS CAN TAKE THE FORM OF VARIOUS SIMPLE MEASUREMENTS, SUCH AS SETTLEABLE PARTICLES, WHICH CAN BE TAKEN REGULARLY IN ORDER TO DETERMINE WHETHER AIR POLLUTION IS INDEED INCREASING AND THE PERIODS OF THE YEAR IN WHICH THE PROBLEM IS WORST. LIKEWISE, THE HEALTH MINISTRY SHOULD START COLLECTING DATA ON HEALTH PROBLEMS THAT COULD BE ASSOCIATED WITH AIR POLLUTION IN ORDER TO PREVENT FUTURE PROBLEMS. A FEW BASIC LAWS SHOULD BE PASSED IN ORDER TO START REGULATING THE EMISSION FROM THE TRANSPORTATION SECTOR. RESTRICTIONS SHOULD ALSO BE IMPOSED ON THE SIZE OF INDUSTRIAL STACKS AND THE CONTROLLED BURNING OF FORESTS SHOULD BE MADE DURING APPROPRIATE METEOROLOGICAL CONDITIONS. THE PROPOSED INCREASE IN THE USE OF FIREWOOD AS AN ENERGY SOURCE SHOULD BE REEVALUATED, IN PARTICULAR AS IT APPLIES TO TEGUCIGALPA.

6.4 MINING POLLUTION

THE LAKE YOJOA WATERSHED CONSTITUTES ONE OF THE BETTER DEVELOPED ECOSYSTEMS IN HONDURAS, AS DESCRIBED IN OTHER SECTIONS OF THIS PROFILE. HOWEVER, AND AS EARLY AS 1976, SIGNIFICANT FISH KILLS HAVE BEEN OBSERVED. TWO STUDIES PERFORMED IN 1976, (DEL CID, 1976) AND IN 1978, (LANDINE, 1978) HAVE TRIED TO EXPLAIN THE REASONS FOR THESE KILLS AND THEIR FINDINGS ARE PRESENTED HERE.

THE LAKE RECEIVES THE DISCHARGES FROM THE ROSARIO RESOURCES CORPORATION MINING AND REFINING OPERATIONS. THIS COMPANY HAS BEEN ENGAGED IN THE PRODUCTION OF ZINC, LEAD AND SILVER. THERE ARE TWO EFFLUENTS FROM THE OPERATION, ONE FROM THE MINE ITSELF. THE TAILINGS FROM THE REFINING OPERATION ARE PASSED THROUGH A SETTING POND (BUILT IN 1971) AND THEN DISCHARGED TO JUTUL/RAICES CREEK WHICH FEEDS INTO THE LAKE. THE MINE EFFLUENT, CONTAINING INORGANIC SALTS AND THE SOLID WASTES RESULTING FROM THE MINERAL EXTRACTION. DUE TO THE RELATIVELY LONG DISTANCE OF THE CREEK (9 KMS.), SOME OF THE TOXIC ELEMENTS WILL SETTLE AND/OR WILL BE OXIDIZED BEFORE REACHING THE LAKE. HOWEVER, THE REPORT DOES NOT PRESENT ENOUGH DATA FOR EVALUATION.

THE STUDY BY (LANDINE 1978) ALTHOUGH BIASED (THE INTRODUCTION INCLUDES THE STATEMENT THAT "...IT IS NOT NECESSARY TO BE VERY CONCERNED ABOUT POLLUTION CONTROL IN THE MINING AND HYDROCARBONS SECTOR") CONTAINS MORE RECENT INFORMATION ON THE QUALITY OF THE WASTEWATERS. IT IS STATED THAT SINCE THE

SILVER CONCENTRATE WAS NO LONGER PRODUCED, CYANIDE USAGE AT THE MILL HAD DROPPED TO 10% OF FORMER USAGE. STILL, IN 1977 THE TAILINGS POND EFFLUENT CONTAINED 5-20 MG/L OF CYANIDE, 8-11 MG/L OF COPPER, 1-3 MG/L OF LEAD, 0.3-2.0 MG/L OF ZINC AND 0.04-0.6 MG/L OF SILVER. THE FLOW WAS APPROXIMATELY 950 GAL/MIN. THE MINEWATER, AT A FLOW OF 9,000 GAL/MIN., CONTAINED 0.01-0.06 MG/L OF COPPER, 0.01 MG/L OF CYANIDE, 0.2-1.5 MG/L OF LEAD, 0.6-0.8 MG/L OF ZINC, 0.5-0.6 MG/L OF IRON AND 0.1-0.3 MG/L OF MANGANESE. THE TOTAL DISSOLVED SOLIDS CONCENTRATION WAS 500 MG/L AND THE PH 8. IN 1978 A NEW POND WAS UNDER CONSTRUCTION BUT IT HAS NOT BEEN POSSIBLE TO OBTAIN DATA ON ITS REMOVAL EFFICIENCY OR EFFECT ON THE QUALITY OF THE EFFLUENT.

IT IS IMPORTANT TO COMMENT ON AN OBSERVATION MADE BY LANDINE TO THE EFFECT THAT THE BEST FISHING IN THE LAKE WAS NEAR THE ENTRANCE OF JUTUL CREEK. THIS OBSERVATION WAS USED TO IMPLY THAT SINCE THE FISH WERE ALIVE, THERE WAS NO PROBLEM WITH THE WATER DISCHARGED TO THE SAME CREEK THROUGH THE RAICES TUNNEL. IN 1975 THIS FLOW WAS 0.45 M³/SEC. DATA FROM DEL CID (1976) INDICATES THE FOLLOWING WATER QUALITY FOR THE TAILINGS POND EFFLUENT:

PH	11.4	CU	10.6	MG/L
ALKALINITY	992	PB	3.34	"
SO4	68	ZN	3.90	"
TDS	788	AG	0.69	"
TS	808	MN	0.01	"
CL	190	AS	0.01	"
CA	492	CD	0.01	"
NA	11	CZ	0.01	"
K	2.6	FE	0.01	"

THE FIGURES FOR CYANIDE ARE NOT GIVEN SINCE THE SAMPLES WERE IMPROPERLY PRESERVED. HOWEVER, AN ESTIMATED VALUE OF 67 MG/L GOING INTO THE POND IS CALCULATED. EVEN ASSUMING A SIGNIFICANT OXIDATION AT THE POND, THIS VALUE IS WELL ABOVE THE RECOMMENDED VALUE FOR THE PRESERVATION OF AQUATIC LIFE AND TOGETHER WITH THE HIGH CONCENTRATIONS OF COPPER AND LEAD ALMOST GUARANTEE THAT THE CREEK WILL NOT HAVE HIGHER FORMS OF LIFE. THIS IS THE SAME ARGUMENT THAT WAS USED IN MINAMAT BAY, JAPAN, WHERE MERCURY FROM A NEARBY INDUSTRY HAD ACCUMULATED UP THROUGH THE FOOD CHAIN OVER MANY YEARS TO CAUSE THE BIGGEST MERCURY POISONING INCIDENT KNOWN TO DATE. THIS MINE HAS BEEN OPERATING SINCE 1948, AND IT WOULD BE VERY INTERESTING TO MAKE HEAVY METALS AND CYANIDE MEASUREMENTS IN FISH TISSUE IN THE LAKE.

5.5. INDUSTRIAL POLLUTION

IT HAS NOT BEEN POSSIBLE TO OBTAIN ANY DATA ON BOTH THE FLOW AND QUALITY OF WASTEWATERS FROM THE INDUSTRIAL SECTOR. IT IS BELIEVED THAT THE PROBLEM IS OF SIGNIFICANCE AT SAN PEDRO SULA, WHERE MOST OF THE INDUSTRY IN THE COUNTRY IS CONCENTRATED.

THE ONLY REFINERY IN THE COUNTRY IS LOCATED AT PUERTO CORTES AND OPERATES AT A LEVEL OF ABOUT 10,000 BARRELS OF CRUDE PER DAY. ITS ONLY WASTEWATER TREATMENT CONSISTS OF AN API SEPARATOR BEFORE DISCHARGE INTO THE BAY. PROPERLY DESIGNED

AND OPERATED, THIS PROCESS SHOULD REMOVE 70-80% OF THE OIL. DUE TO ITS SIZE, THE AMOUNT OF WASTEWATER DISCHARGE IS SMALL AND THIS PROCESS, IF PROPERLY OPERATING, IS PROBABLY ENOUGH. HOWEVER, SOME CONSIDERATION SHOULD BE GIVEN TO THE INSTALLATION OF A CPI SEPARATOR AND A DEPURATOR FOR ENHANCED OIL REMOVAL.

COFFEE PROCESSING IS A MAJOR INDUSTRIAL ACTIVITY THAT IS DISTRIBUTED OVER 13 OF THE 18 DEPARTMENTS OF THE COUNTRY AND SHOULD BE GIVEN CONSIDERATION FOR FUTURE POLLUTION CONTROL ACTIVITIES. INFORMATION OBTAINED AT IHCAFÉ INDICATES THAT THERE ARE ABOUT 45,000 "BENEFICIOS DE CAFÉ" IN THE COUNTRY, WITH A TYPICAL SIZE OF 5-10 HA. AND HANDLING ABOUT 35-110 "QUINTALES" OF COFFEE PER YEAR. SOME PROBLEMS HAVE BEEN REPORTED OF CATTLE DEATHS DOWNSTREAM FROM "BENEFICIOS", IN PARTICULAR DURING THE DRY SEASON. IN SANTA BARBARA THERE IS ONE "BENEFICIO" WHICH DISCHARGES TO A POTABLE WATER SOURCE. THE MAGNITUDE OF THE PROBLEM CAN BE APPRECIATED IN TABLE 9 WHICH SHOWS TYPICAL EFFLUENT CONCENTRATION FROM OTHER COUNTRIES.

ALTHOUGH THE RESEARCH DEPARTMENT AT IHCAFÉ HAS A PLANNED PROJECT ON THE USE AND TREATMENT OF THESE WASTEWATERS, IT IS UNLIKELY THAT IT WILL GET OFF THE GROUND SOON DUE TO LACK OF PERSONNEL AND FUNDS. SINCE THE TREATMENT OF THESE WASTES IS A HIGHLY COMPLEX PROBLEM WITH NO KNOWN "BEST" SOLUTION, IT IS SUGGESTED THAT DUE TO THE ECONOMIC IMPORTANCE OF COFFEE IN HONDURAS (BIGGEST GENERATOR OF FOREIGN CURRENCY IN 1979), THIS EFFORT BE FUNDED IN ORDER TO AT LEAST BE ABLE TO QUANTIFY THE PROBLEMS.

7.0 RECOMMENDATIONS

- A. ESTABLISHMENT, MOST LIKELY BY CONSUPLANE, OF DESIGNATED WATER USES FOR EACH RIVER.
- B. DEVELOPMENT OF BROAD WATER QUALITY CRITERIA FOR EACH DESIGNATED USE (RENARE), AND THEN STANDARDS.
- C. ENFORCEMENT OF WATER QUALITY STANDARDS BY MSP.
- D. MAPPING OF AQUIFERS. REGISTRATION OF MAJOR GROUND WATER USERS.
- E. CENTRALIZATION OF ALL WATER AND WASTEWATER ACTIVITIES AT SANAA.
- F. PASSING OF SPECIFIC LAWS TO CONTROL MUNICIPAL AND INDUSTRIAL WASTEWATER DISCHARGES.
- G. FINANCE AND ENCOURAGE RURAL SANITATION PROGRAM.
- H. ESTABLISHMENT OF A SHORT COURSE TRAINING CAPABILITY AT THE UNIVERSITY.
- I. ESTABLISHMENT OF A SIMPLE AIR QUALITY MONITORING NETWORK.
- J. PASSING OF AIR POLLUTION LAW.
- K. RE-STUDY THE TEGUCIGALPA TREATMENT PLANT CONCEPT BEFORE PUTTING UP ANY MORE MONEY.
- L. SAMPLING OF FISH AT LAKE YOJDA WHERE THE MINE EFFLUENT COMES IN.
- M. FUND RESEARCH PROGRAM AT IHCAFÉ ON WASTEWATER TREATMENT.
- N. FUNDING OF EQUIPMENT FOR SANITARY LANDFILLS.

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2.0 REFERENCES

2. "ESTUDIO DEL SECTOR ABASTECIMIENTO DE AGUA Y SANEAMIENTO"
CONSUPLANE, APRIL 1979.
9. "EL CAFE EN ESTADISTICAS, VOLUMEN III"
IHCAFE, JANUARY 1980.
8. GEIBER, JOHN, NOTES FOR A SERIES OF LECTURES IN AIR POLLUTION
GIVEN AT VARIOUS MEETINGS THROUGHOUT HONDURAS, 1981
7. GEIGER, JOHN, "INFORME 1: INSPECCION DE LAS EMISIONES VISUALES
DE INDUSTRIAS, PLANES DEL PROYECTO", RENARE, DECEMBER 1980
6. DEL CID, JUAN, JORGE RODRIGUEZ AND RAIMUNDO HEDERRA,
"INFORMACION SOBRE DESECHOS SOLIDOS EN LAS CIUDADES DE MAYOR
POBLACION DE HONDURAS", PRESENTED AT PAHO/WHO WORKSHOP ON
SOLID WASTES, GUATEMALA CITY, GUATEMALA, JUNE 1980
1. "PROGRAMA PARA EL DESARROLLO INTEGRAL DEL SISTEMA DE DESECHOS
SOLIDOS", CLEANING DEPARTMENT, CMDC, JANUARY 1980
5. DEL CID, OMER J, "IMPACTO ECOLOGICO DEL MINERAL EL MOCHITO"
DGMH, JULY 1976
10. LANDINE, ROBERT C., ENVIRONMENTAL ENGINEERING IN THE
MINING SECTOR FOR THE DIRECCION GENERAL DE MINAS E
HIDROCARBUROS, REPORT TO DGMH, NOVEMBER 1978.
3. "PLAN NACIONAL DE DESARROLLO: RECURSOS HIDRICOS.
(1979-1983)", CONSUPLANE, 1979.
4. "PLAN NACIONAL DE DESARROLLO: SALUD (1979-1983)",
CONSUPLANE, 1979.
11. "PLAN OPERATION-1981" SANAA, SEPTEMBER 1980.

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