PD BEF 741

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT DATA SHEET

1. TRANSACTION CODE: A (A = Add, C = Change, D = Delete) — Amendment Number: ____ — DOCUMENT CODE: 3

2. COUNTRY/ENTITY: RWANDA

3. PROJECT NUMBER: 696-0129

4. BUREAU/OFFICE: AFRICA — 06

5. PROJECT TITLE (maximum 40 characters): NATURAL RESOURCES MANAGEMENT PROJECT

6. PROJECT ASSISTANCE COMPLETION DATE (PACD): MM 04 DD 30 YY 94

7. ESTIMATED DATE OF OBLIGATION (Under 'B.' below, enter 1, 2, 3, or 4)
A. Initial FY ____ B. Quarter ____ C. Final FY 92

8. COSTS ($000 OR EQUIVALENT $1 = ____)

A. FUNDING SOURCE	FIRST FY ____ B. FX	C. L/C	D. Total	LIFE OF PROJECT E. FX	F. L/C	G. Total
AID Appropriated Total	2,000	1,000	3,000	3,924	3,776	7,700
(Grant)	(2,000)	(1,000)	(3,000)	(3,924)	(3,776)	(7,700)
(Loan)	( )	( )	( )	( )	( )	( )
Other U.S. 1.						
Other U.S. 2.						
Host Country						
Other Donor(s)						
TOTALS	2,000	1,000	3,000	3,924	3,776	7,700

9. SCHEDULE OF AID FUNDING ($000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH. CODE 1. Grant	C. 2. Loan	D. OBLIGATIONS TO DATE 1. Grant	D. 2. Loan	E. AMOUNT APPROVED THIS ACTION 1. Grant	E. 2. Loan	F. LIFE OF PROJECT 1. Grant	F. 2. Loan
(1) DFA	250	090		0		7,700		7,700	
(2)									
(3)									
(4)									
TOTALS						7,700		7,700	

10. SECONDARY TECHNICAL CODES (maximum 6 codes of 3 positions each): 091 | 092 | 093 | 096 | 099

11. SECONDARY PURPOSE CODE

12. SPECIAL CONCERNS CODES (maximum 7 codes of 4 positions each)

A. Code	BS	BR	PVO				
B. Amount	7,000	7,700	2,900				

13. PROJECT PURPOSE (maximum 480 characters)

The project purpose is fourfold: (1) reduced erosion on Rwanda's hillsides; (2) sustainable use of the country's wetlands; (3) protection of its natural forests; and (4) greater coordination by GOR of activities affecting the natural resource base.

14. SCHEDULED EVALUATIONS
Interim MM 06 YY 91 | MM YY | Final MM 10 YY 93

15. SOURCE/ORIGIN OF GOODS AND SERVICES
[X] 000 [ ] 941 [X] Local [X] Other (Specify) 935

16. AMENDMENTS/NATURE OF CHANGE PROPOSED (This is page 1 of a ____ page PP Amendment.)

17. APPROVED BY
Signature: James A. Graham
James A. Graham
Title: Mission Director
Date Signed: MM 05 DD 12 YY 89

18. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION: MM 07 DD 03 YY 89

AID 1330-4 (8-79)

ACRONYMS

ADO	Agricultural Development Officer (ADO)
AFR/PD	AID Africa Bureau, Project Development Division
AFRENA	Agroforestry Research Network for Africa
AID	Agency for International Development
AID/W	Agency for International Development/Washington
ASPAP	Agricultural Surveys and Policy Analysis Project
AWF	African Wildlife Foundation
AWRM	Agricultural Water Resources Management Project
CARE	Cooperative for American Relief Everywhere
CBD	Commerce Business Daily
CDSS	Country Development Strategy Statement
CRSP	Collaborative Research Support Project
DAHA	Division Aménagement Hydro-Agricole (MINAGRI)
DFA	Development Fund for Africa
DGF	Direction Générale des Forêts (MINAGRI) Direction General of Forestry
DGGR	Direction Générale du Genie Rural et de la Conservation des Sols Direction General of Rural Engineering and Soil Conservation
EAP	Environmental Action Plan
FAO	Food and Agricultural Organization of the United Nations
FSRP	Farming Systems Research Project
FY	Fiscal Year
GDP	Gross Domestic Product
GOR	Government of Rwanda
GTZ	German Agency for Technical Cooperation
HC	Host Country
HBCU	Historically Black College or University
ICRAF	International Council for Research in Agroforestry
IDA	International Development Association (World Bank)
IEE	Initial Environmental Assessment
IQC	Indefinite Quantity Contract
ISAR	Institut des Sciences Agronomiques du Rwanda Rwandan Institute for Agricultural Sciences
ISNAR	International Service for National Agricultural Research
IUCN	International Union for the Conservation of Nature
IWACU	Kinyarwandese for "Chez Nous", a Rwandan cooperative training organization
LOP	Life of Project
MGP	Mountain Gorilla Project
MINAFFET	Ministère des Affaires Etrangères Ministry of Foreign Affairs
MINAGRI	Ministère de l'Agriculture, de l'Elevage, et des Forets Ministry of Agriculture, Livestock and Forests
MININTER	Ministère de l'Interieur et du Developpement Communal Ministry of the Interior and Communal Development
MINIPLAN	Ministère du Plan Ministry of Planning
MINISANTE	Ministère de la Santé Ministry of Public Health
MINISAPASO	Ministère de la Sante Publique et des Affaires Sociales Ministry of Public Health and Social Affairs

MINITRAPE	Ministry of Public Works and Energy
MINIMART	Ministry of Industry, Mines, Artisanry and Crafts;
MIS	Management Information System
MRND	Movement Revolutionaire National pour le Developpement
NESR	National Environmental Strategy for Rwanda
NGO	Non-governmental Organization
NRM	Natural Resources Management Project
NRMP	Natural Resources Management Project
NRMS	Natural Resource Management Support Project
ORTPN	Office Rwandais du Tourism et des Parcs Nationaux Office for Tourism and National Parks (Rwanda)
OYB	Operational Year Budget
PACD	Project Activity Completion Date
PCV	Peace Corps Volunteer
PDO	A.I.D. Project Development Officer
PID	Project Identification Document
PIL	Project Implementation Letter
PIO/C	Project Implementation Order - Commodity Procurement
PIO/P	Project Implementation Order - Participant Training
PIO/T	Project Implementation Order - Technical Assistance
PM	Person Month
PP	Project Paper
PPM	Pilot Program for the Development of Marais
PPN	Projet Pisciculture Nationale National Fish Culture Project
PRAPAC	Programme Regional d'Amelioration de la Culture de la Pomme de Terre en Afrique Central Regional Program for the Improvement of Potato Production in Central Africa
PSA	Procurement Services Agent
PSC	Personal Services Contract
PVO	Private Voluntary Organization
REDSO/ESA	Regional Economic Development Services Office/East and Southern Africa
REO	Regional Environmental Cfficer (REDSO)
RCMO	Regional Commodity Management Office
RRAM	Ruhengeri Resource Analysis and Management Project (USAID)
SAARFA	Strengthening African Agricultural Research and Faculties of Agriculture (AID Project)
SESA	Service des Enquetes et des Statistiques Agricoles (MINAGRI) Surveys and Agricultural Statistics Service
SMSS	Soil Management Support Services Project (AID)
SPN	National Fish Culture Service Service de Pisciculture Nationale
TA	Technical Assistance
TDY	Temporary Duty (short-term technical assistance)
UNDP	United Nations Development Programme
UNEP	United Nations Environmental Programme
UNR	Universite Nationale du Rwanda Rwanda National University
U.S.	United States
USAID	The Agency for International Development Mission to Rwanda
WCI	Wildlife Conservation International
WMS II	Water Management Synthesis II Project

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RWANDA - NATURAL RESOURCES MANAGEMENT (696-0129)

FACE SHEET

ACTION MEMORANDUM FOR THE USAID/RWANDA, DIRECTOR

PROJECT AUTHORIZATION

ACRONYMS

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I. SUMMARY PROJECT DESCRIPTION

A. PROJECT BACKGROUND

Rwanda is a small (26,280 sq. kilometers) densely populated country whose economy is predominantly agricultural. Approximately 90% of the Rwandan labor force is engaged in agriculture and most of the estimated one million farm families are engaged in subsistence farming.

Rwanda depends heavily on its natural resource base to support a rapidly growing population. There are clear indications, however, that the country's natural resource base is becoming increasingly degraded. Environmental stress exerted by rapid population growth is evident throughout the country as land use has become more extensive and intensive to meet Rwanda's burgeoning food needs. Formerly marginal areas, such as steep hillsides, rocky outcroppings, and "marais" (wetlands) have been brought into cultivation. Pasture is being converted into farmland and the country's natural forests are disappearing as the land is brought into agricultural production.

Despite increased soil conservation efforts, more land than ever is now cleared for cultivation. As a consequence, erosion is taking its toll on the hillsides and farmers report productivity declines on older fields due to reduced or abandoned fallow periods.

Reversing these negative trends and increasing the awareness of the population of the importance of natural resource conservation is a formidable task which will require substantial sums of money, commitment, and expertise over the long term. The activities supported by the project will strongly complement those of other donors and the GOR to redress some the major constraints to increasing agricultural productivity.

B. PROJECT GOAL AND PURPOSE

The goal of the Natural Resources Management Project is sustained long-term agricultural production. The project purpose is fourfold: (1) reduced erosion on Rwanda's hillsides; (2) sustainable use of the country's wetlands; (3) protection of its natural forests; and (4) greater coordination by the GOR of activities affecting the natural resources base.

The project will work toward this goal at two levels. On one level, it will undertake specific measures to: increase the awareness among Rwandan decision makers of the importance of natural resources conservation; strengthen the GOR's capacity to effectively control natural resource use and protect the natural resource base; and improve coordination among the various government bodies responsible for "environmental management".

On another level, the project will support activities in several discrete areas within the natural resources sector. These activities include, the management of small marais, particularly, the promotion of fish culture in the marais; soil conservation and agroforestry in the highlands of northwestern Rwanda; and the conservation of the remaining afromontane forests of the country.

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C. PROJECT DESCRIPTION

The project consists of five distinct but mutually supportive components as follows:

(1) Training and Research in the Marais: Under this component the project will: (1) train up to 30 "genie rural" technicians in rural engineering; (2) conduct research to gain a better understanding of the potential and pitfalls of marais development; (3) develop a small marais which will serve as a laboratory to train staff and as a focus for research on marais management; and strengthen the GOR agency responsible for overseeing and regulating marais development efforts in Rwanda.

(2) Integrated Fish Culture in the Marais: This component will build on the existing successful fish culture project (696-0112). Through the provision of technical assistance, training, research, extension and various construction activities, the project will support integrated aquaculture in the marais and thus try to expand the economic benefits of fish farming to a greater number of rural farmers.

(3) Agroforestry and Soil Conservation: This component will identify and promote soil conservation and agroforestry measures which would permit farmers to cultivate hillsides while at the same time maintaining or increasing agricultural productivity. Building on the experience gained in these earlier USAID projects, this component will support research on soil conservation and erosion control, stabilization of soils, and also disseminate various improved technologies which should increase agricultural productivity.

(4) Natural Forest management: This component of the project will support efforts by the "Office Rwandais du Tourisme et des Parcs Nationaux" (ORTPN) and the "Direction Générale des Forêts" (DGF) of MINAGRI, to better manage and protect the two most important afromontane forests in Rwanda. To this end, the project will provide funds for the training of Rwandan technical and managerial staff; applied biological, physical, and socio-economic research; a conservation education program; and for operational support and facility construction.

(5) Environmental Planning and Coordination: Under this component technical assistance and other support will be provided to the Ministry of Plan in the area of environmental planning and policy.

D. PROJECT IMPLEMENTATION

The overall administrative coordination and management of the project will be the responsibility of a Project Coordinating Committee (Comité de Coordination), which will include representatives of MINAGRI, ORTPN, MINIPLAN, USAID, ISAR, and MININTER and MINAFET, and will be chaired by MINAGRI, as the GOR's lead institution. MINAGRI will be responsible for the marais, fish culture, and agroforestry and soil conservation components. ORTPN will have primary responsibility for the natural forest management component. MINIPLAN will be responsible for the environmental planning component.

Day-to-day coordination and management of the project will be the responsibility of a Coordination Unit (cellule de coordination) composed of Rwandan national coordinator for the project, and an expatriate advisor. The national coordinator will be designated by MINAGRI, in consultation with ORTPN and MINIPLAN. This unit will work closely with MINAGRI, ORTPN, and MINIPLAN in coordinating field activities, and will report to the Coordinating Committee.

Implementation of the agroforestry and natural forest management components will be carried out by PVOs operating under cooperative agreements with USAID, with close the collaboration of GOR ministries, MINAGRI and ORTPN. The other 3 components will be implemented by the GOR ministries involved: fish culture and training and research in the marais components by MINAGRI, and the environmental planning and coordination by MINIPLAN. PVO and GOR representatives will work together with the National Project Coordinator and the Resident Advisor to discuss project implementation, prepare work plans, and to address issues that arise.

E. SUMMARY FINANCIAL PLAN

The total cost of this five-year project is estimated at $11,402.7 million. This estimate is based on $7.7 million in "core" project funding, a $200,000 "buy-in" from the centrally funded Natural Resources Management Support Program (698-0467), and a GOR contribution of $3,502.7 million as summarized below:

	AID	GOR	TOTAL
Technical Assistance	1,916.5	-	1,916.5
Training	979	345	1,324
Commodities	894.5	51	945.5
Construction/Infrastructure	945	300	1,245
Local Operating Costs	2,115	2,483	4,598
Evaluation/Audit	150	-	150
Contingency	340	164.7	504.7
Inflation	360	159	519
	7,700	3,502.7	11,202.7
AID/W "buy-in"	200	-	200
TOTAL	7,900	3,502.7	11,402.7

F. SUMMARY FINDINGS

The analyses in the Project Paper conclude that: (1) the project approach is technically and economically sound, socially acceptable, and administratively feasible; (2) the environmental analysis recommended an environmental assessment prior to construction activities in the marais management and fish culture subcomponents. The scheduling of the obligations will allow this to occur prior to commencing actual construction; (3) the design and cost estimates are reasonable and adequately planned; (4) the timing and funding of

project activities are appropriately scheduled; (5) sufficient planning has been made for monitoring and evaluation of the project; and (6) all statutory criteria have been satisfied.

G. PROCUREMENT ARRANGEMENTS UNDER DFA

The funding source for this project is the Development Fund for Africa (DFA). The project is designed to maximize purchases from the USA wherever possible to comply with the intent of the DFA. Excluding vehicles, approximately 60% of commodity purchases will come from the USA.

H. MAJOR CONDITIONS AND COVENANTS

The three major conditions precedent to disbursement relate to construction, training, and preparation of annual work plans. For construction, the GOR will furnish evidence satisfactory to AID that it has, inter alia: (1) title to or has otherwise arranged for the long-term use of sufficient land for construction; (2) has the necessary plans, specifications, cost estimates, and bidding documents for such construction prior to its execution with a contractor acceptable to AID; and (3) made satisfactory arrangements for all engineering services to be performed under the project.

Before the construction of fish ponds and related facilities, the GOR will furnish to A.I.D. a site and construction analysis which shall encompass down stream environmental consequences and the relationship, if any, to possible upstream development. With respect to the annual work plans, the GOR will furnish to AID a project annual work plan, reviewed by the Project Management Committee, and a budget detailing the expenditures that will be required to carry out the work.

Finally, with respect to training, the GOR will furnish to AID satisfactory evidence which guarantees that adequate training facilities will be available for the duration of this training under the project.

The Grantee will covenant to inter alia: (1) establish an evaluation program as part of project; (2) recruit and hire or assign in a timely manner all Rwandan personnel necessary to implement the project; (3) promptly identify and nominate all persons for long- and short-term training financed under the project; (4) establish a Project Coordinating Committee with representatives from all of the Ministries participating in the project; and (5) ensure that participating agencies allocate funds to the project and assume increasing responsibility for local costs budgets.

I. CONSIDERATION OF THE GRAY AMENDMENT

Through full and open competition, in the Commerce Business Daily (CBD), USAID/Rwanda will encourage the participation of, and joint ventures with, minority firms and History Black Colleges and Universities (HBCUs).

J. PROJECT PAPER DESIGN TEAM

The project paper was developed by a number of consultants, and by the personnel of USAID/Rwanda, GOR, and REDSO/ESA over period of months.

The Project Design Team members included:

Background Analyses:

Ms. Susan Huke, Forestry Expert - Independent Consultant
Ms. Amy Vedder, Natural Resources Specialist, International Institute for Environmental Development (IIED)
Mr. Roelof Sikkens, Independent Consultant
Mr. Paul Hanegreef, Natural Resource Specialist, IIED
Mr. Gerry Grosenick, Resource Economist, IIED

PP Design Team:

Mr. Fred Weber, Forestry Expert, Independent Consultant
Dr. Kjell Christopherson, Natural Resource Economist, Energy Development International (EDI)
Dr. Siew Tuan Chew, Evaluation Specialist, Center for Development Information and Evaluation (CDIE), AID/W

REDSO/ESA:

Mr. Dave Gibson, Forestry Expert
Mr. John Peevey, Procurement Officer
Mr. Clifford Brown, Legal Officer
Mr. Ed McGowan, Environmental Officer

USAID/Rwanda:

Mr. Henderson M. Patrick, Project Development Officer
Mr. Paul R. Crawford, Agricultural Development Officer
Mr. Valens Ndoreyaho, Agronomist
Mr. Viet Trong Dong, Engineer
Mr. Edward Robins, Consultant
Mr. Michael Fuchs-Carsch, Agricultural Development Officer

GOR:

Mr. Juvénal Kabiligi, Directeur Général, Direction Générale du Génie Rural et de la Conservation des Sols, MINAGRI

II. PROJECT RATIONALE

A. Background

Rwanda, with a per capita GDP of approximately $310, is one of the poorest nations in the world. It is the also one of most densely populated countries in Africa. Population density on arable land is 390/Km2 and the annual population growth rate is about 3.7 percent.

Rwanda suffers from all of the logistical problems of a poor landlocked country and possesses no mineral deposits. Its primary resources are its relatively good soils and abundant rainfall, although the extremely steep sloping terrain tends to offset these advantages to some degree.

Despite formidable constraints to development, economic growth in Rwanda since the country's independence in July 1962 has been very high. GDP has grown by an average of nearly 6 percent annually in real terms. Rwanda has been one of the few sub-saharan African countries to increase per capita food production. Economic management throughout the period has been prudent, as reflected in: (1) relatively small fiscal deficits and a few surpluses; (2) a slow monetary expansion (below that of GDP); (3) a relatively low rate of price inflation; (4) maintenance of an external reserve rate among the highest in Africa; and (5) a debt service ratio (16% in 1988) which has been generally significantly below the average for sub-saharan Africa. Throughout most of this period, government economic policy has been non-interventionist.

A severe drought in 1984 resulted in a sharp economic decline, but economic performance improved markedly again during 1985 and 1986. Real GDP reached an annual growth rate of 4.4 percent largely because of favorable weather conditions that helped stimulate agricultural production and modulate inflationary pressures. In 1987, the economic and financial situation deteriorated substantially, owing to adverse weather conditions and a marked decline in coffee export prices. Agricultural production decreased by 3 percent, and overall GDP fell by 2.8 percent.

Rwanda, as is true of many developing countries, depends primarily on its agricultural economy. Agriculture accounted for 40 percent of GDP in 1987, down from 43 percent the previous year. Approximately 90 percent of the Rwandan labor force is engaged in agriculture and most of the estimated one million farm families are engaged in small subsistence farming. Primary food crops are beans, bananas, sorghum, sweet potatoes, maize, Irish potatoes, cassava, peas and cocoyam. Intercropping is common and, because of the mild temperatures and generally high rainfall, crops are grown throughout the year. The most important cash crop is coffee, which earns about 60 percent of the country's foreign exchange, with the balance provided by tea, pyrethrum and cinchona. In addition to crops, Rwandan farmers also raise some livestock and poultry.

To date, agricultural production increases have been the primary contributor to Rwanda's GDP growth. From 1966-1983, annual food crop production increases have averaged 4.3 percent. Production increases during the period were attributed to annual increases in area harvested, which rose by 3.7 percent, and to marginal increases in productivity.

The expansion of the arable land base, the means by which Rwandans have maintained their economic growth to date, will not be possible in the future. The rate of land expansion is already decreasing, falling to 3.1 percent during the 1974-1983 period. Additional land available for food crop production is minimal; estimated at no more than 65,000 suitable hectares, with perhaps another 300,000 hectares of at best marginal land. If the amount of land brought into cultivation continues at this rate, the entire arable land base of Rwanda (approximately one million arable hectares) will be in production by the turn of the century.

Moreover, if the population of 7.0 million continues to grow at the current annual rate of 3.7 percent, Rwanda will have more than 15 million people by the year 2010 and the density on arable land will be over 1,100 persons per Km2. Available tillable land per capita will have declined by over 60 percent, to a mere one-half hectare per family.

B. Problem Statement

The rationale for this project is based on the importance of agriculture to Rwanda's economic welfare, the dependence of agriculture upon soil quality and water availability, and the uniqueness and precariousness of some of Rwanda's rare natural resources. The success of efforts to increase agricultural productivity will depend largely on measures which can be adopted by the average Rwandan farmer.

Rwanda depends heavily on its natural resource base to support a rapidly growing population. There are, however, clear indications that the country's natural resource base is becoming increasingly degraded. Environmental stress exerted by rapid population growth is evident throughout the country, as land use has become more extensive and intensive to meet Rwanda's burgeoning food needs. Formerly marginal areas, such as steep hillsides, rocky outcroppings, and "marais" (an administrative term for communal lands including marshes, wetlands, and valley bottom lands) have been brought into cultivation. Pasture is being converted to farmland. The country's natural forests are disappearing, as the land is brought into agricultural production.

At the same time, farmers report productivity declines on older fields due to reduced or abandoned fallow periods, and the failure to replace depleted nutrients and organic matter (partially due to the use of crop residues for fuel). On the hillsides, erosion is also taking its toll. Despite increased soil conservation efforts, more land than ever is now cleared for cultivation and thus exposed to erosive rainfall. In addition, the construction of new roads and buildings has further reduced ground cover. Only in certain instances do current soil conservation policies address site-specific erosion; and often the policies are inappropriate for the nature of the problem.

The increased runoff which results from extensive land use changes, in the absence of adequate soil and water conservation measures, has a significant impact on Rwanda's hydrology. The removal of the natural vegetation has meant that water arrives more quickly to the valley bottoms, and into streams and rivers, carrying increasing amounts of valuable topsoil. Measures of water flows of several rivers indicate that this situation may be widespread throughout Rwanda's watersheds. Fluctuations in water levels, and in

particular flooding, have occurred in various parts of the country, particularly in the northwest.

Population pressures have also created increased demand for wood. Reforestation efforts in Rwanda have been substantial. Nevertheless, with the increasing need for land for agriculture, there has been a growing unwillingness to dedicate significant areas to exclusive forestry use. Water source development does not entail the same conflicts, but new sources are increasingly difficult to find and the level of technology required for their exploitation continues to rise. In the face of these multiple demands, even national parks and forests are not immune to pressure to exploit the wood, water and wildlife they contain, not to mention the land.

There is a growing consensus of the need for greater coordination of natural resource use in Rwanda. There are a number of government agencies with activities that have an impact on the environment. These include, among others, the Ministry of Agriculture (MINAGRI), the Ministry of Interior and Communal Development (MININTER), Ministry of Public Works and Energy (MINITRAPE), the Ministry of Public Health and Social Affairs (MINISAPASO), the Ministry of Industry, Mines, Artisanry and Crafts (MINIMART); and the Rwandan Office of Tourism and National Parks (ORTPN). At the same time, there are a number of donor-funded projects which deal with, or have an impact on, the environment. Until recently, there has been no mechanism for coordinating, or arbitrating, the sometimes conflicting programs of these various entities. In February, 1989, the Ministry of Plan was given the responsibility for this coordination. Unfortunately, MINIPLAN is only just beginning to mobilize the resources and establish the institutional relationships needed to carry out this mandate, and much needs to be done.

C. Relationship with the CDSS

The Natural Resources Management Project is consistent with both the 1988 Rwanda Country Development Strategy Statement (CDSS) and the GOR strategy for development. The USAID program strategy in Rwanda is focused on: increasing per capita income of the rural majority (a) through increased agricultural productivity and off-farm employment opportunities; and (b) decreasing the rate of population growth.

The FY 1988 CDSS for Rwanda points out that Rwanda's agricultural performance has been excellent since independence, but that future performance is not likely to be as impressive without fundamental reforms. Rwanda's population growth rate, an already high population density, and an inelastic land base which is becoming degraded and mismanaged are cited as having brought agriculture to a turning point. For the future, agricultural intensification will require "more careful land-use planning and management of the natural resource base."

1/ MINISAPASO was restructured in February 1989 and is now the Ministry of Public Health (MINISANTE).

The CDSS recommends that AID help the GOR to "generate and/or adapt new technologies that will be readily used by farmers to increase productivity and production, while improving the quality of the land base." Key institutions in the agricultural support system will need to be strengthened, especially for research and training. The CDSS states:

> The intensification of agriculture, the key to increases in overall agricultural production, will demand a complementary focus on the protection of soils, increased soil fertility, and management of hydro-ecological systems. The GOR has been increasingly underscoring the fragility of the land base and efforts have been made to check erosion and protect irreplaceable natural resources. These are but preliminary steps, however. Mountain forests and their fragile ecosystems are essential to maintaining hydraulic reservoirs, but they are insufficiently monitored to elucidate their regulatory role in water catchment protection. The wet lowlands (marais), 45,000 hectares of land with the potential to be recuperated for agriculture, are not presently managed. Erosion control is a major extension theme, and currently 63% of all arable land is protected by ditches topped with fixed grass hedges; yet this method is admittedly not appropriate for all conditions. Reforestation has added 44,000 hectares of land under tree cover since 1976, but efforts will need to be greater to meet prospective demand for fuel. Priority needs to be given to the development and implementation of forest and afromontane forest management plans, the preparation of multiple-use impact assessments of forests and marais, and the testing of soil conservation measures, including agroforestry. ISAR, ICRAF and various departments in the MINAGRI are addressing these issues to some degree, but there is no overall effort to deal with the management of natural resources. (FY 1988 Rwanda CDSS: p. 26).

D. Relationship to GOR Development Plans

Throughout the 1980's, the Government of Rwanda (GOR) has called attention to the importance of preserving and improving the quality of its land base. Over time, annual development and extension themes have focused on reforestation, composting, soil fertility, erosion control, and agricultural intensification. The results of these efforts are apparent in increased forest cover, the widespread introduction of infiltration ditches and hedgerows, the ubiquitous presence of compost pits, and the nascent interest in agroforestry.

The GOR development strategy strongly encourages local government units ("communes", headed by a burgomaster, with populations of about 30,000) to be responsible for organizing grass roots implementation of national development policies. The project will assist communes, in executing productive local development activities.

Over the past few years, the international donor community has demonstrated considerable interest in preserving Rwanda's natural resources. Activities generally have been limited to those areas in which a particular donor has developed a high level of expertise. While donor interventions are found in several natural resource sectors (e.g. soil fertility, erosion control, agroforestry, marais development, forest management, natural forest

management, and fisheries), they nonetheless remain uncoordinated and are not undertaken within the context of a national strategy or support system.

Interviews with major donors and host government reveal a strong consensus for the need to form a steering group with the Government to formulate a coherent policy and to supervise and coordinate natural resource activities. Important steps are being taken to accomplish this. With the help of the World Bank, the GOR is developing an "Environmental Strategy" and an "Environmental Action Plan". The recent transfer of the "environmental portfolio" from MINISAPASO to MINIPLAN should also facilitate this effort. The environmental perspective of MINISAPASO, the public health ministry, was somewhat narrowly focused on environmental health issues. Putting responsibility for the environment in MINIPLAN should broaden the approach and give much needed attention to resource conservation.

III. PROJECT DESCRIPTION

A. Project Goal and Purpose

The Goal of the Natural Resources Management Project is sustained long-term agricultural production.

The Project Purpose is fourfold: (1) Reduced erosion on Rwanda's hillsides; (2) Sustainable use of the country's wetlands; (3) Protection of its natural forests; and (4) Greater coordination by the GOR of activities affecting the natural resource base. These activities are undertaken to enhance long-term agricultural production.

B. Project Strategy

The project will work at two levels. On one level, it will involve activities in several discrete areas within the natural resources sector. These include (1) the management of small marais (wetlands), and in particular the promotion of fish culture in the marais, (2) soil conservation and agroforestry in the highlands of northwestern Rwanda, and (3) the conservation of the remaining afromontane forests of the country. These sets of activities will have their own objectives and will be managed independently by personnel in the field. They will build upon a number of earlier A.I.D. efforts (as described in Section III-D, Relationship with Existing Projects, below).

At the same time, the project will undertake specific measures to (1) increase the awareness among Rwandan decision makers of the importance of natural resource conservation, (2) strengthen the GOR's capacity to effectively control natural resource use and protect the natural resource base, and (3) improve coordination among the various government bodies with a piece of the "environment" to manage. This will be done through an additional component, assistance to the Ministry of Plan in environmental policy, and through the overall coordination of the various elements of the project (i.e. through an interministerial project management committee.

C. Project Components

The Project will have five distinct, but mutually supportive, components. These are: (1) training and research in marais management; (2) integrated fish culture in the marais; (3) agroforestry and soil conservation in Ruhengeri Prefecture; (4) natural forest management; and (5) assistance to the Ministry of Plan in the formulation of environmental policy. Each of these components is discussed briefly below. An illustrative budget is presented for each component in Annex A. This is a five year project, with an estimated total life-of-project funding of $7.9 million. This estimate is based on "core" project funding of $7.7 million and a $200,000 "buy-in" from the centrally funded Natural Resources Management Support Program (698-0467).

1. Marais Development in Rwanda

There are three elements to the marais management component of the NRM Project. They are: (a) the training of A2 technicians in rural engineering;

(b) the development of a model marais; and (c) institutional support to the Division Aménagement Hydro-Agricole of the Direction Général du Génie Rural et de la Conservation des Sols.

Training of A2 Technicians in Rural Engineering

Additional trained technicians are needed to reinforce the capacity of the communes to carry out and monitor marais development efforts. In particular, these technicians must be sensitized to the critical environmental issues involved in marais development. To begin to meet this need, the NRM Project will finance the training of 30 technicians in rural engineering (génie rural) with a focus on marais development. The training of these individuals will be multi-disciplinary, and will take place over approximately 18 months at the Murambi Training Center in Gitarama. This government-run facility, which has a capacity of 150 resident students, is used for in-service training of government officials. Preliminary discussions between the Direction Générale du Génie Rural et de la Conservation des Sols and the Director of the Musambi Center indicate that the center will be, in principal, available for the proposed training.

The curricula will be elaborated by the DAHA, with input from other MINAGRI divisions, during the first four months of the project. The training will consist of course work and field work (stages). The training will cover a number of areas, which will give the trainees well-rounded capabilities in sustainable marais production, including marais agricultural practices, rural engineering, soil conservation, topography, and water management.

Upon completion of the training program, these new technicians will be employed by MINAGRI and assigned to communes, other donor projects, and so forth. Their salaries during the subsequent three years (i.e. the life of the project) will be covered by the GOR as part of its contribution to the project.

When this group of 30 technicians is trained and placed, an evaluation of the effectiveness of the training program and of the need for additional genie rural staff will be made by representatives of MINAGRI and USAID. Based on this evaluation, and assuming that sufficient funding remains available (e.g. through the contingency line item of the project's budget or through additional funding that may be made available), the project may decide to finance a second class of up to 30 students.

The Study and Management of a Model Small Marais

The project will also support the development of a model small marais of approximately 50 hectares in surface area. The objective of this effort will not be the development of the small marais itself. Rather, this model marais will be used as a "laboratory" in which to train genie rural staff and to gain a better understanding of the potentials and pitfalls of marais development. To this end, the focus will be on conducting research in the model marais and applying the results of the research to improve the management of the marais. Particular attention will be given to the affect of upstream activities on the use of the marais, and on the impact of the development of the marais on downstream users.

The marais chosen will be one that has already been cleared and is currently in agricultural use. (Note that, at present, virtually all small marais have been cleared and are cultivated). Large scale clearing activities of a thus far unused marais will not be encouraged. This is because: (a) an intensification of marais land already in use is potentially more viable, both technically and economically; and (b) there still remain serious technical risks associated with rapid, large-scale marais clearing activities.

The NRM Project will provide neither the resources nor the technical capacity to undertake environmentally sensitive projects. Finally, the project will concentrate on activities at the local level. In other words, it will assist small-holder farmers, and organizations made up of small farmers, in improving productivity on land that they already cultivate. Also, in order to facilitate hands-on training of the new genie rural technicians, a marais located near the Murambi training center will be selected. Finally, an effort will be made to incorporate fish ponds into the marais development program, in cooperation with the fish culture component of the project.

Within that area, an in-depth study will be carried out, covering all aspects of marais development and management. This will include hydrology and water management; soil science (including soil fertility); agronomy (e.g. crop adaptability); sociology and local organization; and economics (including marketing).

The Institut des Sciences Agronomiques du Rwanda (ISAR) has expressed interest in including marais research in its program. The NRM Project will assist ISAR in implementing that program. Additional funding for research will be channeled to UNR's Faculty of Agronomy. This research will involve students, as a means of encouraging them to study Génie Rural and Hydrology. Only a limited amount of funding under the project is being earmarked for this research. It is hoped that additional funding could be obtained through A.I.D.'s centrally-funded Agricultural Water Resources Management (AWRM) Project.

Finally, the findings of the research will be applied to the pilot marais, in an effort to further test their practicability and validity. The project will provide funds to improve the management of the marais (including the construction of canals and related works, and of a small warehouse). Construction activities will not commence until after completion of an Environmental Assessment which is expected to find no adverse environmental impact. These funds will be principally used to meet the cost of labor for local works in the marais, as well as materials. Prior to undertaking this investment, an analysis will be made of the costs of operation and maintenance of any works, and the willingness of the farmers, themselves, to shoulder this burden. Additional funds will be provided by USAID to assist the government in the formation of "groupements" within the communes, and for in-country training of farmers and commune officials (perhaps through IWACU, a local cooperative training organization).

Institutional Support for Marais Management

USAID will also fund activities to strengthen the service charged with monitoring marais development activities in Rwanda (the Division Aménagement Hydro-Agricole, DAHA, of MINAGRI's Direction Général du Génie Rural et de la

Conservation des Sols). Currently, the DAHA is seriously understaffed and under equipped, given the scope of its mandate. One condition to the proposed assistance will be that the GOR recruit or assign an additional rural engineer to this staff. This individual will serve as coordinator of the project, supervising both the training program and the marais development activities.

As part of this institutional strengthening program, USAID will finance the services of a resident advisor, on a three-quarter time basis, over a 24 month period. This individual will be procured under a personal services contract to USAID. He or she will provide technical assistance to the DAHA in the management of this project and serve as an advisor to the head of the DAHA. In addition, USAID will finance commodity procurement (e.g. vehicles and computer equipment), and short-term training, including study tours to developing countries with wetland development programs such as Madagascar and Thailand, and some local costs.

The provision of additional long-term training (e.g. two M.S. degrees in water management) would be very appropriate, given the needs of the project. Unfortunately, the present budget of the NRM Project is not adequate to finance such training. Nevertheless, should funds become available, M.S.-level training for water management would be a high priority.

2. Integrated Fish Culture in the Marais

Under the "Integrated Fish Culture in the Marais" Component of the Natural Resources Management Project, USAID would finance technical assistance, training, research, extension, and various construction activities to support the Programme de Pisciculture National (PPN). This component will be implemented by the Service de Pisciculture National (SPN). The GOR contribution to the project will be in the form of staff salaries and infrastructure that will be put at the disposition of the project.

Personnel and Technical Assistance

The leadership of the SPN is very strong. Nevertheless, there is a serious problem with the SPN in that there is no "assistant director" who could take over the program in the event of the departure of the present Director and the Training and Extension Specialist (a married couple). To address this problem, the GOR will recruit, under the auspices of the NRM Project, an assistant Fish Culture Director. This individual will assume responsibility for the management of the project while the Fish Culture Director attends long-term training in the U.S. (financed by the project).

USAID will also finance technical assistance to meet specific needs identified by the SPN. This may include assistance in conducting in-country training or in carrying out the research program. This technical assistance may be from either local or expatriate sources. Particular attention will be given to the possibility of buy-ins to centrally-or regionally-funded AID projects.

Research

The NRM Project will fund applied research in the following areas:

(a) aspects of integrated fish culture;
(b) the commercial, socio-economic, and organizational issues of fish culture within the context of marais development;
(c) hydrology and water management issues as they affect fish culture in marais;
(d) crop production, soil fertility, and related issues of fish culture in marais.

Part of this research budget would be directed towards students and faculty of the National University of Rwanda, and part would finance studies by the Institut des Sciences Agronomiques du Rwanda (ISAR).

Training

The NRMP would fund two Master's degree candidates in fish culture, one of which is intended to be the Fish Culture Director. One candidate, would depart in Year 1 of the project, and the second in Year 3. Funds will also be set aside for third country training/study tours.

A major element of the Fish Culture component will be in-country training in fish culture, particularly directed at fish culture in the marais. This training, which would be offered at the Kigembe Training Center, near Butare, would include the training of up to 20 new fish culture extension agents (moniteurs). The training courses for these new moniteurs would last six months, with each course having approximately 10 students. These 20 new moniteurs will be selected from a set of priority communes and will have at least three years of post-primary education. In-service refresher training would be given to another 45 Pisciculture National moniteurs, with particular attention given to training them in integrated crop/livestock/fish culture under marais conditions. Finally, funds would be set aside for the training of students, cooperative members and farmers in integrated fish culture.

A six-member mobile fish culture extension team would also be trained. Their role will be principally to supervise pond construction and related activities that the farmers, cooperative members, and extension agents are not adequately trained to do. This team would provide on-site technical assistance in the construction of facilities for integrated fish culture (e.g. piggeries and hutches above the ponds), as well as the establishment of fish culture operations. The members of this team will be recruited from within the framework of the SPN.

Support for Extension Activities

USAID will support the operational costs of an expanded fish culture/marais development extension program (exclusive of training costs). In particular, USAID will pay the salaries of newly recruited Pisciculture National moniteurs for the first two years (conditional upon MINAGRI signing an employment contract with these individuals upon completion of their training and shouldering the recurrent costs of their salaries after Year 2 of the project).

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The project would finance the procurement and operation of two small four-wheel drive trucks (one in the first year of the project, and a replacement in Year 3), to be used to transport fry, fishing equipment, and the mobile team. The project will provide funds for the procurement of computer equipment for the Kigembe Fish Culture Center, in order to facilitate the aggregation and analysis of fish production statistics. Finally, funds would be allocated to procure bicycles for extension agents, fishing equipment (e.g. nets, tanks, scales), audio-visual materials, and other equipment and supplies needed to implement the research, training, and extension aspects of the fish culture program.

Construction

Under the NRM Project, USAID will provide funds to construct up to seven communal fish culture centers in marais areas, provided an environmental assessment of this activity finds no adverse impact. These stations, each having one hectare of pond area, will be used to demonstrate integrated fish culture practices to farmers. These communal stations will be managed by "groupements" formed by farmers with individually operated ponds, with the Service de Pisciculture National providing technical assistance. It is assumed that the local community will make an in-kind contribution to these investments (e.g. labor, local materials, etc.). Some funds provided by USAID could be placed in a revolving fund to provide credit to enable farmers and cooperatives to purchase livestock for use in integrated fish culture/livestock production systems. Construction of the communal fish culture centers would be completed by Year 3 of the project.

Funds will also be provided for additional construction at the Kigembe station and three regional stations. This will include the enlargement of pond areas at the regional stations, as well as constructions (hen houses, rabbit hutches, piggeries, etc.) to expand integrated aquaculture practices on production ponds. Construction at the Kigembe and regional centers would be completed by the end of Year 3 of the project.

3. Sustainability of Hillside Production through Soil Conservation and Agroforestry

The Agroforestry and Soil Conservation Component of the NRM Project will involve the implementation of erosion control activities, and the strengthening of soil conservation and agroforestry research and extension in five communes in Ruhengeri Prefecture (Mukingo, Nkuli, Butaro, Cyeru, and Nyamugali).

Ruhengeri prefecture, in the northwest portion of the country, is the site of the former RRAM project and of the ongoing FSRP Project. It has very serious soil erosion problems and one of the highest population densities in the country. In order to implement the field activities in soil conservation and agroforestry, a cooperative agreement will be arranged with a U.S. PVO. This PVO will work in conjunction with D.G. Forêts, D.G. Genie Rural et de la Conservation des Sols, and local commune authorities.

Creation of a Soil Conservation and Agroforestry Unit

Overall coordination of the project's agroforestry and soil conservation

field activities in Ruhengeri Prefecture will be provided by a team specialized in soil conservation and agroforestry, acting as an independent administrative unit within MINAGRI. This team, which will be based in the town of Ruhengeri, will be managed by an AO-level agronome, who will be nominated and paid by MINAGRI. This individual will be assisted by an expatriate technical advisor provided by a U.S. PVO under a cooperative agreement with USAID. The PVO will have primary implementation responsibility. USAID's contribution for this advisor's salary is limited to $200,000 over a four year period. It is assumed that some of the PVO contribution to the project will meet the remaining TA costs.

In addition, the Ruhengeri agroforestry and soil conservation unit will include one A2-level forester and one A2-level agronomist, both nominated and paid by MINAGRI. Additional MINAGRI staff assigned to the project will include agricoms and monagris.

The Ruhengeri soil conservation and agroforestry team will work in conjunction with D.G. Forêts and D.G. Génie Rural, as well as with local commune authorities. It will serve as a clearing-house collecting, analyzing, and synthesizing, information and observations (e.g. from runoff plots and other experiments) and disseminating the results in user-friendly form (such as through "tech sheets"). The NRM Project team will develop a close working relationship with the USAID-funded Farming Systems Research Project. FSRP has been conducting research on soil conservation and agroforestry techniques, as well as research on improved crop varieties and practices appropriate for the region covered by NRMP.

USAID will provide support to the soil conservation and agroforestry team in the form of periodic TDYs by two experts, one in agroforestry and one in soil conservation (each for approximately 1 pm/year for four years). These experts will monitor the progress of the project and provide guidance in terms of technical validity, project management, and extension. They will also assist in the training program. Another expert will be recruited to provide a total of two person months of technical assistance to supervise the analysis of Wischmeier runoff plots.

An office building for the soil conservation and agroforestry team will be constructed in Ruhengeri. USAID will also procure under the project a truck to transport plants and other materials and two 4-wheel drive vehicles. These latter two vehicles will be procured in the third year of the project. During the project's first two years, it will rely on three vehicles that were purchased under the recently completed RRAM project. The project will also procure seven motorbikes, one for the forester, one for the agronomist, and one for each of the communes.

USAID will finance a number of training activities. These will include a Master's degree in agroforestry or soil conservation; short-term training of project staff at ICRAF workshops; and study tours in soil conservation and agroforestry. Seminars will also be held to update project staff on research results and on soil conservation and agroforestry interventions. Support to extension will involve training of communal extension agents, the production of training materials for extension, and the organization of field days for farmers. Finally, farmer-level training will be offered.

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Research in Soil Conservation and Agroforestry

As a result of past research efforts, some basic technical packages are available for both biological and physical soil conservation, as well as for agroforestry. However, many basic questions still remain unanswered. For example, much of the research being conducted in Rwanda on the potential advantages and disadvantages of various agroforestry species has only begun within the past three to five years. This is too short a time span to provide conclusive results. For this reason it is necessary to conduct additional research and pre-extension trials of soil conservation practices. This research must focus, in particular, on the incorporation of improved agroforestry techniques into soil conservation packages.

In the first months of the project, an inventory of soil erosion problems will be completed, and plans developed for addressing erosion problems in the communes. In addition, this inventory will identify research needs and effective and appropriate soil conservation and agroforestry technologies that could be extended in the near term. Based on this inventory, specific recommendations will be made to guide the future implementation of agroforestry and soil conservation component of the project. Short-term technical assistance will be sought from AFRENA to assist in undertaking this study.

Within this research sub-component of the project, the largest single expenditure would consist of a "buy-in" into the Agroforestry Research Network for Africa for the Bimodal Highlands Project (AFRENA) network, with a contribution of approximately $200,000. This five-year, $4.0 million AID-funded project is designed to improve the state-of-the-art of agroforestry research and practices in Kenya, Uganda, Burundi and Rwanda. The funds provided by USAID will be used to cover the local costs of AFRENA activities in Rwanda.

The relatively limited budget of this project makes prioritizing research needs very important and means that, to the extent possible, the research should build upon that which has already been done. Moreover, given the limited funding available, the focus of the research should be on answering practical questions quickly and cheaply. The project will undertake relatively little research that is academically rigorous (an exception will be monitoring the Wischmeier runoff plots, discussed below). The NRM Project will, rather, rely on AFRENA to do the formal, statistically valid research that is required, since AFRENA can carry out such research in a much more cost-effective manner.

AFRENA specialists will also assist in analyzing the results of agroforestry and biological soil conservation experiments carried out under the NRM Project. Site visits by network specialists will enable them to assist and guide the design of on-farm agroforestry trials and related research in Ruhengeri Prefecture.

As noted above, the NRM Project will emphasize field research, rather than academically rigorous research. The one exception will be the observations of Wischmeier runoff plots, three of which were established and monitored under the RRAM II project, and two more of which will be created under the NRM Project. The main function of a Wischmeier runoff plot is to produce

quantitative information on soil loss and runoff as a function of different protective treatments. Such quantitative information is needed if we are to assess the magnitude and the seriousness of the erosion problem in Ruhengeri Prefecture.

Observations, analysis, and evaluation of the runoff plots will require the year-round presence of local, trained farmer-observers for the duration of the project. It also requires the participation of a trained technician and soils laboratory. Therefore, it is suggested that responsibility for implementing this task rest with ISAR and UNR, supplemented by short-term TDY from a U.S. specialist in this area. Under the project, the three Wischmeier plots created under the RRAM Project will be continued, and two others will be created (one in Mukingo and one in Buberuka).

Finally, funds will be provided to carry out a study of the hydrology of the Parc des Volcans's watersheds with the aim of developing a plan to control the torrential runoff from the mountains. This activity may be carried out in conjunction with, and co-financed by, the Karisoke Research Center (see the Natural Forest Management Component).

Nurseries and Demonstration Centers

Solid, verifiable evidence exists from RRAM, FSRP, and CARE-Gituza that at least some local people will adopt new techniques and apply them on their land without much, if any active hard-sell extension efforts. Farmers must be able, however, to see for themselves how various technologies perform under conditions similar to their own. Thus, on-farm demonstrations are a good way of putting the message out into the field. With demonstration sites, farmers can observe, consider, and judge for themselves the value of the new methods, techniques, species, and so forth that are available.

The project will establish one research and demonstration center in each commune. These centers will include nurseries and demonstration fields, where new agroforestry species, grasses and fruit tree species will be tested. Each research and demonstration center will be managed by an agricom (agronome de commune). Under the guidance of the project agroforester, each agricom will implement species performance observations and pre-extension trials. He will also serve as the liaison between the project and neighboring farmers. The nurseries will serve as the source of agroforestry trees and grasses for the research and demonstration plots as well as for local farmers. Labor for the nurseries will be provided by the project.

In addition, on-farm research and demonstration activities will be carried out with the cooperation of farmers living in the same watersheds as the research and demonstration centers. This on-farm research will be conducted within the context of an overall management plan for the watershed. These on-farm research and demonstration activities will be carried out by the farmers themselves on their own fields, with guidance from the agricom and project-trained agronomes (extension agents). The project will provide material support, such as agroforestry plants and grasses, for these activities.

The project will also give support to the existing sector nurseries (there are approximately 10 sectors per commune, and the project will work in 5 communes). The project will furnish support (seeds, bags, pesticides, etc.) to the communes for the sector nurseries, which will be managed by the members of the communes themselves, under the supervision of an agricom and monagris. The beneficiaries will contribute to the project by working on these nurseries (primarily through "umuganda" labor). The nurseries will provide new agroforestry and fruit tree species, as well as agroforestry species that are already well known and appreciated by the farmers.

Implementing Commune Forestry Plans and other Soil Conservation Works

The soil conservation and agroforestry team will assist the five Ruhengeri communes in preparing and implementing commune forestry plans. These plans will serve as a basis for subsequent forestry interventions carried out by the project. Implementation activities may include (a) the reforestation of severely degraded sites, including gullies and ravines, extremely steep slopes, and sites threatened with landslides; (b) the conversion of degraded commune forests, and (c) soil conservation works identified in the inventory of soil erosion problems (e.g. the channelling of runoff water and rural engineering techniques). The exact activities will be specified in annual work plans.

The Importance of Improved Crop Production Technology

One major constraint that has limited the adoption of soil conservation and agroforestry measures by Rwandan farmers has been their cost, in terms of labor input and in terms of a decreased amount of land available for cultivation. It is therefore important to develop technologies that require minimal labor input for installation and maintenance. At the same time, it is necessary to develop technologies that have a net positive effect on production.

Achieving this latter will be most feasible if agroforestry and soil conservation practices can be packaged with improved crop production packages. This emphasizes the importance of a close link between the Natural Resources Management Project and the agricultural research activities of ISAR, particularly those under the USAID-financed Farming Systems Research Project (FSRP) at Rwerere, and PRAPAC (Programme Regional d'Amelioration de la Culture de la Pomme de Terre en Afrique Central).

FSRP is undertaking multi-disciplinary research on beans (particularly variety selection), Irish potatoes, wheat, and sweet potatoes. Particular attention is being given to improving soil fertility (through agroforestry and soil conservation techniques). To date, four climbing bean varieties, three wheat varieties, and one triticale variety have been identified that produce more, and are more disease resistant, than traditional varieties. Similarly, the International Potato Center has been supporting, through PRAPAC, research aimed at improving potato production in the highlands. By introducing improved crop production technologies and packages developed by these and other projects, in conjunction with the NRM Project's improved soil conservation and agroforestry measures, the latter's financial attractiveness to farmers in the near term, will increase. For this reason, the NRM Project

will maintain a close working relationship with these projects, and will take advantage of their efforts.

4. Natural Forest Management

The Natural Forest Management component of the NRM Project will support efforts by the Office Rwandais du Tourisme et des Parcs Nationaux (ORTPN) and the Directeur General des Forêts (DGF) of MINAGRI to better manage and protect the two most important afromontane forests, the Parc National des Volcans and the Nyungwe National Forest. The total USAID contribution to this component of the proposed project is $1,200,000 (USAID will cover part of this total with a matching grant of $200,000 from AID's centrally-funded (Natural Resources Management Support Program (698-0461). Implementation of this component will be through Cooperative Agreements with the three PVOs with ongoing programs in these forests: The African Wildlife Foundation (AWF), which is implementing the Mountain Gorilla Project; the Digit Fund, which is operating the Karisoke Research Center; and Wildlife Conservation International (WCI - a division of the New York Zoological Society), which is carrying out the Conservation of Nyungwe Forest Reserve Project. These PVOs will, in turn, work through ORTPN and the D.G. Forêts.

The four priority areas identified for activities under this component of the NRM Project are: (a) technical and managerial staff development; (b) applied research program development; (c) conservation education; and (d) operational support and facility construction.

Technical and Managerial Staff Development

A lack of qualified and experienced professionals is the primary constraint to the improved and sustainable management of both the Parc National des Volcans and the Nyungwe Forest Reserve. To address this need, the project will support:

(a) The development of a cadre of Rwandan scientists capable of designing and implementing applied research;

(b) Increasing the number and quality of staff charged with park/reserve management, including financial and personnel managers and middle-level technicians responsible for supervisory field functions. Degree training at the Mweka Wildlife College in Tanzania, or the Garoua Wildlife Center in Cameroon, is seen as a cost effective alternative to long-term training in the U.S. (annual costs for these schools is approximately $5,000, as opposed to $25,000 for attending a European or American program).

(c) Training of guards and guides to improve their interpretive and language skills.

(d) Formalized training aimed at community leaders and educators, including Commune and Prefectoral authorities, and primary and secondary school teachers.

Applied Research

In order to better manage and conserve the natural forests of Rwanda, additional research on the physical, biological, and social environment of the two forests is critical. The knowledge base on existing conditions and trends within the forests is incommensurate with development of effective management decisions. Furthermore, the impact of local needs and interests on the forest is poorly understood. To address this need, the NRMP will provide grants to expand and diversify the research by the Karisoke Research Center and the Conservation of Nyungwe Forest Project. This research would be done in collaboration with Rwandan researchers. The highest priority for applied research would be accorded to:

(a) Biological Research. This would include inventories of the flora and fauna within the Parc des Volcans and Nyungwe Forest. These inventories would emphasize not only current status and trends, but also the potential of, and constraints to, increased use of forest products, and the potential and impact of tourism development on the flora and fauna in both areas;

(b) Physical Research. A serious study of the hydrological and climatological impacts of the Parc des Volcans and Nyungwe forest is required, particularly a quantification of the value of these forests as watersheds. In addition, much more work needs to be done on the distribution of soils in the forests, geologic formations, and topography.

(c) Socio-economic Research. The conservation and preservation of these forest areas has an adverse impact on local populations which, in the past, have exploited the forest to meet traditional needs (e.g. hunting, and bamboo and wood harvesting), and also constrains the expansion of agriculture in these heavily populated areas. If the park/reserve is to survive, the needs of the local population must be met, either directly or indirectly. This suggests the need for studies that would examine the interaction between the forests and the local population; estimate the impact, potential for growth, and sustainability of the local use of forest resources; and identify local needs and interests which must be met through alternative sources and projects. Similarly, an analysis of the practicality of a revolving fund to compensate farmers for animal damage to crops and other property, and to support small local development projects, would also be of great value. Other worthwhile research would include a study on the market potential of tourism, and an analysis of the infrastructure required by, and recurrent cost burdens associated with, tourism development.

The above studies are indicative. Detailed research plans will be developed within the context of a "Plan Directeur de Recherche" (Directorate of Research). It is suggested that a working group made up of representatives of ISAR, UNR, DGF, ORTPN, USAID, and the involved PVOs be established to prioritize research needs, to coordinate research efforts among the various institutions, and to rapidly disseminate research findings. This working

group would review and approve research proposals before they received project funding.

Conservation Education

There is evidence that the ten-year old conservation education program of the Mountain Gorilla Project has led, at least in part, to a more favorable perception of the environmental and economic importance of the Parc des Volcans by the surrounding communities. The NRM Project will finance an expansion of this program, and will support efforts already underway, through the AID/W-funded Conservation of Nyungwe Forest Reserve Project, to develop a similar program for Nyungwe Forest.

Under the conservation education program, expatriate and Rwandan experts on the forests will visit local communities and schools to explain the importance of these forests to the local population and to the nation as a whole. In particular, the NRMP will finance:

(a) The costs of preparing audio-visual materials and travelling displays that can be placed at schools and communal headquarters; curriculums and teacher training packages; and interpretive materials (e.g. park brochures and maps) that can be given or sold to visitors to the parks;

(b) The operating costs of a community outreach program directed at farmers, local community leaders, students, teachers, extension service personnel, and government officials. Such a program would involve both community visits by project staff and field trips by members of the local community to the park; and

(c) The operating costs of vocational training seminars and field trips for extension agents, foresters, wildlife managers, and university students, and so forth.

Operational Support and Facility Construction

The project will provide funds to improve the management of the Parc National des Volcans and the Nyungwe National Forest. Apart from increased training, as mentioned above, the project will provide for administrative support, vehicles and operating costs, office supplies and equipment. The project will also provide partial funding to construct and equip interpretive centers at both Nyungwe and the Parc des Volcans. These centers will not only play a vital role in the conservation education program, but will provide a focus for tourism at both locations.

5. Environmental Planning and Policy

The GOR demonstrated its commitment to environmental protection by organizing in 1985, with UNEP and GTZ support, the first "National Seminar on the Environment". The purpose of this seminar was to identify the main environmental problems facing Rwanda, and to sensitize the administration and the public to environmental issues. An interministerial working group was organized to follow through with the preparation of an environmental strategy

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for Rwanda. This group sponsored a seminar in mid-1987 that produced a useful diagnosis of environmental issues and problems, as well as terms of reference for the preparation of a national environmental strategy.

At the request of the GOR, World Bank staff visited Rwanda in November 1987 to: (1) examine the possibility of International Development Association (IDA) and/or multi-donor assistance to the GOR's environmental effort; (2) help the GOR define objectives and processes in the development of a strategy; and (3) to suggest the preparation of an environmental action plan as a component of the overall environmental strategy. A second mission, co-sponsored by IDA and USAID, visited Rwanda in February 1988 to complete objectives, and to discuss with the GOR the priorities to be addressed, the organization of the work, and the time frame of the study.

IDA financing, in the amount of U.S. $190,000, for the preparation of a National Environmental Strategy for Rwanda (NESR) and an Environmental Action Plan (EAP) was approved in May 1988 (this was later increased to $210,000). This amount is funding logistical support to the environmental office (recently transferred to MINIPLAN) in the form of temporary office space, the purchase of two vehicles, office furniture and equipment, and personnel and operating costs for a small secretariat through July 1989. The study is also funding two expatriate advisors (a total of approximately 10 person months) and a team of five national consultants. IDA and USAID are also funding the costs of periodic supervision missions and other short-term assistance.

In February, 1989, in an effort to develop a more coherent environmental policy and to supervise and coordinate natural resource activities, the GOR gave MINIPLAN responsibility for national environmental planning and policy. Prior to this, responsibility for environmental matters rested with the Division of Public Hygiene and Environment, within the Direction General for Public Health in the Ministry of Public Health and Social Affairs (MINISAPASO). Unfortunately, the environmental focus of MINISAPASO was primarily on environmental health. Broader issues, such as resource conservation in general, were not adequately addressed. In addition the placement of the environmental portfolio at a division level within MINISAPASO limited the degree of interministerial coordination. The transfer of the environmental portfolio to MINIPLAN should address both of these constraints. The MINISAPASO environmental coordinator, who has been coordinating the preparation of the National Environmental Strategy and Environmental Action PLan, has also been transferred to the Ministry of Plan, with the rank of Director.

The exact mandate, staff, budget, and organization of the environmental office within MINIPLAN has not yet been determined. The Ministry is awaiting the recommendations of the Environmental Strategy and Action Plan, which will address this matter among others. MINIPLAN has, however, requested USAID assistance under the Natural Resources management Project to fund a long-term resident advisor to assist the Minister of Plan in a number of areas. The advisor would provide:

a. Technical assistance related to the follow-up and implementation of the Strategy and Action Plan (including recommendations of the seminar and donor's round table);

b. Technical assistance in organizing an administration unit in MINIPLAN which would be capable of fulfilling the environmental mandate of MINIPLAN, and in identifying the institutional mechanisms which need to be put into place in order for MINIPLAN to carry out this mandate.

c. Technical and scientific support to MINIPLAN in their review of ongoing and proposed development activities with respect to their possible environmental impacts and relationship to environmental problems in Rwanda; and

d. Support to technical departments in developing their own capability to assess the environmental implications of their programs, and support to coordinate the programs and activities of the various government agencies involved in land use planning, natural resource management, environmental conservation and protection.

Additional and more specific terms of reference for this long-term advisor would be developed based on the findings of the NESR and EAP study team.

USAID would fund this advisor for a two-year period (approximately December 1989 to December 1991. USAID would also provide funds for the procurement of a vehicle, and a computer and other office equipment. In addition, funds are provided for logistical support and report publication, and for short-term and in-country training workshops and seminars. The GOR will provide a counterpart for this long-term advisor. In addition, a number of GOR technicians will be provided by MINIPLAN or seconded from other ministries to work on the Environmental Strategy and Action Plan.

D. Gender Participation

Women comprise approximately 54 percent of the Rwandan population and the majority of them live and work in rural areas. Studies show that although Rwandan women provide most of the agricultural labor and perform a disproportionate share of the arduous tasks such as fetching wood, water, cooking, and caring for the household, that they are frequently unequal recipients of project benefits in areas of training, dissemination of new technologies, and other interventions aimed at reaching the small farmer. As highlighted in the Social Soundness analysis for this project, (Annex G) women are often untouched by extension agents, left out in training programs, and are infrequently organized into groups for economic development purposes.

The NRMP will put special emphasis on including women in all aspects of project activities. The following are indicative ways in which USAID will ensure women's participation in the project:

-- include a covenant in the Project Grant Agreement between the GOR and USAID in which the GOR agrees not to discriminate against women in its selection of participants for training or in its recruitment for positions under the project. The USAID project manager will monitor the GOR selection of participants and encourage the GOR to increase access to training and work opportunities for women.

-- encourage those managers charged with implementing each project component to pay special attention to womens' participation. This will be especially true in the fish culture and agroforestry/soil conservation components, where training and dissemination of new technologies have the potential to increase economic returns to the farmers;

-- sensitize the Project Coordinator (Rwandan) and his TA counterpart (US) of USAID's concern in this area and encourage the Project Director's office to report on womens' participation in his quarterly reports to USAID.

-- ensure that womens' groups are identified for outreach and training;

-- ensure that, to the extent possible, women's plots are adequately represented in the selection of demonstration plots for agroforestry and soil conservation on farm trials.

-- disaggregate where possible, on-going monitoring activities to include information on women. The mid-term and final evaluations will, among other things, assess the project's impact on women.

E. Relationship with Existing Projects

1. USAID

As noted above, the Natural Resources Management Project will build upon a number of earlier A.I.D. efforts. The marais management component will incorporate the experience gained during 1987-88 in the Water Management Synthesis II project, which developed a draft strategy for the development of the small marais, as well as on the follow-up "Pilot Program for the Development of Marais" (PPM) currently underway.

The fish culture component of the proposed project is a follow-on activity to the National Fish Culture Project (696-0112), which has a PACD of 9/88. The NRM Project will also take substantial advantage of the ongoing Pond Dynamics Collaborative Research Support Program (CRSP, 936-4023) which is conducting research into pond fertilization at UNR's fish station at Rwasave.

The soil conservation and agroforestry activities in Ruhengeri prefecture will build upon the experiences of several projects, including the Ruhengeri Resources Analysis and Management Project (698-0463.06) and the Farming Systems Research Project (696-0110), the Communal Afforestation Project (698-0424.01), and the CARE-Gituza Forestry Project (698-0502.96).

The relationship between the NRM Project and the FSRP project will be particularly critical. The benefits of improved soil conservation methods will be particularly effective if combined with improved crop packages developed by the researchers at the FSRP station at Rwerere. In addition, the FSRP is, itself, carrying out research on agroforestry and soil conservation. Therefore, it is important that a strong communication link be developed between the NRM and FSRP Projects, in order to ensure that their efforts complement, rather than duplicate, each other. A Memorandum of Understanding

will be developed between the NRM Project and the FSRP Project, which will ensure cooperation between the two projects in the area of research.

At the same time, the planned efforts of the NRM Project in the Nyungwe Forest Reserve will build upon a recently signed Cooperative Agreement with Wildlife Conservation International for the Conservation of Nyungwe Forest Reserve Project. The NRM activities will encompass this initial effort, and will provide a substantial increase in resources for its conservation education and research program.

The proposed NRM project will also complement, and take advantage of, other USAID-funded activities. One linkage will be with the Agricultural Surveys and Policy Analysis Project (ASPAP, 696-0126) which is being implemented by MINAGRI's "Service des Enquetes et des Statistiques Agricoles" (SESA, the Surveys and Agricultural Statistics Service) . The NRM Project may be able to turn to SESA for much of the data that will be needed to monitor the impact of the proposed NRM Project. In addition, there will be links between NRMP activities and the SAARFA Project (Strengthening African Agricultural Research and Faculties of Agriculture, 698-0435.11), as UNR staff will carry out research under the NRM Project. The SAARFA Project is providing assistance and training to the UNR Faculty of Agriculture.

An explicit attempt will be made to incorporate several regional or centrally-funded A.I.D. projects into the NRM Project framework. These include:

- the Agroforestry Research Network for Africa (AFRENA) Project. It is planned that this regional project will take much of the responsibility for agroforestry research under the NRM Project;

- the Agricultural Water Resources Management Project (AWRM), which has been asked to support additional activities under the marais management component of the NRM Project; and

- the Natural Resources Management Support Project (NRMS, 698-0467) which has agreed in principle to fund a portion of the Natural Forest Management Component of the project.

Other sources of support could include centrally-funded projects such as the Aquaculture Research and Support Project (936-4180); the Soil Management Support Services (SMSS) Project (931-1229); and the Tropical Soils CRSP (TROPSOILS).

2. Other Donors

As noted earlier, the international donor community has demonstrated considerable interest in recent years in preserving Rwanda's natural resource base. There are donor projects in a number of areas, including soil fertility, erosion control, agroforestry, marais development, forest management, and natural forest management. Unfortunately, the activities undertaken to date have generally been discrete and uncoordinated, with each donor focusing on those limited areas in which it has some level of expertise. Interviews with major donors reveal a strong consensus on the need for better coordination by the GOR of donor activities in the natural resources area. The proposed NRM Project will complement many of the

activities of other donors, and should help the GOR to better coordinate efforts affecting the environment.

As discussed elsewhere, NRM Project assistance to the Ministry of Plan in environmental planning will be directly linked to World Bank efforts (supported by UNEP and AID) to develop an "Environmental Strategy" for Rwanda and, based upon that strategy, an "Environmental Action Plan". The Strategy and Plan are to be completed in late 1989 or early 1990. At that time, a donor's round table will be held by the GOR to solicit additional foreign assistance aimed at implementing the various activities envisioned in the Action Plan. NRMP-funded support in environmental planning will ultimately assist the Ministry of Plan in implementing the Action Plan and in coordinating donor activities. It may also lay the basis for further USAID-World Bank coordination in this area.

The NRMP activities in will complement the development programs of four other donors in the Nyungwe Forest Reserve. The Nyungwe Reserve has been divided into four Management Units. The Swiss and French are working in units 1 and 2; the Projet Crete Zaire Nil, funded by the Federal Republic of Germany, is developing unit 3; and the World Bank-financed Second Agro-sylvo-pastoral Project is working in unit 4. In general, these projects are seeking to develop and exploit the forest on a renewable basis By carrying out research on the ecology of the Nyungwe Forest, and by promoting conservation education, the NRM Project will support these other efforts.

As discussed elsewhere in this report, there are a large number of marais development activities underway in Rwanda. Some of these efforts focus on large marais, such as the World Bank-financed master plan for the development of the Nyabarongo River valley and the Canadian project to develop the Mutara valley. Others are smaller-scale efforts, principally aimed at developing small marais (e.g. the rehabilitation of the Cyili rice perimeter is an example). At the same time, the FAO and UNDP are financing a national inventory of marais. FAO is also assisting the GOR in the preparation of legislation and guidelines for the exploitation of the marais. It is clear, however, that marais development activities (both donor funded and communally-based) have gotten ahead of the ability of the GOR to monitor them. In addition, the understanding of the marais as an ecological system is inadequate to safely support such efforts. As a result, marais development efforts present a serious risk of irreparable damage to these fragile ecosystems. Consequently, the NRM Project's effort to strengthen the capacity of the GOR to manage marais activities (through training and institutional support) and to complete research on marais, will fill a critical need vis-a-vis other donor projects in the marais.

Finally, there are a number of donors working on agroforestry and soil conservation in various regions of Rwanda. The largest such project is the German-funded Projet Agro-Pastoral de Nyabisindu. The Netherlands has also been supportive in this area, with the Kirambo II Project in Cyangugu Prefecture and, in coming years, the second phase of the Gituza forestry Project. The Swiss have been particularly active in supporting agroforestry and forestry development in Rwanda. In particular, they have provided technical and institutional support to the forestry department of ISAR and to the agroforestry school at Nyamirambo. The NRM Project's activities in the area of agroforestry and soil conservation could benefit substantially from the experiences of these other donor projects. An initial NRM Project activity will be an assessment of the erosion problems of the country. This will include an examination of these projects and their experiences.

IV. COST ESTIMATE AND FINANCIAL PLAN

A. COST ESTIMATE

The total costs of the Natural Resources Management Project will be $11,402,700. This estimate is based on the assumption that $7,700,000 will be provided from "core" project funds, $200,000 from an AID/W "buy-in" and $3,502,700 equivalent from the GOR. The total AID and GOR contribution represents 69 percent and 31 percent respectively of total project costs.

Table I presents a summary of estimated costs and a financial plan. This is followed by Table II which describes the projected expenditures of USAID and the GOR for each fiscal year. Annex J presents, in detail, a pro forma budget of the estimated project costs. A weighted average of 5 percent was used as an estimate of the annual inflation rate for the AID budget. In preparing the AID budget, it was assumed that the compounded annual inflation rate for goods and services procured in the United States (52 percent of the AID contribution and 36 percent of the total project budget) would be 5.0 percent, and that the compounded annual inflation rate for goods and services procured in Rwanda (48 percent of A.I.D.'s proposed contribution and 33 percent of the total project budget) would be 10 percent. Nevertheless, taking into account the relative rate of expenditures (i.e. the relatively quick disbursement for goods procured locally), a weighted average of 5.0 percent was considered adequate for the annual inflation rate for the AID budget.

An exchange rate of 75 Rwandan Francs was used to estimate the U.S. Dollar equivalent for local currency costs. A contingency factor of .04934 was used for the USAID budget to cover unexpected changes in the estimated level of services and to reflect fluctuating exchange rates in Rwanda. Construction activities are on a small scale and large cost variances were not considered to be more than 5 percent. This Cost Estimate and Financial Plan reflect sufficient details for project planning and current cost estimates. USAID has determined that the project cost estimates are reasonably firm for the project elements. Thus, the requirement of FAA, Section 611, (a)(1) has been satisfied.

B. FUNDING OBLIGATION MECHANISMS

It is proposed that the following USAID incremental obligation schedule be accepted in order to ensure forward funding and successful implementation of this project. An initial obligation of $3 million will be made in FY 1989 and subsequent obligations are planned for FY 90 of $2.2 million, FY 91 of $2.0 and FY 92 of 0.7 million. The estimates of allowances are based on U.S.A.I.D. receiving of $7,700,000 for "core" costs and an AID/W "buy-in" of $200,000. This approach will strengthen the GOR's ability to coordinate and supervise the various public sector activities envisioned under the project. It will also enable USAID to provide the GOR with greater budgetary flexibility during the first 36 months of the project and a rapid response to the mid-term evaluation and audit planned for the end of Year 3 of the project.

C. FINANCIAL PLAN

Listed below are the major project inputs to be financed by USAID and the GOR, including inflation and contingency factors. Detailed cost estimates for each activity are shown in Annex I.

TABLE I
SUMMARY OF COST ESTIMATES AND FINANCIAL PLAN
FOR THE NATURAL RESOURCES MANAGEMENT PROJECT
($000s)

Source of Funds

Use of Funds	AID FX	AID LC	AID SUBTOTAL	GOR FX	GOR LC	GOR SUBTOTAL	TOTAL FX	TOTAL LC	GRAND TOTAL
1. Technical Assist.	1,756.7	359.8	2,116.5	0.0	0.0	0.0	1,756.7	359.8	2,116.5
2. Training	379.0	600.0	979.0	0.0	345.0	345.0	379.0	945.0	1.324.0
3. Commodities	357.8	536.7	894.5	0.0	51.0	51.0	357.8	587.7	945.5
4. Construction	0.0	945.0	945.0	0.0	300.0	300.0	0.0	1,245.0	1,245.0
5. Other Costs	1,155.0	960.0	2,115.0	0.0	2,483.0	2,483.0	1,155.0	3,443.0	4,598.0
6. Evaluation and Audit	124.5	25.5	150.0	0.0	0.0	0.0	124.5	25.5	150.0
Subtotal * * * *	3,773.0	3,427.0	7,200.0	0.0	3,179.0	3,179.0	3,773.0	6,606.0	10,379.0
Inflation	188.7	171.4	360.0	0.0	159.0	159.0	188.7	330.3	519.0
Subtotal * * * *	3,961.7	3,598.4	7,560.0	0.0	3,338.0	3,338.0	2,748.9	6,936.3	10,898.0
Contingency	162.5	177.5	340.0	0.0	164.7	164.7	162.5	342.2	504.7
TOTAL * * * *	4,124.2	3,775.9	7,900.0	0.0	3,502.7	3,502.7	4,124.2	7,278.5	11,402.7
Percentage			69.3 %			30.7	36.2	63.8	

Note: Total AID project contribution of $7.9 million assumes "core" project funding of $7.7 million and a $200,000 "buy-in" from the centrally funded National Resources Management Support Program (698-0467).

TABLE II

NATURAL RESOURCES MANAGEMENT PROJECT EXPENDITURES BY FISCAL YEAR
($000)

USE OF FUNDS	FY 89			FY 90			FY 91			FY 92			FY 93			FY 94		
	AID	GOR	TOTAL	AID	GOR	TOTAL	AID	GOR	TOTAL	AID	GOR	TOTAL	AID	GOR	TOTAL	AID	GOR	TOTAL
TECHNICAL ASSIST.																		
A. Long-term	15.0	0.0	15.0	484.0	0.0	484.0	459.0	0.0	459.0	237.0	0.0	237.0	227.0	0.0	227.0	0.0	0.0	0.0
B. Short-term	0.0	0.0	0.0	250.0	0.0	250.0	160.0	0.0	160.0	142.0	0.0	142.0	105.0	0.0	105.0	37.5	0.0	37.5
TRAINING																		
A. Long-term	0.0	0.0	0.0	120.0	0.0	120.0	60.0	0.0	60.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B. Short-term	0.0	0.0	0.0	100.0	0.0	100.0	64.0	0.0	64.0	45.0	0.0	45.0	10.0	0.0	10.0	0.0	0.0	0.0
C. In-country	0.0	0.0	0.0	247.5	69.0	316.5	185.0	69.0	254.0	110.0	69.0	179.0	35.0	69.0	104.0	2.5	69.0	71.5
COMMODITIES	81.5	0.0	81.5	530.5	51.0	581.5	183.0	0.0	183.0	82.0	0.0	82.0	15.0	0.0	15.0	2.5	0.0	2.5
CONSTRUCTION	0.0	0.0	0.0	220.0	183.0	403.0	400.0	117.0	517.0	245.0	0.0	245.0	80.0	0.0	80.0	0.0	0.0	0.0
OTHER COSTS	60.8	201.5	262.3	565.1	520.0	1,085.1	572.1	520.0	1,092.1	543.1	520.0	1,063.1	316.9	520.0	836.9	57.0	201.5	258.5
EVALUATION/AUDIT	0.0	0.0	0.0	0.0	0.0	0.0	50.0	0.0	50.0	50.0	0.0	50.0	50.0	0.0	50.0	0.0	0.0	0.0
SUBTOTAL	157.3	201.5	358.8	2,517.1	823.0	3,340.1	2,133.1	706.0	2,839.1	1,454.1	589.0	2,043.1	838.9	589.0	1,427.9	99.5	270.5	370.0
INFLATION	7.9	10.1	17.9	125.9	41.2	167.0	106.7	35.3	142.0	72.7	29.5	102.2	41.9	29.5	71.4	5.0	13.5	18.5
SUBTOTAL	165.2	211.6	376.8	2,643.0	864.2	3,507.2	2,239.8	741.3	2,981.1	1,526.8	618.5	2,145.3	880.8	618.5	1,499.3	104.5	284.0	388.5
CONTINGENCY	8.2	10.4	18.6	130.4	42.6	173.0	110.5	36.6	147.1	75.3	30.5	105.8	43.5	30.5	74.0	5.2	14.0	19.2
TOTAL	173.4	222.0	395.4	2,773.4	906.8	3,680.2	2,350.3	777.9	3,128.2	1,602.1	649.0	2,251.1	924.3	649.0	1,573.3	109.7	298.0	407.7
	AID	GOR	TOTAL	AID	GOR	TOTAL	AID	GOR	TOTAL	AID	GOR	TOTAL	AID	GOR	TOTAL	AID	GOR	TOTAL

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D. METHODS OF IMPLEMENTATION AND FINANCING

The overall financial planning and proposed methods of financing for this project are sound. The financial management capabilities of the GOR's implementing entities have been reviewed and deficiencies and constraints relative to the management of U.S. Government funds were identified during the project design. USAID disbursement of funds under the proposed project will be made in several ways. Direct payment will be utilized for training, offshore and local procurement of project commodities, NGO grants, and staff and contractor support. Periodic advances will be utilized for in-country training and workshops, vehicle operations/maintenance, a revolving credit fund and local support and operational costs. Fixed amount Reimbursement will be utilized for construction activities.

The following Table III summarizes the methods of implementation and financing the projects activities. The funding amount includes an estimated "buy-in".

TABLE III
METHODS OF IMPLEMENTATION AND FINANCING
FOR THE NATURAL RESOURCES MANAGEMENT PROJECT (696-0129)
AID INPUTS ($000s)

TYPE OF ASSISTANCE	METHOD OF IMPLEMENTATION	METHOD OF FINANCING	APPROXIMATE AMOUNT
Technical Assistance	PIO/T - Direct AID Contracts	LOC-TFCS 1/ or Direct Payment or Reimbursement	2,116.5
Training	PIL - Host Country PIO/P PIO/T - Direct AID Contracts	Periodic Advance Direct Payment Direct Payment or Reimbursement	979.0
Commodities	PIO/C - Direct AID Contracts	Direct Payment or Direct L/Com 2/	894.5
Construction	PIL - Host Country PIO/T - Direct AID Contracts	Fixed Amount Reimbursement Direct Payment or Reimbursement	945.0
Other Costs	PIL - Host Country PIO/T - Direct AID Contracts	Periodic Advance Direct Payment or Reimbursement	2,815.0
Evaluation/Audit	PIO/T - Direct AID Contracts	Direct Payment or Reimbursement	150.0
TOTAL USAID FINANCING (including inflation and contingency)			7,900.0

1/ LOC-TFCS - Letter of Credit - Transfer of Federal Credit
2/ L/Com - Letter of Commitment

E. RECURRENT COSTS

The GOR contribution to the Natural Resources Management Project is $3.5 million, approximately 31 percent of total project costs. Of the $3.5 million, $2.7 million is categorized as recurrent costs and $800,000 as investment costs. All costs are spread over the life of the project. Recurrent costs consist primarily of personnel costs (approximately 90 percent), vehicle operation and maintenance, and other costs. Beginning in Year 3 of the project, the GOR recurrent costs are expected to rise significantly, as the GOR assumes a greater proportion of costs for personnel and vehicle operation.

The GOR contribution to recurrent costs after the PACD in 1994 has been estimated by marginal contribution analysis, unlike the estimation for recurrent costs during the life of the project. Post-PACD recurrent cost estimates do not include estimates for personnel salaries and benefits, or vehicle and building operation and maintenance, when equivalent costs were already being met by the GOR before the project started. Project personnel already being employed by the GOR before the project began do not represent an additional cost to the GOR, even if they are working under the project. In the case of the agroforestry and soil conservation component, recurrent costs are not included for the small number of Rwandan personnel expected to be hired, nor for office and vehicle operation and maintenance. The reason for is that MINAGRI is in the process of establishing a new regional organization called a "Unite Operationelle". This organization, already established in some regions, will be set up at the sub-prefecture level or within a group of three or four communes. It will be responsible for the local administration and extension work for MINAGRI, as well as for managing the Rwandan part of donor-sponsored projects within its jurisdiction. As a result, the Rwandan personnel working in bilateral or multilateral projects, and in the former regional and local structure of MINAGRI, will be absorbed by this new organization. It is also expected that, as projects reach their completion date, that the number of personnel in the organization will be reduced, especially at the lower grades.

Regarding vehicle and operation costs, the vehicles purchased for the project will generally replace GOR vehicles currently in operation. It is assumed that the new vehicles will be operated with the recurrent costs provisions established for the old ones.

In view of the above assumptions, it is estimated that GOR recurrent costs after the PACD will rise, per project component, per year, as shown below:

Project Component	US $/year
1. Project Coordination	1,000
2. Improved Marais Management	101,000
3. Integrated Fish Culture	82,000
4. Agroforestry and Soil Conservation	5,000
5. Natural Forest Management	81,000
6. Environmental Planning and Policy	1,000
Total Recurrent Cost per year after LOP	271,000

Although the 1989 GOR budget has not yet been published, it is expected that GOR allocations to natural resource management activities will not be less than the amount allocated in 1988. It is noteworthy that allocations to natural resources management activities in 1988 were higher than in preceding years. In 1988, the MINAGRI budget totalled nearly 850 million Rwandan Francs ($11.3 million). Of this amount, $1.4 million was allocated to the Direction Général des Forêts and $3.1 million to the Direction Général du Génie Rural et de la Conservation des Sols. Other departments of MINAGRI which account for the rest of the MINAGRI budget, and which are engaged partially in natural resources management activities, include, the Office of Agricultural Production and the Office of Animal Husbandry. The Ministry of the Interior and Commune Development, responsible for community public works, was and will also permanently be involved in NRM activities.

The President of the Republic of Rwanda and the National Revolutionary Movement for Development, have declared 1989 the Year of Rural Auto-Organization; this aspect particularly involves the Ministry for Youth and Cooperative Movement activities. The President's program for his new five year term stresses the need for permanent efforts in natural resources management and it introduces environmental protection as a vital aspect of government policy.

The GOR expenses for natural resources management activities in 1988 totalled approximately $13.1 million, $8.6 million in the Development Budget and $4.5 million in the Ordinary Budget. The Development Budget for Rwanda provides financial information on 15 natural resources management projects as follows:

	(In millions of US Dollars)		
	GOR	Loans/Grants	Total
11 projects	7.7	18.0	25.7
(in percent of total)	30%	70%	100%
3 projects	0.9	-	0.9
1 project	-	4.7	4.7
Total expenses in Budget de Développement for NRMP Projects	8.6	22.7	31.3

Severe austerity cuts have been imposed by the GOR for the 1988 Ordinary Budget, including a 20 percent reduction in allocations for gasoline and vehicle maintenance. These measures and the blocking of an automatic 3 percent annual increase of individual public servants salaries in the 1988 Budget (lifted in November 1988), did not affect GOR disbursements for projects financed in the 1988 Development Budget. As a result of the GOR's emphasis on the conservation of natural resources, it is expected that budget allocations for natural resource activities will not decrease in the immediate future. Past experience in working with the GOR suggests that, barring a severe economic crisis, that GOR will continue to honor its obligations resulting from this project.

V. IMPLEMENTATION PLAN

The overall administrative coordination and management of the project will be the responsibility of a Project Coordinating Committee (Comite de Coordination), which will include representatives of MINAGRI, ORTPN, MINIPLAN, USAID, ISAR, and MININTER and USAID. MINAGRI will be responsible for the marais, fish culture, and agroforestry and soil conservation components. ORTPN will have primary responsibility for the natural forest management component. MINIPLAN will be responsible for the environmental planning component.

Day-to-day coordination and management of the project will be the responsibility of a Coordination Unit (cellule de coordination) composed of a Rwandan national director for the project, and an expatriate advisor. The national coordinator will be designated by the Project Coordinating Committee MINAGRI. This unit will work closely with MINAGRI, ORTPN and MINIPLAN in coordinating field activities, and will report to the Coordinating Committee.

Actual implementation of the subcomponents will be carried out in the field by representatives of the three GOR agencies and by Private Voluntary Organizations (PVOs). Representatives of these agencies and organizations will constitute a Comite Technique which will meet quarterly, together with the National Director and Resident Advisor, to discuss project implementation, prepare work plans, and to address issues that arise. An organigram of the project is presented in Figure 1.

It is intended that an institutional contract will be let to provide two long-term technical advisors for the project. This contractor will also coordinate and/or provide short-term technical assistance and U.S. and third country training. The contractor may be a U.S. consulting firm, a PVO, a U.S. university, or a combination of the above. The Natural Forest Management portion of the project will be implemented through Cooperative Agreements to three PVOs currently working with ORTPN and the DG Forêts in the targeted natural forests. PVO participation will also be sought to provide on-the-ground support for the agroforestry and soil conservation activities in Ruhengeri Prefecture. Short-term technical assistance will be obtained, to the extent possible, through local sources or through "buy-ins" to centrally- and regionally-funded AID projects (see below).

Long-term Technical Assistance

The NRMP will finance two long-term advisory positions under the primary institutional contract. One of these advisors, together with the Rwandan Project Director from MINAGRI, will be responsible for the overall supervision of the project. The duties of this advisor will include:

a) monitoring the progress of the project towards the achievement of its goals;

b) identifying and resolving implementation problems as they arise;

c) ensuring that the activities of the various implementing agencies (e.g. PVOs, communes, MINAGRI, centrally-funded TA,) under the separate components of the project are coordinated;

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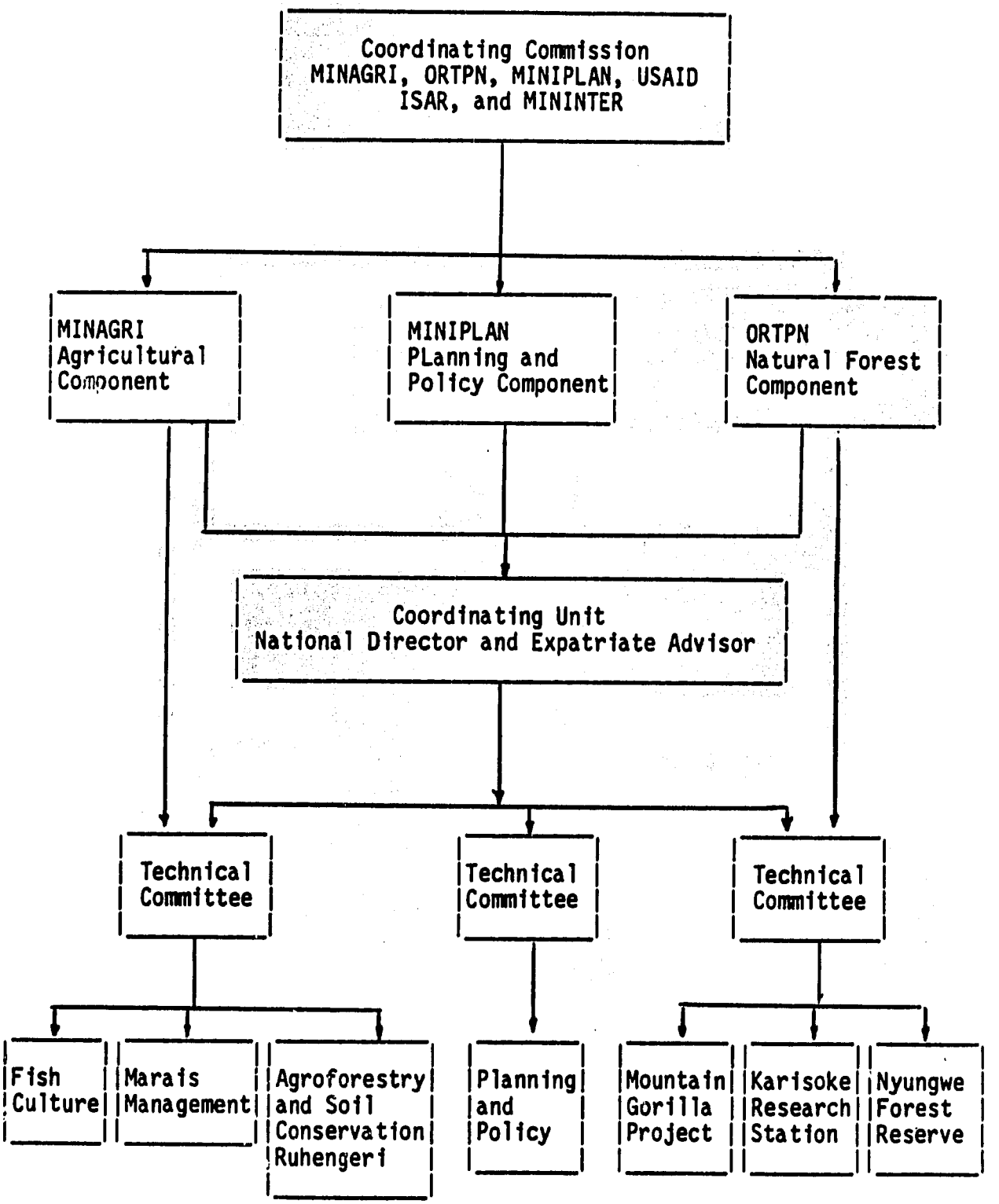
Coordinating Commission
MINAGRI, ORTPN, MINIPLAN, USAID
ISAR, and MININTER
MINAGRI
Agricultural
Component
MINIPLAN
PLanning and
Policy Component
ORTPN
Natural Forest
Component
Coordinating Unit
National Director and Expatriate Advisor
Technical
Committee
Technical
Committee
Technical
Committee
Fish
Culture
Marais
Management
Agroforestry
and Soil
Conservation
Ruhengeri
Planning
and
Policy
Mountain
Gorilla
Project
Karisoke
Research
Station
Nyungwe
Forest
Reserve

d) ensuring that the activities of the project are linked to, and coordinated with, the GOR's agricultural research and extension programs;

e) reviewing and making recommendations with respect to work plans submitted by the various participating institutions.

f) setting objectives and coordinating data collection for measurement of project impact;

g) interfacing between USAID and the GOR and reporting to USAID on project implementation (i.e. work plans and financial reports);

h) identifying short-term TA needs, assisting in the recruitment of appropriate technical advisors, and providing them with logistical support; and

i) identifying training needs and coordinating in-country, third country and U.S. training.

This individual will not have a specific technical assignment. Nevertheless, he will be involved in setting objectives and monitoring progress for all five project components. Therefore, this individual should have an advanced degree in natural resources management or some other environmentally-related discipline, and should have substantial experience in the management of natural resources projects in developing countries.

Two person-years of resident technical assistance will be funded in order to implement the Environmental Planning component of the project. This individual will work with MINIPLAN. A summary of his responsibilities is presented in the Environmental Planning section of the project description (Section III-C-5).

Funding will be provided by the project for a resident technical advisor in marais management. This advisor will provide assistance, on a three-quarter time basis and over a 24 month period, to the Division Amenagement Hydro-Agricole of MINAGRI in implementing the marais management component of the project. This individual will be recruited locally, through a personal services contract.

Funds will also be allocated to purchase the services, over the life of the project, of an engineer under a personal services contract. This individual will assure quality control to USAID for construction and engineering activities undertaken by the project. The engineer will only work part-time on the project.

Some funding will be earmarked to cover the costs of Coordination Unit Operations. This will include office rental, salaries of a secretary, accountant, etc., and office furnishings and supplies. In addition, funds will be set aside for a mid-term and a final evaluation of the project, as well as for carrying out a financial audit.

Short-term Technical Assistance

Funding will be provided under the project for the procurement of short-term technical assistance. In order to stretch these funds as far as possible, they will be used, to the extent possible, for buy-ins to central and regionally-funded AID projects dealing with natural resources. Examples of such projects include: the Agroforestry Research Networks for Africa (AFRENA) Project; the Soil Management Support Services (SMSS) Project; the Tropical Soils CRSP (TROPSOILS); the Natural Resources Management Support (NRMS) Project; the Forestry Support Program, and the proposed Agricultural Water Resources Management Project (AWRM). Such projects could provide technical assistance and training to the NRM Project if the latter covers a portion of the cost. For example, a regional or centrally-funded project might cover the salaries of technical advisors, if the NRM Project covers transportation, per diem and local costs. Using this mechanism, it may be possible to significantly expand the resources available to the NRM Project.

TABLE 1: Tentative Implementation Plan

DATE	ACTION
May 1989	Signature of Project Agreement.
June 1989	Signature of Cooperative Agreements with natural resources management PVOs and possibly with a PVO to implement the Agroforestry and Soil Conservation Component.
June 1989	Issuance of a Request for Technical Proposals for the principal Contractor.
June 1989	Signature of a Personal Services Contract with a local expert in marais management. Commencement of the work for this individual.
Sept. 1989	Submission to USAID of the First Annual Workplan.
Oct. 1989	Selection of Contractor for contract coordination.
Jan. 1990	Arrival of resident advisors (coordinator, environmental planner, and soil conservation expert).
Jan. 1990	Commencement of the Marais Training Program for A2 technicians.
June 1990	Departure of the first MS candidate in fish culture and MS candidate in soil conservation/agroforestry.
Sept. 1990	Submission to USAID of Second Annual Workplan.
Oct. 1990	Submission to USAID of First Annual Report.
June 1991	Completion of Marais Training Program for A2 technicians.

TABLE 1: Tentative Implementation Plan

DATE	ACTION
June 1991	Completion of contract for Marais Management PSC.
June 1991	Completion of construction of soil conservation offices in Ruhengeri, and completion of interpretative centers in Nyungwe Forest and Parc des Volcans.
Sept. 1991	Submission to USAID for Third Annual Workplan.
Oct. 1991	Submission to USAID of Second Annual Report.
Jan. 1992	Departure of Environmental Planning Advisor.
June 1992	Return of soil conservation/agroforestry MS participant and first fish culture MS candidate. Departure of second fish culture MS candidate.
June 1992	Mid-term Project Evaluation.
Sept. 1992	Submission to USAID for Fourth Annual Workplan.
Oct. 1992	Submission to USAID of Third Annual Report.
Nov. 1992	Project Audit
Sept. 1993	Submission to USAID for Fifth Annual Workplan.
Nov. 1993	Final Project Evaluation.
Jan. 1994	Submission to USAID of Final Project Report.
Jan. 1994	Departure of expatriate project coordinator and soil conservationist.
Apr. 1994	Return of second fish culture MS candidate.
April 30, 1994	Project Activity Completion Date.

VI. PROCUREMENT PLAN

1. Responsible Agency

Overall responsibility for implementing the Natural Resources Management Project, including the procurement of project commodities, will rest with the Project Coordinating Committee. The GOR Project Coordinator will manage the project on behalf of the GOR. This individual will be responsible for authorizing the expenditure of project funds; for approving and signing Project Implementation Orders, Project Implementation Letters, and other forms of obligating documents; for monitoring the procurement process; and for acknowledging to USAID, by the issuance of receiving reports, the receipt of goods.

2. Purchasing Entities

Procurement responsibility for the various components of this project will be divided among the prime contractor, the PVO(s), USAID and a Procurement Services Agent (PSA). This division breaks down as follows:

A. Marais Management and Integrated Fish Culture Components

For the Marais Management and Integrated Fish Culture components, procurement responsibility will be shared by the Contractor, USAID and a PSA under the REDSO/ESA PSA Indefinite Quantity Contract (IQC). The Contractor will be directly responsible for purchasing approximately $113,000 of computer equipment, training materials and miscellaneous field equipment. USAID will purchase all motor vehicles, and the PSA IQC will purchase rural engineering equipment valued at over $100,000. The PSA may also assist with the purchase of fishing equipment and supplies (value: $30,000) if the Contractor so requests.

B. Agroforestry & Soil Conservation Component

Purchases for this component will be the direct responsibility of the PVO that is selected to implement this component. USAID may assist with the procurement of vehicles and motorbikes if the PVO proves incapable of securing these items alone.

C. Natural Forest Management, and Ministry of Planning Components

The various PVOs associated with the three sub-components of the Natural Forest Management component of this Project (the Mountain Gorilla Project, Nyungwe Forest Reserve, and Karisoke Research Center) will be responsible for the purchase of vehicles and motorbikes. USAID assistance may be provided if required. The PVOs implementing the Mountain Gorilla and Conservation of Nyungwe Forest Reserve Projects will be responsible for purchasing office supplies, education and technical materials (value: $84,000). A high proportion of these goods will, in all probability, be sourced locally. The Contractor will purchase audiovisual equipment for Mountain Gorilla Project, exhibiting equipment for the Nyungwe Forest Project, and computer and laboratory equipment for the Karisoke Research Center. USAID will purchase a vehicle for the Ministry of Planning.

3. Development Fund for Africa Certification

This Project will be funded by resources provided under the Development Fund for Africa (DFA). Under DFA, the Assistant Administrator for Africa approved a number of Administrative Recommendations which (1) transfers nearly all DFA waiver implementation authority to USAID; (2) "unties" whenever possible the eligible source to AID Code 935 (Special Free World); and (3) directs USAIDs to formulate sufficiently comprehensive procurement plans to assure that procurement is from the United States to the maximum extent practicable.

The authorized source for procuring motor vehicles is AID Code 935, and a no "special circumstance" waiver is required to be executed by the Project Officer to purchase such vehicles from non-U.S. sources. Because U.S. manufactured vehicles are unavailable in Rwanda, the Project intends to purchase vehicles from Code 935 sources.

Of the other items to be purchased, only those items which are not currently made in the U.S. (e.g. certain audiovisual equipment) or which, because of their very nature, cannot be purchased and shipped to Rwanda at a reasonable cost, will be purchased offshore. As such, USAID/Rwanda, in accordance with Agency Africa Bureau Guidelines, is maximizing US procurement whenever practicable.

The approximate division between US and non-US procurement is as follows:

($000's)	US	%	non-US	%	Total
Vehicles included	277	31	616	69	893
Vehicles excluded *	276	60	184	40	460

* $343,500 budgeted for vehicles

Significantly, when vehicles are excluded from the commodity listing, about 60 percent of the projected purchases are expected to have their source and origin in the U.S. It must be recognized, however, that this figure could drop if potential U.S. commodity suppliers fail to respond to purchase requests, a common occurrence in this part of Africa. The USAID Project Officer assigned to monitor this project will keep records of all commodities purchased by the project by AID Geographic Code and will report this information on a yearly basis to AFR/PD.

The list in Table 2, drawn-up with the assistance of the REDSO/ESA Regional Commodity Management Officer, was prepared with the intent of maximizing US purchases whenever practicable.

4. DFA Procurement under Grants and Cooperative Agreements

According to AID Handbook 1B, Chapter 16, when the total procurement element of a grant or cooperative agreement is $250,000 or less, the grantee must follow an order of preference for procurement: (1) U.S. only, (2) host country, (3) Code 941, and (4) Code 935. Since the authorized procurement source under DFA is Code 935, the $250,000 ceiling does not apply.

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Table 2 : Equipment List

Item	Qty	Prob. Source and Origin	Procurement Agent	Budget (US $)
I. MARAIS MANAGEMENT COMPONENT				
01. Minibus (18-25 seat capacity)	1	EUR/JAPAN	USAID	35,000
02. Vehicle (4-WD double cabin)	1	EUR/JAPAN	USAID	35,000
03. Training Materials	-	US/HC/EUR.	CONTRACTOR	10,000
04. Computer Equipment	-	US/EUR/JAPAN	CONTRACTOR	10,000
05. Rural Engineering Equipment	-	US	PSA	115,000
06. Misc. Field Activity Equipment	-	US/HC/EUR.	CONTRACTOR	30,000
07. Misc. Field Equip. for DAHA	-	HC	CONTRACTOR	20,000
		Subtotal (I)		255,000
II. INTEGRATED FISH CULTURE COMPONENT				
01. Vehicle (small 4-WD truck)	2	EUR/JAPAN	USAID	40,000
02. Computer Equipment	-	US/EUR/JAPAN	CONTRACTOR	10,000
03. Fishing Equipment & Supplies	-	US	CONT/PSA	30,000
		Subtotal (II)		80,000
III. AGROFORESTRY AND SOIL CONSERVATION COMPONENT				
01. Vehicle (standard 4-WD truck	3	EUR/JAPAN	USAID/PVO	100,000
02. Motorbikes (125-185 cc)	7	JAPAN	USAID/PVO	21,000
03. Misc. Equipment	-	US/HC/EUR.	PVO	29,000
		Subtotal (III)		150,000
IV. NATURAL FOREST MANAGEMENT COMPONENT				
A. Mountain Gorilla Project				
01. Vehicle (small 4-WD truck)	2	EUR/JAPAN	USAID/PVO	40,000
02. Office Supplies & Equipment	-	US/HC/EUR.	PVO	40,000
03. Audio-Visual Equipment	-	US/JAPAN	CONTRACTOR	30,000
B. Nyungwe Natural Forest				
04. Vehicle (pick-up)	1	EUR/JAPAN	USAID/PVO	20,000
05. Vehicle (small 4-WD truck)	1	EUR/JAPAN	USAID/PVO	20,000
06. Motorbikes (125-185 cc)	3	JAPAN	USAID/PVO	7,500
07. Office Supplies	-	HC/EUR.	PVO	13,000
08. Educational Material	-	US/HC/EUR.	PVO	15,000
09. Tech. Materials & Field Equip.	-	US/HC/EUR.	PVO	16,000
10. Furnishings & Exhibiting Equip.	-	US/HC/EUR.	CONT/PVO	20,000

Table 2 : Equipment List (cont.)

Item	Qty	Prob. Source and Origin	Procurement Agent	Budget (US $)
C. Karisoke Research Center				
11. Vehicle (small 4-WD truck)	1	EUR/JAPAN	USAID/PVO	20,000
12. Motorbikes (125-185 cc)	3	JAPAN	USAID/PVO	5,000
13. Computer & Office Equipment	-	US/EUR/JAPAN	CONTRACTOR	10,000
14. Laboratory Equipment	-	US/EUR.	CONTRACTOR	5,000
		Subtotal (IV)		261,500
V. MINISTRY OF PLANNING				
01. Vehicle	1	EUR/JAPAN	USAID	20,000
02. Computer	-	US/EUR/JAPAN	CONTRACTOR	15,000
03. Office Equipment	-	HC	CONTRACTOR	10,000
04. Household furnishings	-	US/HC/EUR	CONTRACTOR	30,000
		Subtotal (V)		80,000
VI. Project Coordination				
01. Computer Equipment	1	US/EUR/JAPAN	USAID/PVO	10,000
02. Office Equipment	-	H/C	CONTRACTOR	8,000
03. Vehicle	1	EUR/JAPAN	CONTRACTOR	20,000
04. Household furnishings	-	H/C	CONTRACTOR	30,000
		Subtotal (VI)		80,000
		Total (I-VI)		894,500
		Contingency (11%)		98,395
		Grand Total		992,895
		ROUNDED TOTAL		993,000

5. Local Cost Financing - Shelf Items

Imported shelf items are items imported and kept in stock to meet a general demand for these items within the country. Under pre-DFA rules, shelf items from Code 899 (Free World) sources could be financed if their total cost were less than $25,000 for any given project and did not exceed 10 percent of the AID funds available for local costs, and if each item costs the local currency equivalent of $5,000 or less. The Shelf Item Rule Dollar limitations for Code 899 procurement noted here no longer apply to DFA purchases.

6. Commodity Marking

Commodities purchased by the project will be appropriately marked with the AID handclasp emblem. The PSA will be instructed to ensure that goods it purchases are marked at source. The USAID will maintain a supply of emblems for distribution to MINAGRI for marking commodities purchased locally, as well as for marking the vehicles purchased for the project.

7. Procurement Schedule

Realistic advance planning for the procurement of all equipment and materials is essential for project success. Lists of needed commodities and anticipated costs will be prepared at the initial stages of the project and further refined before any procurement occurs. For the various entities involved in procurement, all will take into account the significant time required to complete some or all of the following steps: (1) contracting with the PSA (discussed in greater detail below); (2) preparing specifications and solicitation documents; (3) advertising; (4) preparing bids or offers by suppliers; (5) evaluating responses; (5) conducting negotiations; (6) issuing contracts or orders; (7) establishing payment documents; (8) manufacturing, inspecting and packing equipment; and (9) transporting and clearing equipment from customs.

Because of the disparate nature of this project, no target dates for project procurement can be established at this time.

8. Procedures for Employing the REDSO/ESA PSA IQC

The contractor and USAID will collaborate jointly in preparing the documentation required to permit employing the services of the PSA under the REDSO/ESA IQC for procurement services. USAID will prepare the PIO/C, with the contractor preparing the specifications. Before forwarding the PIO/C and specifications to REDSO, the Mission will ensure that sufficient funds (usually from 6-8 percent of the FAS value of the commodities) have been reserved for the PSA's fee).

REDSO Contracts will negotiate the work order with the PSA, providing cable notification to USAID once the work order has been signed. USAID is responsible for initiating the financing documents to pay the PSA's fee, as well as for the commodities. The fee will be paid directly by USAID, while payment of the commodities will be through a bank letter of commitment issued by AID/W. The PSA will be designated as the approved applicant to direct issuance of letters of credit to suppliers under the bank letter of

X

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commitment. RCMO assistance will be provided as needed.

9. Contingency Plan for Procuring Vehicles Directly from U.S. Embassy Japan

Because of the uncertain availability of vehicles in Rwanda, the project will retain the option of utilizing the Central Procurement Office in the US Embassy in Tokyo to obtain vehicles and vehicle parts directly from Japan. Orders will be accepted for project vehicles on behalf of the grantee or procurement conducted by the host country itself. RCMO assistance will be provided as needed.

VII. MONITORING AND EVALUATION PLAN

A. PROJECT MONITORING

All project activities will be carefully monitored throughout the life of the project. The monitoring process will: (1) collect information that will subsequently enable both the USAID and GOR project managers to compare reported progress against planned inputs, outputs, and objectives; (2) alert project managers and policy makers to implementation problems requiring corrective action; and (3) provide information needed to prepare project evaluations, including information on conditions and assumptions which are critical to the success of the project.

B. PROJECT REPORTING

To ensure that the objectives of the project are attained, the following planning documents and reports will be produced.

1. A draft Annual Workplan will be prepared by the staff of each component and sub-component and submitted to the Project Management Committee for its review and approval within 120 days of the signature of the Project Agreement. This Annual Workplan will be revised based on comments from the Project Management Committee and will be submitted to USAID for review and approval by September 30, 1989, and annually thereafter. This workplan will specify the objectives, targets, and outputs of each activity underway or planned. The Annual Workplan will also outline the steps to be taken in reaching these objectives, and will specify those resource requirements necessary for its implementation (e.g. will contain budgets detailing actual, planned, and projected expenditures).

2. An Annual Report will be prepared in October 1990, and annually thereafter. These annual reports will summarize the activities carried out during the preceding year, as well as the progress made by the project towards attaining its output objectives.

3. A Final Project Report will be submitted in January 1994, three months prior to the PACD.

4. All annual workplans and annual reports will be prepared in both English and French. Other reports may be prepared in English and/or French as may be mutually agreeable to the GOR and USAID.

C. SUGGESTED METHODOLOGY FOR DATA COLLECTION

Monitoring project performance and evaluating the impact of the proposed project will entail the collection of selected data during the course of project implementation. The majority of this data will be collected by the entities implementing the project in the field. The project's evaluation plan emphasizes practicality over sophistication. Given the hilly terrain, poor road conditions and dispersed residential pattern in the proposed project areas, NRMP will encourage the use of simple, low cost data collection techniques, including rapid rural appraisal methods, and the extension-based monitoring systems, such as that developed by the Fish Culture project.

1. Fish Culture

The fish culture component of the proposed project will build upon the activities of the National Fish Culture Project (696-0112), which has already incorporated a monitoring and evaluation system into its extension program. This program has included: (a) monthly extension agent reports; (b) monthly supervisor reports; (c) monthly station reports; (d) detailed station pond records; (e) individual private pond records; (f) pond management evaluations; (g) pond censuses; (h) fingerling orders; and (i) pond harvest work sheets. Through these reports, data has routinely been collected on pond and station production (e.g. fish stocking rates, harvests, the level and cost of inputs used, fingerling distribution, and fish marketing). Data has also been collected on beneficiary characteristics, including the number and types of farmers involved in fish culture. and the effectiveness of the extension program. The National Fish Culture Project also involved a number of special studies which contributed substantially to the data base, including a socio-economic survey of fish producers.

Under the fish culture component of the NRM project, this effective management information system will continue to provide the information needed for project monitoring and evaluation. The procurement of data processing equipment will facilitate the analysis of the data. This will be particularly important since, with integrated fish culture, data will also need to be collected on crop and livestock production, and the interrelationships between these and fish production.

2. Marais Development

A study of the socio-economic issues important for marais development is envisioned as part of the marais management component of the project. This study will focus on the model marais and, in all likelihood, will entail a socio-economic survey which will provide a good set of baseline data. This study will most likely be undertaken by researchers and students from UNR. The researchers, themselves, will develop their own research plan and methodology. The baseline survey will recommend a follow-up program to collect the additional data needed to assess changes in socio-economic indicators and thus the impact of the project.

3. Agroforestry and Soil Conservation

GOR agencies, PVO's and communal authorities implementing reforestation, agroforestry and soil conservation activities will set up their respective monitoring systems. The information obtained from extension-monitoring systems will be routinely included in the quarterly and annual activity reports submitted to USAID/Rwanda. It will be used to assess the overall performance of the agricultural components of NRMP and in identifying implementation issues. The project will ensure that the monitoring system can effectively measure indicators of project progress, such as the effectiveness of soil conservation measures and tree plantings by farmers.

A preliminary assessment of the monitoring system set up under the CARE Gituza Forestry Project indicates that a system based on collecting pertinent

agroforestry and soil conservation data from reports of extension workers and close supervision of extension activities, can provide adequate information on extension activities and farmer response. A modification of this management information system could be used for the agroforestry and soil conservation activities envisioned under the Natural Resources Management Project.

4. Natural Forest Management

The collection of baseline data will be a major activity under the Natural Forest Management component of the project. Under the research component of the project, data will be collected on flora and fauna populations, use of the forest, and the physical characteristics of the forest. However, it is unlikely that, in the five-year life of the project, statistically significant changes in many of these variables will be observable. Nevertheless, the three PVOs that will manage these subcomponents will develop monitoring and evaluation systems which will: (1) provide information on project activities, and (2) monitor changes in forest use. Particular attention will be given to indicators such as: tourist visits and revenues, poaching violations, population levels within the forest boundaries (i.e. in Nyungwe).

5. Environmental Planning

In the initial months of the project, MINIPLAN, together with the resident advisor, will develop progress indicators for the project's efforts to improve the GOR's environmental planning and policy analysis capability. These measures could include the preparation and approval of strategy documents for various sectors (e.g. marais development, fish culture), actions taken to address selected environmental problems, and so forth.

D. PROJECT EVALUATION

In addition to the internal project monitoring activities described above, two external evaluations (a mid-term evaluation around June 1992 and a final evaluation around November 1993) will be commissioned by USAID/Rwanda to assess the success of the project in meeting its Goal, Purpose, and Output objectives. Technical assistance to carry out these evaluations will be contracted by A.I.D., and will be financed through the project. The evaluations will be designed to meet the criteria stipulated in AID's Evaluation Handbook (AID/W, April 1987). These are:

Relevance	Are the goals of the project still consistent with the development objectives of AID?
Effectiveness	Is the project achieving satisfactory progress towards its anticipated outputs.
Efficiency	Are the project's outputs being achieved at an acceptable cost compared with alternative approaches towards accomplishing the same effects?
Impact	What positive or negative effects have resulted from the project?

Sustainability Are the effects of the project likely to be sustained by farmers and GOR agencies after AID funding has stopped?

Apart from assessing the project's progress against its stated inputs and outputs, the mid-term evaluation should offer recommendations to improve project performance, while the final evaluation should determine whether the benefits generated will be sustained after AID funding has stopped. These evaluations should also review whether USAID/Rwanda has provided adequate management support to the project.

The evaluations will each involve a multi-disciplinary team, including experts in natural resources, agroforestry and soil conservation, an natural resource or agricultural economics, aquaculture, and social science. All evaluation team members should speak fluent French and have working experience in Africa.

In addition to the two evaluations, there will be a financial audit of the project in November 1992.

E. AUDIT PLAN

A financial audit of the project will be held in Year 3 of the project.

This NRM Project will provide funds to U.S. contractors and grantees, with no departure from standard methods of financing foreseen. In the event of a grant to an indigenous PVO, a financial management assessment will be required as a prerequisite. It is probable, however, that any grant benefiting an indigenous PVO would pass through a U.S. PVO meeting AID financial management standards.

VIII. SUMMARY OF ANALYSES

A. Technical Analyses Summaries

1. Marais Management

Small marais (wetlands) cover approximately 90,000 hectares of Rwanda. These areas are among the last land resources to be put into agricultural use in this country. Small marais show a significant potential for increased agricultural productivity. However, over the past few years, the development of marais lands has become increasingly uncontrolled. Many donors, large and small, have launched projects in the marais. The government, seriously understaffed in the agricultural engineering sector, can only monitor the largest of these projects. In 1987, in order to gain more insight into the options for improving the situation, the GOR conducted, with USAID financing, a study to develop a national strategy for small wetland development. The National Strategy Study made far reaching recommendations for the small marais. The most important of these are given below (the text within brackets indicates what steps the GOR has already taken to address these recommendations).

a. Authority on the development and management of small marais should be transferred to the commune level, and communal structures should be reinforced to effectively manage the small marais. [The Sixth Congress of the country's principal political party, the Mouvement Revolutionaire National pour le Developpement (MRND), which was held in Kigali in June 1988, approved the proposition that the resources of the small marais should henceforth be developed and managed at the commune level].

b To enable the communes to carry out this task, at least one agricultural technician should be posted at each commune. Thus, the training of technicians, particularly to an A2 level in rural engineering (génie rural), is a high priority.

c. In order to provide incentives for productive investment in marais, cultivation rights should be given for longer periods of time (e.g. 15 years) and should be automatically renewed under normal circumstances.

d. Farmers and, preferably, farmer organizations should participate directly in the management of the marais.

e. Further research should be carried out in the fields of: hydrology, soil fertility, local organizations, marketing and on socio-economic issues, in order to develop appropriate technologies to exploit marais in a sustainable and locally manageable manner.

f. A national inventory of wetland areas should be undertaken. [An inventory of Rwanda's wetlands is scheduled for 1989, with financing from FAO/PNUD].

g. Legislation governing the marais must be enacted, aimed at better defining the roles and responsibilities of those individuals and

groups involved in the exploitation of the marais. [Legislation covering the marais has been drafted with the assistance of FAO. The text is in final draft form in MINAGRI].

In December 1987, MINAGRI requested USAID assistance to follow-up on the Water Management Synthesis II project with additional study of the small marais sector. USAID provided FRw 20 million (approximately $250,000) from the monetization of PL 480 vegetable oil to MINAGRI to support a new program, entitled "Pilot Program for the Development of Marais" (PPM). The objective of PPM is to apply and fully analyze the recommendations of the WMS II study. This program collaborates with the communes of Tare and Mbogo in the Prefecture of Kigali, and Tumba Commune, in the Prefecture of Byumba, on the planning of field-level activities.

As indicated above, MINAGRI has taken several steps to implement the National Strategy recommendations concerning the small marais. Nevertheless, additional work needs to be done, not so much in terms of pure hydrological or agricultural management, but in terms of the social, organizational, economic and ecological aspects of marais development. Particular attention needs to be given to examining the watersheds as a single entity, i.e. assessing the impact of upstream activities on the development of any given marais, and the impact of marais development on downstream users.

At the present time, several donors are beginning, or have expressed interest in, financing the development of specific marais. A critical constraint, however, will be the ability of the government and the communes to monitor these activities and to ensure that they are technically and environmentally sound and consistent with the long-term welfare of local populations. It is the objective of the NRM Project to provide such capacity and, as a result, the benefits of the project will extend to marais development efforts throughout the country.

It should be noted that the funds available under this project will not be sufficient to meet all of the marais management needs that have been identified by the government. Therefore, USAID will seek to supplement project funding by buying into the AID/W-funded Agricultural Water Resources Management Project (AWRM).

2. Integrated Fish Culture in the Marais

A second component of the Natural Resources Management Project will involve the promotion of integrated fish culture/crop/livestock production systems in marais. There are two principal reasons for this focus. First, as is clear from the economic analysis of this project, integrated aquaculture offers great economic potential for marais development. Second, USAID has substantial experience in the support of fish culture in Rwanda, as a result of its very successful Fish Culture Project (696-0112) with the Service Pisciculture Nationale (SPN), a service within MINAGRI's Direction Generale d'Elevage. USAID wishes to build upon this strong working relationship and the accomplishments of that project.

Under the Fish Culture Project, USAID invested $2.45 million to develop the capacity of Rwandan farm families to build and maintain profitable on-farm

fish ponds. Specifically, the project renovated ponds and constructed facilities for the Kigembe Fish Culture Center, as well as five prefectural stations producing fingerlings. Training in fish culture was provided to 54 moniteurs, who now constitute the core of a fish culture extension service reaching 59 communes (out of a total of 143). In addition, the extension agents have provided technical advice for the renovation of 1081 ponds and the construction of another 721 ponds.

As a result of the project, average fish production in those farmer-managed ponds receiving SPN extension support increased from 340 to 1500 kg/ha/year (as of September 30, 1988). The total surface area of these ponds is 101 hectares. This has meant an increase in total national production of over 117 MT/year. As of December 1988, there were 2889 ponds, involving over 19,700 farmers (17,600 families). The biggest accomplishment of the SPN is that fish culture is now increasingly accepted among small farmers in Rwanda as a viable and economically attractive agricultural activity. It is presently seen as one of the more successful and attractive options for wetland development, both in an economic and a technical perspective, and is often used as a focal point for other marais development activities.

Experience has shown that using manure, mulch, and agricultural by-products to fertilize the ponds (to increase the plankton upon which the fish feed) substantially increases both fish productivity and the economic returns to the farmer. Integrated crop/livestock/fish culture was initiated at the Kigembe research center in late 1987. Specifically, research has been conducted on the returns to systems combining tilapia production with that of pigs, chickens, ducks, and rabbit. The results have been promising and, based on these results, the NRM Project will support an extension of integrated crop/livestock/fish culture to farmers.

During the life of the Fish Culture Project, approximately 50 "moniteurs piscicoles" were trained. As of the end of 1987, that number is insufficient to meet the training needs of farmers interested in fish culture. This is in spite of the fact that some of the moniteurs trained cover more than one commune. As a result, a number of fish culture efforts underway in the country are not receiving adequate support from trained fish culture technicians.

Under the NRM Project, USAID will provide a total of $1,212,000 to support the further expansion of integrated fish culture in marais. The project would be implemented by the SPN, which would work closely with the Division d'Amenagement Hydro-agricole (DAHA), which is charged with marais development. Investments made by the project (e.g. in fish pond construction and related activities) would follow requests by local communes to the SPN. The SPN would, in turn, be responsible for providing on-site supervision of all construction and implementation. USAID's acceptance of this implementation arrangement is predicated upon the continuing availability and involvement in the program of the current leadership of the SPN. In particular, should the current Acting Director not be available for at least the first two years of the project, USAID would require the involvement of a PVO or other institutional mechanism to help manage the project.

3. Sustainability of Hillside Production through Soil Conservation and Agroforestry

The objective of this component of the Natural Resources Management Project is to identify and promote soil conservation and agroforestry measures which would permit farmers to cultivate hillsides, while at the same time maintaining or increasing agricultural productivity levels.

Ninety percent of all farms in Rwanda are located on hill summits or hillsides. For these farms, soil erosion and decreasing soil fertility are serious problems. This is particularly true in the Zaire-Nile Crest, the highlands of Buberuka, and the volcanos area. These are regions where agricultural lands are generally located on steep slopes (of as much as 80 percent in some areas); where soils are easily erodible and subject to landslides; where the agricultural practices used are often inappropriate for such terrain; and where, due to population pressures, land is intensively cultivated.

This soil conservation problem is compounded by the growing shortage of fuelwood and other wood products in upland areas of Rwanda. As the country's population has grown, more and more of the natural forest cover has been converted to agriculture or cut for fuelwood and other wood products. Today, only a fraction of the original natural forest remains and most wood needs must be met from woodlots. Obtaining wood for fuel and for other uses has become increasingly difficult and more costly for many rural residents. Moreover, the loss of vegetative cover has exacerbated the problems of soil erosion in many areas.

Under previous USAID-financed projects, particularly the Ruhengeri Resources Analysis and Management Project (698-0463.06) and the Farming Systems Research Project (696-0110), natural resource management techniques have been identified which address the need for soil erosion control and for enhancing soil fertility and soil quality. These projects have also carried out significant work in agroforestry. In addition, USAID has financed several successful reforestation and agroforestry projects. These have included the CARE-Gituza Forestry Project (698-0502.96), the Communal Afforestation Project (698-0424.01), and Africare's Lake Nasho Resettlement Project (698-0502.96-01).

The NRM Project will build upon the experience gained in these earlier USAID projects. It will conduct additional research on soil conservation and erosion control and the stabilization of soils, and also disseminate various improved technologies which should increase agricultural productivity. The technologies supported by the proposed project will include:

a. the control of runoff to reduce water infiltration and over-saturation of soils;

b. the stabilization of land through the plantation of trees with deep roots and/or through the use of cover crops;

c. The improvement of the structure and the fertility of soils through the use of organic matter, particularly green manure and organic matter provided by agroforestry species; and

d. the restoration of degraded soils through reforestation and other techniques, including those of rural engineering.

A number of suitable measures to control soil erosion and landslides, and to improve soil fertility, including agroforestry techniques, exist that could be employed by the proposed project to meet the above needs. The technologies supported by the project will include the following:

Protection and Diversion Ditches

The most important anti-erosion technique in Rwanda consists principally of the use of infiltration ditches to reduce the adverse effects of runoff. Nevertheless, it has been demonstrated that infiltration ditches are not always appropriate, particularly for high altitude soils such as those in Ruhengeri. For very crumbly soils and for soils resting on bedrock (mother stone), infiltration ditches and terraces may exacerbate landslides and soil movement, due to the excessive accumulation of water in the soils.

Therefore, before other interventions aimed at soil protection (i.e. infiltration ditches and terraces, biological contours, hedgerows) are tried, steps must be taken to protect against excess water accumulation through the installation and improvement of ditches to divert water into channels (talwegs) and bottom lands. This is a new technique for Rwanda, and one which could be tested by the project, particularly in the communes of Nkuli and Mukingo.

On-farm Agroforestry and Covercropping

Surface erosion and landslides can be checked through the planting of agroforestry trees and covercrops along the contours of terraces, as well as in the fields themselves. Therefore, the project will sensitize farmers to the benefits of that technique and will furnish the support necessary to enable them to employ these techniques on their own farms. To this end, the project will undertake tests of new species and install them on selected "model" centers (at the rate of one center per commune). The project will also furnish material (seeds, bags, etc.) to the communes to create their own nurseries, one for each sector. At these communal nurseries, the beneficiaries could themselves produce the agroforestry plants that they choose.

The project will also encourage the use of soil stabilizing grasses and agroforestry species, as well as the use of cover crops, by furnishing seeds for multiplication according to their needs. The preferred trees will be those that have a multiple-use. In addition, the project will focus on soil stabilizing grass species which also provide a high quality forage.

Production and Use of Manure

Planting leguminous tree species or cover crops can increase soil fertility as well as protect soils from heavy rains. Prior to planting, cover crops can be turned into the soil for green manure. Agroforestry species and grasses can also be cut and used as green manure. Moreover, tree species can provide other benefits (such as fuelwood or fodder production). At the same time, the application of animal manure can greatly increase soil fertility.

The project will, therefore, encourage farmers to increase the production of manure and, above all, of green manure. To this end, the project will furnish agroforestry species, as well as material for livestock production (e.g. building materials, veterinary products, etc.) to selected farmers.

The Restoration of Degraded Sites

There currently exist, particularly within the prefecture of Ruhengeri, many sites that are degraded or are rapidly becoming degraded due to erosion, declining physical and chemical soil properties, road construction and quarrying, and landslides. The Natural Resources Management Project will attempt to address these problems through a series of activities, including reforestation, introduction of vegetative cover and soil stabilization, and selected rural engineering works.

Given the limited size of the Project's budget, it is necessary to begin this exercise with an exhaustive inventory of degraded sites, with the objective of determining which sites should be given priority. The site restoration activities will be financed by the Project. To the extent possible, however, the local population will contribute within the framework of "Umuganda".

4. Natural Forest Management

Rwanda shelters a wide variety of plant and animal species, due to the combination of a large range of topographic and climatic conditions, which produce a significant variety of habitat types within a relatively small area. A country of only 26,338 km2, Rwanda includes mid-altitude afromontane forests, steep hills punctuated with lush valleys, rolling wooded savanna, dry and periodically flooded grassland plains, and extensive wetland systems. The afromontane forests of Rwanda, in particular, include a rich assemblage of rare and endangered species. The afromontane forests of Rwanda represent part of a regional zone of exceptionally high endemism, which extends into Burundi, southwest Uganda and adjacent Zaire. This is second only to Madagascar in species unique to the "old world", according to the conservation data base of the International Union for Conservation of Nature and Natural Resources (IUCN).

The remaining natural forests, savanna, national parks, and forest reserves are essential to the well-being of Rwanda's population. These areas provide vital ecological benefits, such as watershed protection, hydrological regulation, and erosion control. Many of these services have an impact throughout the country and internationally. Further, these sites are focal points for international tourism, which currently attracts more than $2.5 million worth of foreign exchange to Rwanda each year. Finally, Rwandans are showing more and more interest in recreational aspects of nature and wild areas, as evidenced by their increased visitation rates.

It is clear that the economic returns from "gorilla tourism" in the Parc des Volcans are substantial. Nevertheless, the small size and fragility of the gorilla population puts a serious constraint on growth of this revenue source. The diversification of tourism within the Parc des Volcans and into Nyungwe appears to be an option that would not only increase per tourist revenues but would also spread the benefits elsewhere in the country. At the

same time, there is a real need to "plow back" a greater portion of the receipts from tourism into the management of the forests and to the local population, which shoulders the majority of the opportunity costs associated with protection of the forests.

Despite the evident importance of the afromontane forests, and of the flora and fauna that they contain, to the long-term welfare of Rwanda, it is clear that their long-term viability is seriously threatened. The short-term gain to be had from the destructive "mining" the forests, surely pales in comparison to the benefits that would, in the long-term, accrue through non-consumptive uses.

Rwanda lacks both financial resources and expertise to plan or implement multiple-use management programs for its afromontane forests. Nevertheless, there is evidence of increasing GOR commitment to conserving these forests. This suggests that increased donor support at this time would be effective in generating further commitment from the government and, ultimately, its gradual absorption of financial and managerial responsibility for the conservation of these resources.

One component of the Natural Resources Management Project will therefore support efforts by the Office Rwandais du Tourisme et des Parcs Nationaux (ORTPN) and the Directeur General des Forêts (DGF) of MINAGRI to better manage and protect the two most important afromontane forests, the Parc National des Volcans and the Nyungwe National Forest. Implementation of this component will be through Cooperative Agreements with the three PVOs with ongoing programs in these forests: the African Wildlife Foundation, the Digit Fund, and Wildlife Conservation International (WCI - a division of the New York Zoological Society). These PVOs will, in turn, work through ORTPN and the D.G. Forets (the chief manager of forest reserves).

The NRMP funding will support (1) the development of a larger information base concerning the forests and their dynamics; (2) a vital increase in Rwandan participation in conservation activities, via education, training and policy planning; and (3) the active encouragement of additional economic benefits to local people surrounding the protected areas, as well as to the nation as a whole in the form of foreign exchange generated by tourism.

The proposed project will build upon the ongoing programs of these PVOs. The African Wildlife Foundation is currently administering the Mountain Gorilla Project in the Parc des Volcans. The Digit Fund is financing the Karisoke Research Center. Wildlife Conservation International is currently working with ORTPN in developing the tourism potential of the Nyungwe Forest Reserve under the USAID-funded Conservation of Nyungwe Forest Project.

AID is already providing some funding to two of these organizations. Approximately $25,000 is being provided to the Karisoke Research Center to renovate its facilities. In addition, under the Conservation of Nyungwe Forest Reserve Project (Project No. 698-0467), WCI has received a $127,900 grant from AID/W under a two-year cooperative agreement. The activities of the Nyungwe forest project include: (a) training of key Rwandan personnel in forest ecology, tourism management, and conservation education; (b) implementation of a conservation education program; (c) applied ecological research and monitoring; (d) evaluation and promotion of tourism and other non-consumptive

uses of the forest; and (d) provision of advisory assistance to the government in matters related to the conservation of the forest.

B. SUMMARY INSTITUTIONAL ANALYSIS

There are a number of ministries and other entities involved, either directly or indirectly, in the natural resources sector. Principal among them at the national level are MINIPLAN, MINAGRI, and ORTPN, the planned counterpart agencies for the NRM Project. In addition, both ISAR and UNR will be involved in the proposed project, through their research functions. Finally, the local communes play an important role in natural resources management, generally in collaboration with central ministries (e.g. by providing an extension function for new technologies).

The Ministère du Plan (MINIPLAN)

MINIPLAN is responsible for coordinating planning activities at the national level, the identification of pressing economic and financial problems, and the preparation of the broad outlines of the National Plan. MINIPLAN is also responsible for preparing Rwanda's development or investment budget. In the past, MINIPLAN has not had a strong reputation or political clout. It was considered to be badly organized and to suffer from lack of both human and physical resources. This situation appears to be improving dramatically, due to changes in the leadership and mandate of MINIPLAN which were instituted during the February 1989 reorganization of the government.

As part of this reorganization, MINIPLAN was named the principal GOR institution responsible for environmental planning and policy. Prior to February 1989, no entity had a true mandate to coordinate national level environmental activities. The only agency with any kind of environmental mandate was the relatively low-level 'Office of the Environment' within MINISAPASO, the Ministry of Public Health and Social Affairs. Given its institutional home, however, MINISAPASO's Office of the Environment focused on health-related environmental issues. The broader issues of resource conservation were largely ignored. Nevertheless, since this office was the only one in the government with any kind of environmental mandate, it was selected to organize and sponsor the First National Seminar on the Environment in September 1985. Subsequently, it coordinated the World BankOfunded efforts to prepare a National Environmental Strategy and Environmental Action Plan.

In February 1989, the responsibility for environmental coordination was transferred from MINISAPASO to the Ministry of Plan, as noted above. Responsibility for managing the National Environmental Strategy and Environmental Action Plan was also passed to MINIPLAN. It is generally felt that this move underscores the GOR's seriousness about broadly addressing the needs of the environmental sector.

At present, there is a temporary "environmental unit" within MINIPLAN which reports directly to the Minister of Plan. A more permanent institutional arrangement within MINIPLAN for the coordination and management of matters pertaining to the environment will be established after the completion of the National Environmental Strategy and the Environmental Action Plan later this year. Long-term technical assistance funded by the NRM

Project would be located in this temporary unit and, ultimately, in the permanent environmental unit that replaces it.

The Ministère de l'Agriculture, de l'Elevage, et des Forêts (MINAGRI)

MINAGRI is the ministry who's program affects, most broadly, the environment. The Natural Resources Management Project will be directly involved with three of MINAGRI's four Directions-Generals.

The first is the Direction General du Genie Rural et de la Conservation des Sols (Rural Engineering and Soil Conservation). The DGGR is composed of two Directions:

- The Direction du Conservation du Sol, which is responsible for all aspects of erosion control, and will therefore be involved in the soil conservation and agroforestry activities of the NRM Project; and

- The Direction du Genie Rural, which is the institutional home of the Division d'Amenagement Hydro-agricole. This division is charged with monitoring marais development activities in the country. As such, it will be the counterpart agency for the marais research and training component of the NRM Project.

The NRM Project will also be directly involved with the Direction-General du Forets (DGF). The DGF is responsible for forestry activities in the country, from strategic planning to the identification of appropriate species and techniques. The DGF is noteworthy for its relative depth in qualified personnel, including hundreds of foresters now working with projects in the field. Extensive international assistance has helped support the training of these cadres. The DGF will be involved in the soil conservation and agroforestry activities of the proposed project.

The third Direction General involved in the project will be that of Livestock (l'Elevage), which contains the Division de Peche et Pisciculture, the institutional home of the Programme Pisciculture Nationale (PPN). The NRM Project's fish culture activities will be implemented as part of that Programme.

The Institut des Sciences Agronomiques du Rwanda (ISAR)

ISAR, the GOR institution charged with carrying out agricultural research in Rwanda, will be involved in the research efforts of the NRM Project in the areas of agroforestry and soil conservation and marais development. ISAR is also the counterpart institution for the USAID-funded Farming Systems Research Project. As such, it is the directly responsible for the agroforestry and soil conservation work being undertaken by that project. Finally, ISAR sponsors AFRENA activities in Rwanda.

The overall research program of ISAR is very ambitious, given the relatively small staff available. In fact, ISAR's main problem at the moment is a serious lack of human resources. As a result of this manpower constraint, little research activity is currently underway in the selected forestry topics or in wetland development. Recently, however, the Institute

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has increased its commitment to applied research on agroforestry and erosion and seems intent on making a greater contribution in these areas.

The UNR Faculty of Agriculture

The Université Nationale du Rwanda (UNR) is the only public institution of higher education in Rwanda. UNR has nine faculties, one of which is the Faculty of Agriculture, which was created in 1974. The Faculty of Agriculture has three major responsibilities: (1) to train high-level agricultural specialists, (2) to conduct agricultural research and (3) provide information to the extension service.

UNR's involvement in agricultural research, while limited, covers a number of areas relevant to the proposed NRM Project. For example, UNR is the counterpart agency for the AID-sponsored Pond Dynamics Collaborative Research Support Project (the Pond Dynamics CRSP). Under this project, UNR researchers are collaborating with those from U.S. universities to gather data on the environmental and eco-climatic aspects of fish pond dynamics, as well as on the growth and feeding of *Tilapia nilotica*. UNR may also be involved in research financed by the project in areas such as wetland management and natural forest management.

Historically, UNR Faculty of Agriculture has faced a number of problems in meeting these responsibilities. Because of its small size and shortage of laboratories, research facilities and equipment (particularly microcomputers), UNR's ability to produce graduates has been limited. Until recently, UNR has been turning out barely 15 graduates annually, nowhere near what the country need. In the past, UNR has emphasized generalist training, which is probably no longer the most appropriate preparation for its graduates, given the highly specialized challenges of modern agriculture. Moreover, the lack of manpower and resources has limited the ability of the Faculty of Agriculture to address the agricultural problems actually facing the country.

A number of changes are underway which should to some extent address these problems. A number of donors are providing assistance to improve UNR's facilities and equipment and to train its professors. USAID is contributing to this effort, through its SAARFA project being implemented by the University of Minnesota (UM). SAARFA is specifically designed to involve faculty members in adaptive research activities through strengthening linkages with other research institutions throughout the country.

The Office Rwandais du Tourism et des Parcs Nationaux (ORTPN)

ORTPN has a status comparable to that of a ministry in that it is directly attached to the Presidency of the Republic. Created in 1974, ORTPN is responsible for the management and protection of Rwanda's two national parks. It is also legally responsible for the conservation of all natural flora and fauna outside of the parks. The application of this more general mandate, however, thus far has proven to be quite complicated, due to overlapping responsibilities and interests of other ministries. ORTPN has developed good relationships with several PVOs working in the afromontane forests. While USAID's assistance under the NRM Project will be offered through Cooperative Agreements to those PVOs, ORTPN should take an active role

in the management of the project.

Commune Support

The national territory of Rwanda is divided into ten prefectures encompassing 143 communes. The commune represents the lowest administrative unit in Rwanda. To be effective, the NRM Project will have to establish good working relationships with the communes hosting project activities. For the NRM Project, the most important role for the communes will revolve around the extension of new technologies. Extension services in Rwanda generally lack a single, direct line of technical support and administrative control. MINAGRI has no extension department, per se. Rather, extension agents are assigned to the local communes, even though they may be paid for by the central government. The local extension agents find themselves integrated into the local civil administrative structure, under the supervision of the burgomaster, while receiving instructions from MINAGRI via the 'agronome de préfecture' and the 'agronome de commune'.

The lack of a lack a single, direct line of technical support and administrative control, means that extension service personnel are often assigned multiple roles including non-agricultural rural development tasks and regulatory work. This, of course, undermines their effectiveness in extension. Further, monagris are poorly paid, often have no means of transport and very little material to use in working with the farmers. Many agents have little or no training when they begin their work and they often receive very little in-service or on-the-job training. There have access to very few appropriate extension or agricultural reference materials, and, because of their weak ties to research activities, their message is often out of date.

The explicit reform of the extension system at the commune level is beyond the scope of the proposed NRM Project. Nevertheless, to be successful the NRM project will have to strengthen extension activities in those communes in which the project will work. This will be done through improved training, materiel support, and the development of discrete, easy to disseminate technological packages. In the agroforestry and soil conservation component of the project, substantial reliance will be put on commune-level agents. In this case, some caution will be necessary to ensure that conflicting demands upon these individual's time do not undermine the success of the project. In the case of fish culture, on the other hand, a highly motivated and effective cadre of commune-level extension agents has already been trained, and is using a variant of the 'training and visit' system approach. This program could serve as a model for other activities.

C. SOCIAL SOUNDNESS ANALYSIS SUMMARY

The value of natural resources to people is only partly measured in monetary terms. Lands which retain their economic value through protection and improvement give vitality to rural economies and promote social stability. Watersheds which are well-managed improve health levels and prevent catastrophic seasonal flooding. Forests yield medicines, food, fodder, and flowers -- in addition to wood -- and provide work for the young, old, and infirm. The degradation of the natural resource base, by contrast, leads to the breakdown of precariously balanced economies, the disruption of social systems through migration and increased mortality, government instability, and an increasing dependency of individuals, families, and nations upon the uncertain intentions of others. The adverse effects of environmental degradation have been clearly demonstrated throughout the African Sahel.

The early social signs of natural resource deterioration already exist in Rwanda, in the form of increased rates of migration, unemployment, and disease prevalence in urban areas. Better management of the natural resource base can counter these harmful trends, as well as increase the equity of access of Rwandans to their patrimony and preserve this heritage for future generations.

The Social Soundness Analysis addresses the questions of: (1) how, in the Rwandan setting, natural resource management has been featured as a customary practice; (2) which individuals can be expected to benefit from improved natural resource management techniques and technologies; and (3) the impact on the overall society of a sustainable natural resource base.

1. Beneficiaries and Equity

Poorer families, as a rule, have fewer management options than do relatively wealthier ones. Their farms (surface area/person) are smaller; their resource base is of lower quality; their labor is less skilled and diverse; and their support systems are weaker (especially in the case of female-headed households). It is these families especially who will benefit from low cost soil enhancement technologies, greater availability of fuelwood, and alternative income generating uses for land. Farmers in general will benefit from watershed protection, which would regulate water flows and hence increase the reliability of water for crop production.

Female-headed households (21 percent of the total) are a special case of this group. Their farms are smaller on the average by 30 percent, their laborers fewer, their patrons weaker. Women in particular are often untouched by extension agents, left-out of training programs, only occasionally organize into permanent groups, and are dependent upon whimsical authorities for access to marais parcels. The overall potential benefits of sustainable resource management are likely to reach women only if women are intentionally identified as clients of development program activities.

The need to involve men and women in coordinated activities for hillside soil conservation and marais development is fundamental for successful natural resource management. Erosion control involves all farmers, since their disbursed parcels must be treated in a coordinated fashion in order to obtain the maximum benefit from soil protection technologies. This is also true for marais agriculture, since water use and production techniques (e.g. pesticide

application) at one end of the marais will affect farmers downstream. Better organized groups also are more willing to invest in land improvement and protect those investments. This is especially marked in the marais where, by increasing the stake of the "community" in the management and development of the land, greater care and protection of the resource will result. Resources such as trees, fish, and livestock are seen as security and savings by the rural poor, and willingness to sustain them can be promoted under conditions where the poor are guaranteed greater tenure security.

The equity of NRMP activities and widespread beneficiary incidence can be best promoted by:

a. Promoting tenure security of parcels, especially in the marais, to increase farmer willingness to invest in land improvement;

b. Involving farmers from the start in technology demonstrations and applied research trials;

c. Organizing hillside and marais families for improved technology adoption and marketing;

d. Working with private groups (e.g. associations, cooperatives, NGOs) to reduce the burden on government to implement development and to profit from private interests in the promotion of family welfare;

e. Making sure that women and women's groups are identified for training and outreach;

f. Disaggregating analyses by gender; and

g. Addressing the impact of natural forest management on conservation on indigenous ethnic groups.

2. Socio-Cultural Feasibility

The priorities of the GOR in the natural resource sector are laudable for demonstrating the awareness of the country's leaders of the constraints facing Rwanda vis-a-vis the resource base, and the socio-economic effects of resource degradation. Yet farmers, who historically have employed some sound land use practices (e.g., fallow, crop rotation, livestock and crop rotation), are not always receptive to national extension themes. Often this is due to the latter's ineffectiveness on some sites (lack of site-specific suitability) or increased labor demands. While farmers are demonstrating an eagerness to try improved technologies through the FSRP, RRAM, Fish Culture, and Gituza Forestry projects, the feasibility of NRMP interventions can be strengthened by:

a. identifying suitable site-specific technologies, which require greater farmer-researcher-planner collaboration;

b. improved understanding of labor constraints -- especially in eastern Rwanda but seasonally elsewhere as well -- which require that the payoffs of labor intensive technologies be apparent and forthcoming. This will require convincing demonstrations, continuous tracking,

and probably marketing interventions;

c. optimizing the tradeoffs between erosion control and soil fertility improvement technologies, on the one hand, employed even in the high-risk zones of the ZND, and land, labor, and materials, on the other, by displaying convincing demonstrations of technology effectiveness and researching the opportunity costs of land, labor, and capital;

d. undertaking market analyses and improving marketing methods for production of high value crops in the marais. Currently, lack of markets and poor marketing techniques make production of high value crops uninteresting to farmers in the marais;

e. assisting in the formation and training of associations and other groupings. Insufficient organization of farmers makes protection of high value marais crops (food and livestock) difficult and mitigates against their use; and

f. developing widespread public education campaigns and increasing distribution of economic spin-offs from forest-based remunerative activities. Insufficiently understood forest ecology and the near total lack of the public's sense of "ownership" of national park and forest land prevent greater public support for forest conservation.

3. Impact

While the introduction of improved techniques of soil conservation, agroforestry, fish culture, and marais management, will benefit producers by improving land use potential and concomitant production increases, greater impacts will accrue to the Rwandan society at large. These will include better health and nutrition from regular supplies of clean water; socio-economic stability through natural resource sustainability; and rural economic vitality, reducing rural-urban migration and unemployment.

To facilitate the attainment of these long-term benefits, the NRMP will need to:

a. Determine the optimal trade-off between production and resource improvement by monitoring intervention impact and participant resource allocations;

b. Educate/train individuals in forest ecology and improved resource management;

c. encourage widespread participation through assistance in group formation;

d. assure the sociological appropriateness of potential techniques through farmer surveys and monitoring;

e. promote applied research and links between researchers and farmers; and

f. undertake extensive public education campaigns to sensitize the population to the desirability of employing improved management techniques and technologies for the short-, medium-, and long-term, through workshops, seminars, publications, policy dialogue, collaborative endeavors, applied research, and demonstrations of technology effectiveness.

D. ECONOMIC ANALYSIS SUMMARY

Rwanda is an agricultural country. Approximately 90 percent of the Rwandan labor force earns its living from agriculture. Some 40 percent of the GNP was attributable to agricultural labor (1987). About 80 percent of export earnings come from agricultural products. Much of Rwanda's industry is agro-industry and much of the potential off-farm employment is likely to be in agro-industry or in some other industry based on natural resources. Rwanda depends on its natural resource base and a sustained, growing economy depends on maintaining the stability of that natural resource base.

In recent years, Rwanda's rapid population growth has led to more extensive and intensive farming practices. As a result, the natural resource base is becoming increasingly degraded and environmental stress is evident throughout the country. Confronted with the task of arresting the degradation of its natural resource base, the GOR must make some difficult financial and economic choices. If the degradation of the natural resource base is to be completely stopped, the GOR must be prepared to spend large sums of money. If the objective is to only slow the rate of degradation, lower investments will have to be made in the short run (the long run problems will still persist). There are economic tradeoffs between these two extremes.

The economic and financial analyses presented in Annex H, Economic Analysis, are only illustrative and should be interpreted with caution. They use assumptions collected in the field that cannot be readily verified by documented field research. Until reliable information is available, the analyses should be considered only indicative. It is recommended that the project collect data in sufficient detail to carry out accurate economic and financial analyses.

Soil Conservation and Agroforestry Interventions

The soil conservation and agroforestry interventions proposed are judged feasible. It is probable that farmers will be able to recover their investments of time and money through higher crop yields. The results of the analyses, based on conservative assumptions, show that crop yields will have to increase roughly to initial cropping year levels and remain there, rather than decline over time. In other words, the intervention must prevent a decline in yields over time in order to be feasible from the farmer's perspective.

These break even increases in crop yields are not unreasonable given the much higher increases obtained using similar interventions as documented by Farming Systems Research Project (FSRP). Because the assumptions used are conservative (relatively low farm gate prices, high costs and a high return on investment requirement), it is probable that the interventions will generate

substantially higher crop yields than those that would be required by the farmer in order for him to break even on his investments.

Forestry Plantations

Based on the values of wood products only (fuelwood and poles), forestry plantations are not likely to be economically or financially feasible. However, the wood benefits represent only a small portion of the total benefits. Reforestation under the auspices of the project should be carried out for soil conservation and watershed management reasons, not hoping for positive economic returns based on the wood values alone. Where the returns based on the wood values only are negative, the intervention should not be automatically rejected. The question is whether the (unquantified) environmental benefits will outweigh the extent to which the returns from the wood only are negative. The most intensive management alternative will yield the highest wood volume and quality (highest pole:firewood ratio) because of higher survival rates, and probably is the best alternative from the resource protection perspective.

The results of the analyses showed that most intensive management alternative, however, is also the most expensive alternative. The financially and economically most attractive alternative (based on wood benefits only), is also likely to be the least effective resource conservation alternative. The results of the analyses illustrate how expensive intensive forestry can be. Intensive forest management is not automatically synonymous with "good forestry." What may be biologically optimal for a particular site probably may not be economically or financially optimal.

The important point to retain is that the major purposes of the forestry plantations are to plant on agriculturally marginal or unsuitable sites and to promote soil conservation. The wood benefits, therefore, are incidental and a "bonus". In the economic and financial analyses, however, only the wood benefits are quantified because the resource conservation benefits are inherently difficult to identify and quantify. The environmental benefits, nevertheless, are present and real, though not included in the analytical spreadsheets. Their presence should be counted in the decision making process. The analytical results represent information for the decision makers, and should not be the sole decision-making criterion. They may help to "short list" the alternatives to a choice that best balances the economic and resource conservation objectives.

Fish Culture

The economics of aquaculture in the marais has been well documented. Based on previous analyses, aquaculture in the marais is financially and economically feasible and farmers compete for the opportunity to participate in aquaculture development programs.

The analyses presented in Annex H also address the economic returns to the integration of fish culture with livestock production (e.g. ducks, chickens or pigs) and improved gardening practices. The economic analyses presented under PPN auspices considered only fish ponds. If the returns to the fish ponds are as high as indicated, the farmer can afford to make additional investments towards full integration of the aquaculture activity --

in livestock infrastructure and improved gardening practices. In economic terms, the farmer will be able to spend up to the point where the NPV is zero, or where the discount rate used (which should reflect the opportunity cost of capital) equates benefits and costs.

The analysis demonstrates that a farmer could afford, other things being equal, to spend up to 34,605 FRw towards the requirements for an integrated system. This amount represents approximately 10 percent of the total cost of a pig installation, four percent of a duck installation and three percent towards a chicken installation.

This result was based on an average yield figure of 20 kg/are. Under efficient management, however, yields have reached as high as 64 kg/are (in a cooperative pond) which indicates there is much room for improvement. By increasing the yields in the analytical model to 60 kg/are, the amount the farmer could afford to invest in a fully integrated fish culture facilities is 254,000 FRW given the nine percent discount rate.

E. ENVIRONMENTAL ANALYSIS SUMMARY

An Initial Environmental Examination (IEE) recommending a negative determination for the project was included in the PID. However, the original project design, as envisioned in the PID, was significantly changed at the PID review meeting in AID/W. The Program component was dropped and AID/W recommended that a Biodiversity component be added. In the course of the Project Paper design, it was decided to update the IEE to reflect more accurately, the potential environmental impact of the project. The revised IEE, prepared by the REDSO/ESA Environmental Officer concludes that:

(1) The project's environmental impact, especially given the "no project" alternative, is highly beneficial.

(2) The subactivities related to research, training, education, and institutional support are accorded Categorical Exclusions.

(3) The subactivities related to the development of communal forests plans, soil conservation, nurseries and demonstration centers are accorded Negative Threshold Determinations.

(4) The subactivities related to construction of fish ponds should depend on a favorable Environmental Assessment.

(5) Integrated fish culture in the marais raises several environmental questions, relating to: its effect on the overall system hydrology and the activities of other users within the system; and the potential for the development of fish pathologies that could affect sensitive drawn systems. These questions and others raised in the revised IEE can, however, be adequately addressed through appropriately applied design criteria. It is the intention of the project to develop such criteria in accordance with the Environmental Assessment.

USAID/Rwanda will ensure that all construction carried out under the project is in conformity with sound engineering design standards and that all construction be supervised by the USAID/Rwanda PSC engineer under the general direction of the REDSO/ENG and reviewed by the REDSO/REO where necessary.

The specific recommendations relating to each conclusion are contained in the IEE. On the basis of the revised environmental examination, and providing that the recommendations relating to construction are followed during project implementation, a negative determination is confirmed as appropriate and recommended for the project.

F. SUMMARY ENGINEERING ANALYSIS

Construction/Engineering support to the project will be provided in four areas:

1. Development of a model small marais which will be used as a "laboratory" for research and rural staff training.

2. Expansion of the current fish culture project, including the demonstration of integrated fish culture practice for small farmers. This will include (1) the incorporation of low cost construction of hen houses, rabbit hutches, piggeries, etc. at the Kigembe National Fish Culture Center and at three prefectorial centers at Runyinya, Gikongoro and Rushashi, and (2) the construction of facilities at seven communal-level integrated fish culture centers.

3. Construction of an office complex located at Ruhengeri Prefecture to accommodate the project staff of the agroforestry and soil conservation component.

4. Construction of two interpretative centers, on in the Nyungwe Forest Reserve and the other the Parc des Volcans, under the Natural Forest Management component of the project.

Marais Development

In order to experiment with marais development in Rwanda, the project proposes to develop a small 50 ha marais as a pilot project. The development of this small marais will involve land topography and hydrology surveys, the construction of water supply canals for irrigation, and small dams for water distribution, landscaping, etc. Based upon results from topography and hydrology surveys, site plans for drainage or irrigation and detailed plans for water distribution systems will be prepared.

A small 75 m2 warehouse will be built at the site for storage of seeds and for crop drying. This warehouse will also contain a small office for the personnel responsible for the project. Proposed dimensions for this warehouse will be 10 m x 7.50 m, with a height of 3 m. This will be a single-story brick structure with corrugated iron roofing sheets supported on a steel or timber roof truss. The design should include skylighting, ventilation and security. Construction drawings could be based on the existing plans of the Local Crop Storage Project (696-0107) with some minor modifications to adapt to the site and to the project needs.

The site for this project component has not been selected. The GOR will submit the selected site to the U.S Project Officer for approval.

Integrated Fish Culture

The project under this component proposes to expand the national fish center operation at Kigembe to become a multi-purpose center (training, model-farm, monitoring, etc.), and three other prefectorial centers located at Runyinya, Rushashi and Gikongoro to be used as information centers and production centers at the regional level. Under this project component, in

addition to the work at the existing centers, seven communal integrated fish culture centers will be created in marais areas. These centers will each have one hectare of pond area, and will be used to demonstrate to farmers integrated fish culture on production ponds.

The engineering support to this project component, therefore, consists of the renovation or the enlargement of pond areas, as well as construction of fish ponds, hen houses, rabbit hutches, piggeries, etc. at the regional centers. Most of these facilities will be constructed using locally available materials such as bricks, timber, galvanized roofing, nails and cement. Unskilled and skilled labor are also available at the community levels.

Construction of an Office Building at Ruhengeri Prefecture

To accommodate the staff of the soil conservation and agroforestry component, an office building will be constructed in the town of Ruhengeri. This complex will consist of approximately 360 square meters and will house offices, reception area, conference room, library, toilets and a small store room. The cost of this building is estimated to be $140,000. USAID will contribute $100,000 to this construction and the GOR will contribute the rest. The office complex will be of simple construction and will be one story high. The foundation will be of masonry, the floor will be a concrete slab, walls will be brick with reinforced columns and a reinforced concrete collar beam. The roof will consist of wood or metal rafters and galvanized roof sheeting. Electrical and plumbing hardware will be of the quality locally available which is imported from either Kenya or from European countries.

Although, the site of this building has not been selected, utilities such as electricity and water services are available since the building will be located within the urban zone limit of Ruhengeri Prefecture.

Construction of Two Interpretative Centers at Nyungwe Forest and the Parc des Volcans

The goal of the conservation program is to inform the local communities about the value and the benefits of the environmental and economic importance of the these forest areas. Two interpretative centers will be built for this purpose, one in the Nyungwe Forest Reserve and another at Kinigi Commune adjacent to the Parc des Volcans. Not only will these centers be used as information centers for the surrounding communities and for Rwandan students, but they will also be used for tourist information.

These centers will measure approximately 150 square meters each and will house offices, a small museum, a projection room, gift shop, reception area, toilets and a small library. The cost of these buildings is estimated at $50,000 each. USAID will contribute $50,000 to the cost of constructing each center. In the event that the cost of these centers will exceed the amount above, the overrun construction cost will be covered by the GOR or other, non-USAID sources. These centers will be one story high. The structure and the materials to be used will be similar to the office complex at Ruhengeri (see above). It is noted that electricity and water are not available at the sites. Rain water will be collected through roof catchment by gutters, fed into underground cisterns, hand pumped to an overhead tank, and fed into the buildings by gravity. Electricity could be provided by a small generator.

The interpretative center of the Parc des Volcans will be located next to the existing buildings of the park reception center. Access could be created from the main road of the area. This land has a gentle slope and is found suitable for the proposed construction.

The site for the center in the Nyungwe forest has not been selected. The following criteria should be considered for actual selection: (1) availability of flat or gently sloped land; (2) availability of an access road and nearness to a community; and (3) reduced exposure of building to wind or rain (e.g. not on the top of a hill).

Construction Plans and Specifications

In all, the project will require four structural buildings - a small warehouse, an office complex and two interpretative centers. For these buildings, the project will contract a local architectural firm for the design and for the preparation of technical specifications, cost estimates and tender documents. The design for all buildings will incorporate, as recommended by the REDSO Engineer, the minimum seismic considerations, thus insuring the building's resistance to seismic forces. The buildings will have reinforced floor beams tying footings together, reinforced columns and reinforced ring beams. USAID/Rwanda with REDSO engineering assistance, will approve all plans, technical specifications, tender documents and cost estimates prepared by the architectural firm,

Engineering Support and Supervision

Project funds are budgeted for a Personal Services Contract (PSC) with a civil engineer who will be assigned to the AID Office. The engineer will provide support and supervision at all stages of the engineering/construction for each of the Project Components.

The PSC Engineer will work under the general direction of the REDSO/ENG, who will provide periodic inspections. REDSO/ENG will also be available to provide support at all stages of the construction process. A similar arrangement has been used to REDSO/ESA's satisfaction for the construction in other projects in the USAID/Rwanda a portfolio.

Cost Estimates

Cost estimates are based on experience with similar construction by AID over the past several years in Rwanda.

A.	Marais development	$ 170,000
B.	Integrated Fish Culture	575,000
C.	Office Complex	140,000
D.	Two interpretive centers	100,000
	TOTAL	$ 985,000

FAA Section 611(a) and 611(b) Requirements

Based on the Engineering Analysis in Annex K, it is determined that the requirements of FAA Section 611(a) have been met. Engineering and other plans necessary to undertake the construction activities have been, and will be, carried out and a reasonably firm estimate of the total cost and AID contribution for these activities has been prepared.

As discussed in the Engineering Analysis, it is determined that the standards and criteria in Section 611(b), pertaining to the Principles and Standards for Planning Water and Related Land Resources, have been taken into consideration.

IX. CONDITIONS AND COVENANTS

A. Conditions Precedent

The Project Agreement shall have conditions precedent in substance as presented below. Except for condition 6 below, A.I.D. may, on a case by case basis, agree to waive or modify any such condition at a later date based on proper written justification:

(1) Prior to any disbursement under the Grant, or to the issuance by A.I.D. of documentation pursuant to which such disbursement will be made, the Grantee shall furnish or have furnished to A.I.D., in form and substance satisfactory to A.I.D. a written statement specifying the names and titles of person(s) that will have the authority to act as the representative or representatives of the Grantee, together with a specimen signature of each such person certified as to its authenticity.

(2) Prior to any disbursement under the Grant, or to the issuance by A.I.D. of documentation pursuant to which such disbursement will be made, to finance local cost support, for each year of the Project, the Grantee will, except as the parties may otherwise agree in writing, furnish to A.I.D., in form and substance satisfactory to A.I.D., a Project Annual Work Plan reviewed by the Project Coordinating Committee and a budget detailing the expenditures that will be required to carry out the work plan.

(3) Prior to any disbursement under the Grant for construction, or to the issuance by A.I.D. of documentation pursuant to which such disbursement will be made, the Grantee will, except as the Parties may otherwise agree in writing, furnish to A.I.D., in form and substance satisfactory to A.I.D.:

(a) evidence that the Grantee owns, has acquired title to, or has otherwise arranged for long-term use of sufficient land for such construction and has taken the necessary steps to assure that adequate access and public utility services are available to the site(s).

(b) plans, specifications and bidding documents for such construction, and a contract for such construction prior to its execution with a contractor acceptable to A.I.D.; and

(c) a contract prior to its execution or other satisfactory arrangement for engineering supervision services for such construction with a contractor acceptable to A.I.D.

(4) Prior to any disbursement under the Grant, or to the issuance by A.I.D. of documentation pursuant to which such disbursement will be made, for construction of interpretative centers at either the Nyungwe Forest Reserve or the Parc des Volcans, the Grantee will, except as the Parties may otherwise agree in writing, furnish to A.I.D., in form and substance satisfactory to A.I.D.:

(a) An estimate of the full cost of constructing and furnishing the centers; and

(b) Evidence of commitments from other funding sources (e.g. other donors, private voluntary organizations, or the Grantee) to finance those construction costs and costs of furnishing the centers that are not covered by A.I.D.

(5) Prior to any disbursement under the Grant, or to the issuance by A.I.D. of documentation pursuant to which such disbursement will be made, for the training of genie rural technicians in marais management, the Grantee will, except as the parties may otherwise agree in writing, furnish to A.I.D., in form and substance satisfactory to A.I.D.:

(a) a written contract or memorandum of understanding between the training center and the Grantee or its agent which guarantees that adequate training facilities will be available for the duration of this training program;

(b) a written curriculum for the training program;

(c) criteria for the selection of trainees.

(6) Prior to any disbursement under the Grant, or to the issuance by A.I.D. of documentation pursuant to which disbursement will be made for the construction of fish ponds and related facilities, an Environmental Assessment shall be completed in accordance with A.I.D. Regulation 16 which shall show no significant adverse environmental impact of such construction.

B. <u>Covenants</u>

The Project Agreement shall have covenants in substance as follows:

(1) The Parties agree to establish an evaluation program as part of the Project. Except as the Parties otherwise agree in writing, the program will include, during the implementation of the Project and at one or more points thereafter:

(a) evaluation of progress towards attainment of the objectives of the project;

(b) identification and evaluation of problem areas or constraints which may inhibit such attainment;

(c) assessment of how such information may be used to help overcome such problems; and,

(d) evaluation, to the degree feasible, of the overall development impact of the Project.

(2) The Grantee agrees to recruit and hire or assign in a timely manner all Rwandan personnel necessary to implement the Project. The Grantee further agrees to name such personnel in the first Project Annual Work Plan. In particular, the Grantee agrees to recruit and hire or assign in the first year of the project, individuals acceptable to A.I.D. to serve as (a) National Project Director, (b) Assistant Director of the Fish Culture Component of the Project, (c) Coordinator for the Marais Development Component of the Project, (d) Field Coordinator for the Soil Conservation and Agroforestry Component of the Project in Ruhengeri Prefecture, and (e) the Coordinator for the Environmental Planning Component of the project. The names and curriculum vitae of the personnel shall be submitted to A.I.D. by the Grantee within 120 days of the date of signature of this agreement, except as otherwise A.I.D. may agree in writing.

(3) The Grantee agrees to take prompt action to bring into government service all new personnel recruited for positions in the project. The Grantee also agrees to actively consider women, as well as men, in selecting candidates for participant training and in recruitment for positions under the project.

(4) The salaries of selected Rwandan project staff will be initially covered by the USAID portion of the project and the Grantee will take responsibility for these salaries beginning in Year 3 of the Project. Prior to the approval of the Second Annual Work Plan of the Project, the Grantee will, except as the Parties may otherwise agree in writing, furnish to A.I.D., in form and substance satisfactory to A.I.D., evidence that the Grantee has submitted for inclusion in the MINAGRI budget the salaries of said Rwandan nationals. Prior to the approval of the Third Annual Work Plan of the Project, the Grantee will, except as the Parties may otherwise agree in writing, furnish to A.I.D., in form and substance satisfactory to A.I.D., evidence that the salaries of said Rwandan nationals will be paid for out of the national budget.

(5) The Grantee agrees to promptly identify and nominate all persons for long- and short-term training financed under the Project. The Grantee agrees to provide travel documents to persons nominated for long-term training in a timely manner. The Grantee agrees to establish arrangements to assure that all personnel completing long-term training under the Project will return to Rwanda to serve as employees of the respective Participating Agencies and that such personnel are promptly assigned to positions commensurate with the training and experience they have received under the Project.

(6) The Grantee will ensure that a Project Coordinating Committee is established within 2 months of the signature of the Project Agreement, with representatives appointed from the Ministry of Agriculture, ORTPN, the Ministry of Plan, and USAID with the mandate to plan Project activities consistent with the purpose and objectives of the Project and to review and approve annual Work Plans.

(7) The Grantee will ensure that the Participating Agencies allocate funds to the Project, and assume increasing responsibility for local cost budgets in the amounts and for the purposes specified in Annex 1 of the Project Agreement.

(8) The Grantee will prepare and approve a National Strategy for the Fish Culture Sector in Rwanda.

(9) The Grantee agrees that, in order to permit the Karisoke Research Center to effectively carry out its research program, access to that Center will be restricted to center staff, government and donor officials, visiting scientists and researchers, and individuals expressly invited by Center staff. Visits to the Center for the sole purpose of tourism will be discouraged.

(10) The Grantee agrees that access to the Parc National des Volcans and the Nyungwe Center will be free for groups visiting these two forests under the auspices of the Project's Conservation Education Program. Such access will be scheduled in advance, and ORTPN will be notified in advance of any visits. All such groups will be accompanied by Project personnel while they are in the forests.

(11) Within 6 months of the signature of the Project Agreement, Representatives of the Conservation of Nyungwe Forest Reserve Project will be made full members of the Commission des Forets Naturelles de la Crete Zaire-Nil, which serves as the coordinating body for government and donor efforts in natural forest management in the Nyungwe Forest Reserve.

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

ANNEX A

Life of Project:
From FY 89 to FY 94
Total U.S. Funding: 7.933 million
Date Prepared: 4/15/89

Project Title & Number: Natural Resources Management Project (698-0129)

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Project Goal	Measures of Goal Achievement		
Sustained long-term agricultural production	- Reduced degradation of Rwandan crop lands, watersheds, and natural forests.	Review of environmental analyses and issues papers done by the GOR and donors during coming 10 years.	Protection of the natural resource base is critical for the long-term viability of Rwandan agriculture.
	- Yields/ha of basic food crops increase by 100%. over next 20 years.	MINAGRI annual surveys.	
PROJECT PURPOSES			
1. Erosion on hillsides reduced.	- Reduced siltation levels in selected rivers.	Siltation testing carried out on selected rivers where the project is active.	
	- Stable or increasing yields from hillside agriculture	MINAGRI annual surveys (over long-term)	Unless erosion is reduced, yields from hillside agriculture will invariably steadily decline. Hence, stable or increasing yields from hillside agriculture would be an indicator that soil erosion problems are being addressed.
2. Sustainable Use of Wetlands Promoted.	- Stable or increasing crop yields from small marais.	MINAGRI annual surveys	Unless marais are cultivated in an ecologically sound manner, long-term production will decrease.
	- Increasing fish production from marais.	Project records	Fish production is an economically attractive and environmentally appropriate crop for marais.
3. Rwanda's Natural Forests Protected	- Evidence of reduced encroachment on forest boundaries.	ORTPN records, aerial photos	Protecting the natural forests is necessary to protect the highland watersheds, which is in turn necessary to assure optimal water availability for crop production (on a geographic and seasonal basis).
4. Greater coordination by GOR of activities affecting the natural resource base.	- Explicit efforts made (e.g. strategy studies, conferences and workshops) to coordinate efforts of GOR and donors which have an impact upon the environment.	Perceptions of GOR and donor representatives (from interviews conducted by evaluation team.	Current development activities affecting the natural resource sector are not adequately coordinated, resulting in less than optimal resource allocation.

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Project Outputs	Magnitude of Outputs		
Research and Training in Marais Management			
Technicians trained in marais management and working in the field on marais-related activities.	30 individuals trained in rural engineering with a focus on marais management (an 18 month course), equipped, and assigned by MINAGRI to work on marais development in selected communes	Project Progress Reports	Murambi training facility is available for extension training on a timely basis.
Research completed on marais development and management issues.	At least three studies completed covering issues such as hydrology and water management, soil science, agronomy and socio-economics; and findings applied to the development of a model marais.	Studies completed and copies delivered to USAID. Quality reviewed by evaluation team.	
One 50 ha. model marais managed on a sustainable basis, incorporating lessons learned from research undertaken by the project.	Production levels in the marais increase by 20%, without evident environmental degradation.	Progress reports. Quick and dirty environmental analysis during evaluation.	Pressure, especially from local authorities to "develop" the marais can be held off until the needed studies are completed.
Division Amenagement Hydro-Agricole (DAHA) strengthened.	At least one permanent engineer added to DAHA staff.	Condition Precedent met.	
	DAHA staff trained in various marais development areas (by TA advisors, and through in-country and short-term training.	Project Progress Report	A qualified technical advisor can be recruited locally.

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Project Outputs (cont.)	Magnitude of Outputs (cont.)		
Aquaculture in the Marais			
Increased numbers of productive fishponds.	The SPN actively providing extension services and fingerlings to 2500 fishponds (up from 1600 fishponds in 1988).	Project reports	Current leadership of the Projet Pisciculture Nationale continues for at least the first two years of the project, in order to ensure continuity and allow enough time to train a replacement.
Creation of integrated fish culture-crop-livestock production enterprises in marais areas.	Model ponds integrating fish culture and crop and animal production established in 7 marais areas.	Project reports	
Increased production of pond fish per unit area.	Average annual yield of fish from ponds benefitting from extension by the SPN increased to 18 kg/are/year (up from 14.5 kg/are/year in 1988). At least 10% of ponds producing over 25 kg/are/year.	Project reports	
MS degree training in fish culture.	Two MS degrees awarded.	Project reports	A qualified individual can be identified to begin degree training in fish culture
Applied research in marais development and aquaculture.	Three research studies completed in areas such as fish culture economics and marketing, soil fertility and erosion in the small marais, water management in the marais, and socio-economic issues.	Study documents delivered to USAID.	
Increased SPN capability for extension and adoption of integrated fish culture/crop/animal techniques.	50 MINAGRI fish culture extension agents receive in-service training in integrated fish culture/crop/livestock techniques and actively extending these techniques at the commune level. 20 new fish culture extension agents training and actively promoting fish culture at commune level.	Project reports. Informal sample of former trainees by evaluation team.	

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Project Outputs (cont.)	Magnitude of Outputs (cont.)		
Soil Conservation and Agroforestry			
Implementation of appropriate soil conservation and erosion control measures on degraded or fragile lands.	An inventory of soil erosion problems completed for 5 communes in Ruhengeri Prefecture.	Document prepared and copies presented to USAID.	A PVO will be willing to help implement the project, sharing the costs of fielding a resident advisor in Ruhengeri.
	Commune forestry plans prepared for 5 communes in Ruhengeri Prefecture.	Documents prepared and copies presented to USAID.	Agroforestry and soil conservation technologies exist of can be developed which will be economically attractive to farmers in the near term even without the complementary introduction of new crop varieties.
	Effective agroforestry, soil conservation and erosion control measures taken on 100 ha of communally- and privately-owned land in each of 5 communes in Ruhengeri Prefecture.	Project reports	
Increased extension of proven soil conservation and erosion control techniques.	50 MINAGRI extension agents trained in soil conservation and erosion control techniques and actively extending these techniques at the commune level.	Project reports	
Communal research and demonstration centers established.	Five communal demonstration centers established.	Project reports	
Sector nurseries strengthened.	50 sector nurseries strengthened.	Project reports	
MS degree training in soil conservation.	One MS degree awarded in soil conservation	Project reports	
Applied on-farm research in agroforestry and soil conservation.	An applied research program established within ISAR aimed at refining soil conservation agroforestry and techniques for the highlands of Rwanda.	Research reports completed containing recommendations with regard to agroforestry and soil conservation technologies.	An agreement will be reached with AFRENA to carry out agroforestry research.

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Project Outputs (cont.)	Magnitude of Outputs (cont.)		
Natural Forest Management			
Research completed on the physical, biological, and socio-economic environment of the afromontane forests, and its links to agricultural production in the lowlands.	Three research studies completed on physical, biological, and socio-economic aspects of the Nyungwe afromontane forest. Three research studies completed on the Parc des Volcans forest.	Research reports delivered to USAID. field research.	Researchers will be willing to shoulder some of the costs of
Education efforts undertaken to promote the multiple use management and conservation of remaining natural forests.	Active conservation education programs established (involving school visits, teacher training, school field trips, vocational seminars, commune-level meetings) to familiarize people living in and around the Nyungwe forest of the importance of the forest.	Project reports.	
	The conservation education program of the Mountain Gorilla Project expanded.	Project reports.	
Interpretive centers and related facilities constructed	An interpretive center and staff accomodations constructed and fully equipped at Nyungwe forest. An interpretive center constructed and fully equipped at Kinigi for the Parc des Volcans.	Building inspections.	Other Nyungwe donors provide funds towards the construction of the Nyungwe interpretive center. WCI and/or GOR provide additional funds to construct the Parc des Volcans center.
MS degree training in conservation and park management.	3 MS degrees awarded to Rwandan counterparts.	Project reports.	
In-country training for Rwandan counterparts and park guides.	Formal in-country training received by 10 counterparts and park guides in the two forests.	Project reports.	
Improved Coordination of Natural Resource Activities			
MINIPLAN plays positive role in coordinating environmental policy.	Role of MINIPLAN in coordinating environmental actions and formulating policies clearly delineated.	Survey of perceptions of donor and GOR representatives from interviews conducted by evaluation team.	
Environmental action plan developed and being implemented.	Action Plan approved by GOR and action underway of some of its recommendations.	Copy of document delivered to USAID.	
National fish culture strategy developed.	Strategy drafted and approved by GOR.	Copy of strategy document delivered to USAID.	
Marais development strategy approved.	Draft strategy approved by GOR.	Copy of strategy document delivered to USAID.	
National seminars, workshops, and coordinating meetings held involving a wide range of Rwandans involved in environmental issues.	Seminars, workshops, etc. held.	Project and USAID records.	

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Project Inputs (cont.)	Magnitude of Outputs (cont.)		
USAID			
Long-term Technical Assistance	$1,422,000, 7.5 p/y		
Short-term Technical Assistance	694,500 36 pm		
Equipment	505,500		
Vehicles	355,000 13 trucks/jeeps		
	34,000 10 motos		
Construction	945,000		
Other Costs	2,115,000		
Long-term Training	180,000 - 3 MS		
Short-term Training	219,000 - 30 p/m		
In-country Training	580,000		
Evaluation and Audit	150,000		
Contingency & Inflation	700,000		
Total USAID Contribution	$7,900,000		
GRANTEE			
Training Costs	345,000		
Infrastructure/Construction	300,000		
Commodities	51,000		
Local Operating Costs	2,483,000		
Contingencing and Inflation	324,000		
Total GOR Contribution	3,503,000		

IV. COST ESTIMATE AND FINANCIAL PLAN

A. COST ESTIMATE

The total costs of the Natural Resources Management Project will be $11,402,700. This estimate is based on the assumption that $7,700,000 will be provided from "core" project funds, $200,000 from an AID/W "buy-in" and $3,502,700 equivalent from the GOR. The total AID and GOR contribution represents 69 percent and 31 percent respectively of total project costs.

Table I presents a summary of estimated costs and a financial plan. This is followed by Table II which describes the projected expenditures of USAID and the GOR for each fiscal year. Annex J presents, in detail, a pro forma budget of the estimated project costs. A weighted average of 5 percent was used as an estimate of the annual inflation rate for the AID budget. In preparing the AID budget, it was assumed that the compounded annual inflation rate for goods and services procured in the United States (52 percent of the AID contribution and 36 percent of the total project budget) would be 5.0 percent, and that the compounded annual inflation rate for goods and services procured in Rwanda (48 percent of A.I.D.'s proposed contribution and 33 percent of the total project budget) would be 10 percent. Nevertheless, taking into account the relative rate of expenditures (i.e. the relatively quick disbursement for goods procured locally), a weighted average of 5.0 percent was considered adequate for the annual inflation rate for the AID budget.

An exchange rate of 75 Rwandan Francs was used to estimate the U.S. Dollar equivalent for local currency costs. A contingency factor of .04934 was used for the USAID budget to cover unexpected changes in the estimated level of services and to reflect fluctuating exchange rates in Rwanda. Construction activities are on a small scale and large cost variances were not considered to be more than 5 percent. This Cost Estimate and Financial Plan reflect sufficient details for project planning and current cost estimates. USAID has determined that the project cost estimates are reasonably firm for the project elements. Thus, the requirement of FAA, Section 611, (a)(1) has been satisfied.

B. FUNDING OBLIGATION MECHANISMS

It is proposed that the following USAID incremental obligation schedule be accepted in order to ensure forward funding and successful implementation of this project. An initial obligation of $3 million will be made in FY 1989 and subsequent obligations are planned for FY 90 of $2.2 million, FY 91 of $2.0 and FY 92 of 0.7 million. The estimates of allowances are based on U.S.A.I.D. receiving of $7,700,000 for "core" costs and an AID/W "buy-in" of $200,000. This approach will strengthen the GOR's ability to coordinate and supervise the various public sector activities envisioned under the project. It will also enable USAID to provide the GOR with greater budgetary flexibility during the first 36 months of the project and a rapid response to the mid-term evaluation and audit planned for the end of Year 3 of the project.

C. FINANCIAL PLAN

Listed below are the major project inputs to be financed by USAID and the GOR, including inflation and contingency factors. Detailed cost estimates for each activity are shown in Annex I.

TABLE I
SUMMARY OF COST ESTIMATES AND FINANCIAL PLAN
FOR THE NATURAL RESOURCES MANAGEMENT PROJECT
($000s)

Source of Funds

Use of Funds	AID FX	AID LC	AID SUBTOTAL	GOR FX	GOR LC	GOR SUBTOTAL	TOTAL FX	TOTAL LC	GRAND TOTAL
1. Technical Assist.	1,756.7	359.8	2,116.5	0.0	0.0	0.0	1,756.7	359.8	2,116.5
2. Training	379.0	600.0	979.0	0.0	345.0	345.0	379.0	945.0	1,324.0
3. Commodities	357.8	536.7	894.5	0.0	51.0	51.0	357.8	587.7	945.5
4. Construction	0.0	945.0	945.0	0.0	300.0	300.0	0.0	1,245.0	1,245.0
5. Other Costs	1,155.0	960.0	2,115.0	0.0	2,483.0	2,483.0	1,155.0	3,443.0	4,598.0
6. Evaluation and Audit	124.5	25.5	150.0	0.0	0.0	0.0	124.5	25.5	150.0
Subtotal * * * *	3,773.0	3,427.0	7,200.0	0.0	3,179.0	3,179.0	3,773.0	6,606.0	10,379.0
Inflation	188.7	171.4	360.0	0.0	159.0	159.0	188.7	330.3	519.0
Subtotal * * * *	3,961.7	3.598.4	7.560.0	0.0	3,338.0	3,338.0	2,748.9	6,936.3	10,898.0
Contingency	162.5	177.5	340.0	0.0	164.7	164.7	162.5	342.2	504.7
TOTAL * * * *	4,124.2	3,775.9	7,900.0	0.0	3,502.7	3,502.7	4,124.2	7,278.5	11,402.7
Percentage			69.3 %			30.7	36.2	63.8	

Note: Total AID project contribution of $7.9 million assumes "core" project funding of $7.7 million and a $200,000 "buy-in" from the centrally funded National Resources Management Support Program (698-0467).

TABLE II

NATURAL RESOURCES MANAGEMENT PROJECT EXPENDITURES BY FISCAL YEAR
($000)

USE OF FUNDS	FY 89			FY 90			FY 91			FY 92			FY 93			FY 94		
	AID	GOR	TOTAL	AID	GOR	TOTAL	AID	GOR	TOTAL	AID	GOR	TOTAL	AID	GOR	TOTAL	AID	GOR	TOTAL
TECHNICAL ASSIST.																		
A. Long-term	15.0	0.0	15.0	484.0	0.0	484.0	459.0	0.0	459.0	237.0	0.0	237.0	227.0	0.0	227.0	0.0	0.0	0.0
B. Short-term	0.0	0.0	0.0	250.0	0.0	250.0	160.0	0.0	160.0	142.0	0.0	142.0	105.0	0.0	105.0	37.5	0.0	37.5
TRAINING																		
A. Long-term	0.0	0.0	0.0	120.0	0.0	120.0	60.0	0.0	60.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B. Short-term	0.0	0.0	0.0	100.0	0.0	100.0	64.0	0.0	64.0	45.0	0.0	45.0	10.0	0.0	10.0	0.0	0.0	0.0
C. In-country	0.0	0.0	0.0	247.5	69.0	316.5	185.0	69.0	254.0	110.0	69.0	179.0	35.0	69.0	104.0	2.5	69.0	71.5
COMMODITIES	81.5	0.0	81.5	530.5	51.0	581.5	183.0	0.0	183.0	82.0	0.0	82.0	15.0	0.0	15.0	2.5	0.0	2.5
CONSTRUCTION	0.0	0.0	0.0	220.0	183.0	403.0	400.0	117.0	517.0	245.0	0.0	245.0	80.0	0.0	80.0	0.0	0.0	0.0
OTHER COSTS	60.8	201.5	262.3	565.1	520.0	1,085.1	572.1	520.0	1,092.1	543.1	520.0	1,063.1	316.9	520.0	836.9	57.0	201.5	258.5
EVALUATION/AUDIT	0.0	0.0	0.0	0.0	0.0	0.0	50.0	0.0	50.0	50.0	0.0	50.0	50.0	0.0	50.0	0.0	0.0	0.0
SUBTOTAL	157.3	201.5	358.8	2,517.1	823.0	3,340.1	2,133.1	706.0	2,839.1	1,454.1	589.0	2,043.1	838.9	589.0	1,427.9	99.5	270.5	370.0
INFLATION	7.9	10.1	17.9	125.9	41.2	167.0	106.7	35.3	142.0	72.7	29.5	102.2	41.9	29.5	71.4	5.0	13.5	18.5
SUBTOTAL	165.2	211.6	376.8	2,643.0	864.2	3,507.2	2,239.8	741.3	2,981.1	1,526.8	618.5	2,145.3	880.8	618.5	1,499.3	04.5	284.0	388.5
CONTINGENCY	8.2	10.4	18.6	130.4	42.6	173.0	110.5	36.6	147.1	75.3	30.5	105.8	43.5	30.5	74.0	5.2	14.0	19.2
TOTAL	173.4	222.0	395.4	2,773.4	906.8	3,680.2	2,350.3	777.9	3,128.2	1,602.1	649.0	2,251.1	924.3	649.0	1,573.3	09.7	298.0	407.7
	AID	GOR	TOTAL	AID	GOR	TOTAL	AID	GOR	TOTAL	AID	GOR	TOTAL	AID	GOR	TOTAL	AID	GOR	TOTAL

D. METHODS OF IMPLEMENTATION AND FINANCING

The overall financial planning and proposed methods of financing for this project are sound. The financial management capabilities of the GOR's implementing entities have been reviewed and deficiencies and constraints relative to the management of U.S. Government funds were identified during the project design. USAID disbursement of funds under the proposed project will be made in several ways. Direct payment will be utilized for training, offshore and local procurement of project commodities, NGO grants, and staff and contractor support. Periodic advances will be utilized for in-country training and workshops, vehicle operations/maintenance, a revolving credit fund and local support and operational costs. Fixed amount Reimbursement will be utilized for construction activities.

The following Table III summarizes the methods of implementation and financing the projects activities. The funding amount includes an estimated "buy-in".

TABLE III
METHODS OF IMPLEMENTATION AND FINANCING
FOR THE NATURAL RESOURCES MANAGEMENT PROJECT (696-0129)
AID INPUTS ($000s)

TYPE OF ASSISTANCE	METHOD OF IMPLEMENTATION	METHOD OF FINANCING	APPROXIMATE AMOUNT
Technical Assistance	PIO/T - Direct AID Contracts	LOC-TFCS 1/ or Direct Payment or Reimbursement	2,116.5
Training	PIL - Host Country PIO/P PIO/T - Direct AID Contracts	Periodic Advance Direct Payment Direct Payment or Reimbursement	979.0
Commodities	PIO/C - Direct AID Contracts	Direct Payment or Direct L/Com 2/	894.5
Construction	PIL - Host Country PIO/T - Direct AID Contracts	Fixed Amount Reimbursement Direct Payment or Reimbursement	945.0
Other Costs	PIL - Host Country PIO/T - Direct AID Contracts	Periodic Advance Direct Payment or Reimbursement	2,815.0
Evaluation/Audit	PIO/T - Direct AID Contracts	Direct Payment or Reimbursement	150.0
TOTAL USAID FINANCING (including inflation and contingency)			7,900.0

1/ LOC-TFCS - Letter of Credit - Transfer of Federal Credit
2/ L/Com - Letter of Commitment

E. RECURRENT COSTS

The GOR contribution to the Natural Resources Management Project is $3.5 million, approximately 31 percent of total project costs. Of the $3.5 million, $2.7 million is categorized as recurrent costs and $800,000 as investment costs. All costs are spread over the life of the project. Recurrent costs consist primarily of personnel costs (approximately 90 percent), vehicle operation and maintenance, and other costs. Beginning in Year 3 of the project, the GOR recurrent costs are expected to rise significantly, as the GOR assumes a greater proportion of costs for personnel and vehicle operation.

The GOR contribution to recurrent costs after the PACD in 1994 has been estimated by marginal contribution analysis, unlike the estimation for recurrent costs during the life of the project. Post-PACD recurrent cost estimates do not include estimates for personnel salaries and benefits, or vehicle and building operation and maintenance, when equivalent costs were already being met by the GOR before the project started. Project personnel already being employed by the GOR before the project began do not represent an additional cost to the GOR, even if they are working under the project. In the case of the agroforestry and soil conservation component, recurrent costs are not included for the small number of Rwandan personnel expected to be hired, nor for office and vehicle operation and maintenance. The reason for is that MINAGRI is in the process of establishing a new regional organization called a "Unite Operationelle". This organization, already established in some regions, will be set up at the sub-prefecture level or within a group of three or four communes. It will be responsible for the local administration and extension work for MINAGRI, as well as for managing the Rwandan part of donor-sponsored projects within its jurisdiction. As a result, the Rwandan personnel working in bilateral or multilateral projects, and in the former regional and local structure of MINAGRI, will be absorbed by this new organization. It is also expected that, as projects reach their completion date, that the number of personnel in the organization will be reduced, especially at the lower grades.

Regarding vehicle and operation costs, the vehicles purchased for the project will generally replace GOR vehicles currently in operation. It is assumed that the new vehicles will be operated with the recurrent costs provisions established for the old ones.

In view of the above assumptions, it is estimated that GOR recurrent costs after the PACD will rise, per project component, per year, as shown below:

Project Component	US $/year
1. Project Coordination	1,000
2. Improved Marais Management	101,000
3. Integrated Fish Culture	82,000
4. Agroforestry and Soil Conservation	5,000
5. Natural Forest Management	81,000
6. Environmental Planning and Policy	1,000
Total Recurrent Cost per year after LOP	271,000

Although the 1989 GOR budget has not yet been published, it is expected that GOR allocations to natural resource management activities will not be less than the amount allocated in 1988. It is noteworthy that allocations to natural resources management activities in 1988 were higher than in preceding years. In 1988, the MINAGRI budget totalled nearly 850 million Rwandan Francs ($11.3 million). Of this amount, $1.4 million was allocated to the Direction Général des Forêts and $3.1 million to the Direction Général du Génie Rural et de la Conservation des Sols. Other departments of MINAGRI which account for the rest of the MINAGRI budget, and which are engaged partially in natural resources management activities, include, the Office of Agricultural Production and the Office of Animal Husbandry. The Ministry of the Interior and Commune Development, responsible for community public works, was and will also permanently be involved in NRM activities.

The President of the Republic of Rwanda and the National Revolutionary Movement for Development, have declared 1989 the Year of Rural Auto-Organization; this aspect particularly involves the Ministry for Youth and Cooperative Movement activities. The President's program for his new five year term stresses the need for permanent efforts in natural resources management and it introduces environmental protection as a vital aspect of government policy.

The GOR expenses for natural resources management activities in 1988 totalled approximately $13.1 million, $8.6 million in the Development Budget and $4.5 million in the Ordinary Budget. The Development Budget for Rwanda provides financial information on 15 natural resources management projects as follows:

	(In millions of US Dollars)		
	GOR	Loans/Grants	Total
11 projects	7.7	18.0	25.7
(in percent of total)	30%	70%	100%
3 projects	0.9	-	0.9
1 project	-	4.7	4.7
Total expenses in Budget de Développement for NRMP Projects	8.6	22.7	31.3

Severe austerity cuts have been imposed by the GOR for the 1988 Ordinary Budget, including a 20 percent reduction in allocations for gasoline and vehicle maintenance. These measures and the blocking of an automatic 3 percent annual increase of individual public servants salaries in the 1988 Budget (lifted in November 1988), did not affect GOR disbursements for projects financed in the 1988 Development Budget. As a result of the GOR's emphasis on the conservation of natural resources, it is expected that budget allocations for natural resource activities will not decrease in the immediate future. Past experience in working with the GOR suggests that, barring a severe economic crisis, that GOR will continue to honor its obligations resulting from this project.

V. IMPLEMENTATION PLAN

The overall administrative coordination and management of the project will be the responsibility of a Project Coordinating Committee (Comite de Coordination), which will include representatives of MINAGRI, ORTPN, MINIPLAN, USAID, ISAR, and MININTER and USAID. MINAGRI will be responsible for the marais, fish culture, and agroforestry and soil conservation components. ORTPN will have primary responsibility for the natural forest management component. MINIPLAN will be responsible for the environmental planning component.

Day-to-day coordination and management of the project will be the responsibility of a Coordination Unit (cellule de coordination) composed of a Rwandan national director for the project, and an expatriate advisor. The national coordinator will be designated by the Project Coordinating Committee MINAGRI. This unit will work closely with MINAGRI, ORTPN and MINIPLAN in coordinating field activities, and will report to the Coordinating Committee.

Actual implementation of the subcomponents will be carried out in the field by representatives of the three GOR agencies and by Private Voluntary Organizations (PVOs). Representatives of these agencies and organizations will constitute a Comite Technique which will meet quarterly, together with the National Director and Resident Advisor, to discuss project implementation, prepare work plans, and to address issues that arise. An organigram of the project is presented in Figure 1.

It is intended that an institutional contract will be let to provide two long-term technical advisors for the project. This contractor will also coordinate and/or provide short-term technical assistance and U.S. and third country training. The contractor may be a U.S. consulting firm, a PVO, a U.S. university, or a combination of the above. The Natural Forest Management portion of the project will be implemented through Cooperative Agreements to three PVOs currently working with ORTPN and the DG Forêts in the targeted natural forests. PVO participation will also be sought to provide on-the-ground support for the agroforestry and soil conservation activities in Ruhengeri Prefecture. Short-term technical assistance will be obtained, to the extent possible, through local sources or through "buy-ins" to centrally- and regionally-funded AID projects (see below).

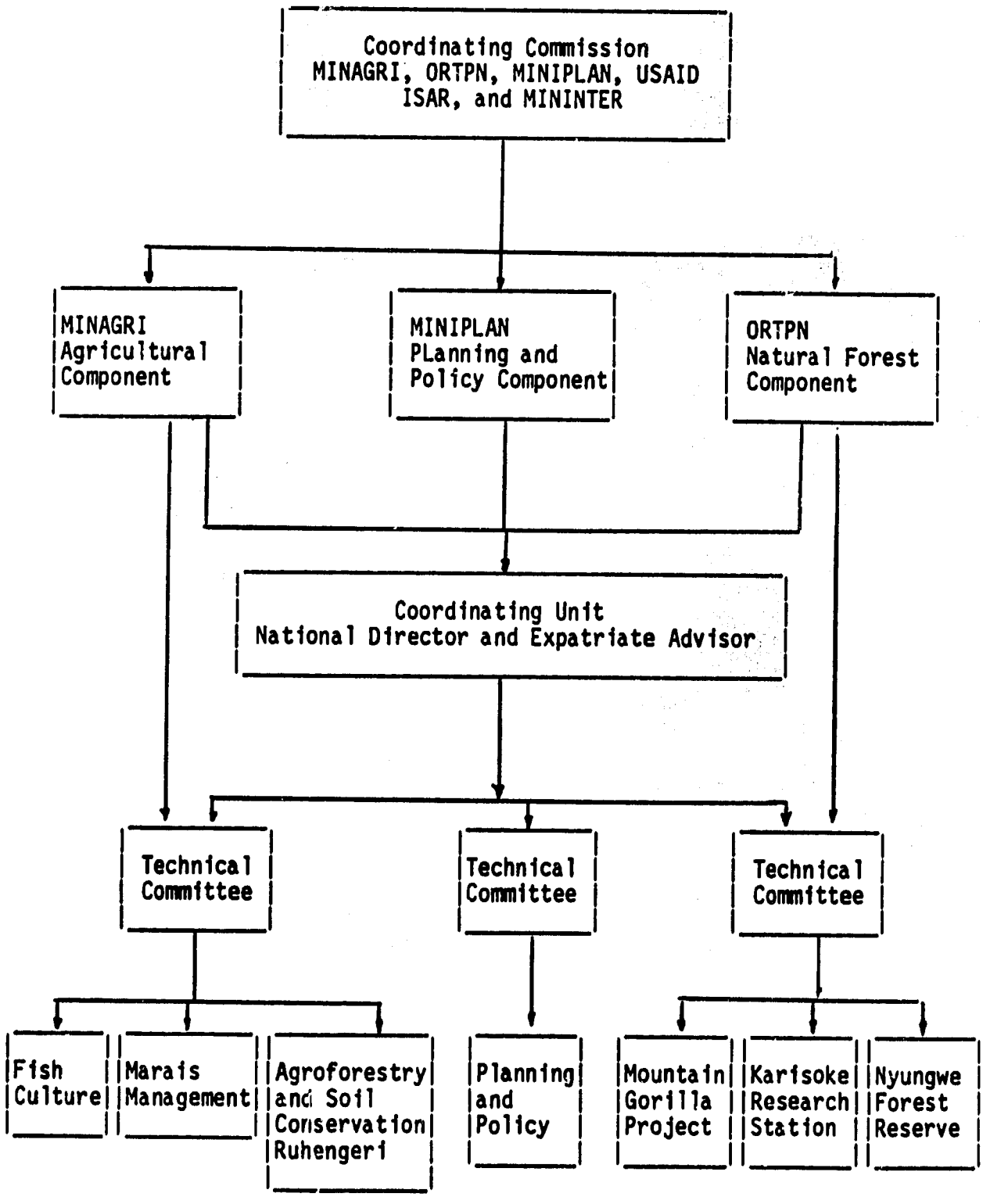
Long-term Technical Assistance

The NRMP will finance two long-term advisory positions under the primary institutional contract. One of these advisors, together with the Rwandan Project Director from MINAGRI, will be responsible for the overall supervision of the project. The duties of this advisor will include:

a) monitoring the progress of the project towards the achievement of its goals;

b) identifying and resolving implementation problems as they arise;

c) ensuring that the activities of the various implementing agencies (e.g. PVOs, communes, MINAGRI, centrally-funded TA,) under the separate components of the project are coordinated;


Coordinating Commission
MINAGRI, ORTPN, MINIPLAN, USAID
ISAR, and MININTER
MINAGRI
Agricultural
Component
MINIPLAN
PLanning and
Policy Component
ORTPN
Natural Forest
Component
Coordinating Unit
National Director and Expatriate Advisor
Technical
Committee
Technical
Committee
Technical
Committee
Fish
Culture
Marais
Management
Agroforestry
and Soil
Conservation
Ruhengeri
Planning
and
Policy
Mountain
Gorilla
Project
Karisoke
Research
Station
Nyungwe
Forest
Reserve

d) ensuring that the activities of the project are linked to, and coordinated with, the GOR's agricultural research and extension programs;

e) reviewing and making recommendations with respect to work plans submitted by the various participating institutions.

f) setting objectives and coordinating data collection for measurement of project impact;

g) interfacing between USAID and the GOR and reporting to USAID on project implementation (i.e. work plans and financial reports);

h) identifying short-term TA needs, assisting in the recruitment of appropriate technical advisors, and providing them with logistical support; and

i) identifying training needs and coordinating in-country, third country and U.S. training.

This individual will not have a specific technical assignment. Nevertheless, he will be involved in setting objectives and monitoring progress for all five project components. Therefore, this individual should have an advanced degree in natural resources management or some other environmentally-related discipline, and should have substantial experience in the management of natural resources projects in developing countries.

Two person-years of resident technical assistance will be funded in order to implement the Environmental Planning component of the project. This individual will work with MINIPLAN. A summary of his responsibilities is presented in the Environmental Planning section of the project description (Section III-C-5).

Funding will be provided by the project for a resident technical advisor in marais management. This advisor will provide assistance, on a three-quarter time basis and over a 24 month period, to the Division Amenagement Hydro-Agricole of MINAGRI in implementing the marais management component of the project. This individual will be recruited locally, through a personal services contract.

Funds will also be allocated to purchase the services, over the life of the project, of an engineer under a personal services contract. This individual will assure quality control to USAID for construction and engineering activities undertaken by the project. The engineer will only work part-time on the project.

Some funding will be earmarked to cover the costs of Coordination Unit Operations. This will include office rental, salaries of a secretary, accountant, etc., and office furnishings and supplies. In addition, funds will be set aside for a mid-term and a final evaluation of the project, as well as for carrying out a financial audit.

Short-term Technical Assistance

Funding will be provided under the project for the procurement of short-term technical assistance. In order to stretch these funds as far as possible, they will be used, to the extent possible, for buy-ins to central and regionally-funded AID projects dealing with natural resources. Examples of such projects include: the Agroforestry Research Networks for Africa (AFRENA) Project; the Soil Management Support Services (SMSS) Project; the Tropical Soils CRSP (TROPSOILS); the Natural Resources Management Support (NRMS) Project; the Forestry Support Program, and the proposed Agricultural Water Resources Management Project (AWRM). Such projects could provide technical assistance and training to the NRM Project if the latter covers a portion of the cost. For example, a regional or centrally-funded project might cover the salaries of technical advisors, if the NRM Project covers transportation, per diem and local costs. Using this mechanism, it may be possible to significantly expand the resources available to the NRM Project.

TABLE 1: Tentative Implementation Plan

DATE	ACTION
May 1989	Signature of Project Agreement.
June 1989	Signature of Cooperative Agreements with natural resources management PVOs and possibly with a PVO to implement the Agroforestry and Soil Conservation Component.
June 1989	Issuance of a Request for Technical Proposals for the principal Contractor.
June 1989	Signature of a Personal Services Contract with a local expert in marais management. Commencement of the work for this individual.
Sept. 1989	Submission to USAID of the First Annual Workplan.
Oct. 1989	Selection of Contractor for contract coordination.
Jan. 1990	Arrival of resident advisors (coordinator, environmental planner, and soil conservation expert).
Jan. 1990	Commencement of the Marais Training Program for A2 technicians.
June 1990	Departure of the first MS candidate in fish culture and MS candidate in soil conservation/agroforestry.
Sept. 1990	Submission to USAID of Second Annual Workplan.
Oct. 1990	Submission to USAID of First Annual Report.
June 1991	Completion of Marais Training Program for A2 technicians.

TABLE 1: Tentative Implementation Plan

DATE	ACTION
June 1991	Completion of contract for Marais Management PSC.
June 1991	Completion of construction of soil conservation offices in Ruhengeri, and completion of interpretative centers in Nyungwe Forest and Parc des Volcans.
Sept. 1991	Submission to USAID for Third Annual Workplan.
Oct. 1991	Submission to USAID of Second Annual Report.
Jan. 1992	Departure of Environmental Planning Advisor.
June 1992	Return of soil conservation/agroforestry MS participant and first fish culture MS candidate. Departure of second fish culture MS candidate.
June 1992	Mid-term Project Evaluation.
Sept. 1992	Submission to USAID for Fourth Annual Workplan.
Oct. 1992	Submission to USAID of Third Annual Report.
Nov. 1992	Project Audit
Sept. 1993	Submission to USAID for Fifth Annual Workplan.
Nov. 1993	Final Project Evaluation.
Jan. 1994	Submission to USAID of Final Project Report.
Jan. 1994	Departure of expatriate project coordinator and soil conservationist.
Apr. 1994	Return of second fish culture MS candidate.
April 30, 1994	Project Activity Completion Date.

VI. PROCUREMENT PLAN

1. Responsible Agency

Overall responsibility for implementing the Natural Resources Management Project, including the procurement of project commodities, will rest with the Project Coordinating Committee. The GOR Project Coordinator will manage the project on behalf of the GOR. This individual will be responsible for authorizing the expenditure of project funds; for approving and signing Project Implementation Orders, Project Implementation Letters, and other forms of obligating documents; for monitoring the procurement process; and for acknowledging to USAID, by the issuance of receiving reports, the receipt of goods.

2. Purchasing Entities

Procurement responsibility for the various components of this project will be divided among the prime contractor, the PVO(s), USAID and a Procurement Services Agent (PSA). This division breaks down as follows:

A. Marais Management and Integrated Fish Culture Components

For the Marais Management and Integrated Fish Culture components, procurement responsibility will be shared by the Contractor, USAID and a PSA under the REDSO/ESA PSA Indefinite Quantity Contract (IQC). The Contractor will be directly responsible for purchasing approximately $113,000 of computer equipment, training materials and miscellaneous field equipment. USAID will purchase all motor vehicles, and the PSA IQC will purchase rural engineering equipment valued at over $100,000. The PSA may also assist with the purchase of fishing equipment and supplies (value: $30,000) if the Contractor so requests.

B. Agroforestry & Soil Conservation Component

Purchases for this component will be the direct responsibility of the PVO that is selected to implement this component. USAID may assist with the procurement of vehicles and motorbikes if the PVO proves incapable of securing these items alone.

C. Natural Forest Management, and Ministry of Planning Components

The various PVOs associated with the three sub-components of the Natural Forest Management component of this Project (the Mountain Gorilla Project, Nyungwe Forest Reserve, and Karisoke Research Center) will be responsible for the purchase of vehicles and motorbikes. USAID assistance may be provided if required. The PVOs implementing the Mountain Gorilla and Conservation of Nyungwe Forest Reserve Projects will be responsible for purchasing office supplies, education and technical materials (value: $84,000). A high proportion of these goods will, in all probability, be sourced locally. The Contractor will purchase audiovisual equipment for Mountain Gorilla Project, exhibiting equipment for the Nyungwe Forest Project, and computer and laboratory equipment for the Karisoke Research Center. USAID will purchase a vehicle for the Ministry of Planning.

3. Development Fund for Africa Certification

This Project will be funded by resources provided under the Development Fund for Africa (DFA). Under DFA, the Assistant Administrator for Africa approved a number of Administrative Recommendations which (1) transfers nearly all DFA waiver implementation authority to USAID; (2) "unties" whenever possible the eligible source to AID Code 935 (Special Free World); and (3) directs USAIDs to formulate sufficiently comprehensive procurement plans to assure that procurement is from the United States to the maximum extent practicable.

The authorized source for procuring motor vehicles is AID Code 935, and a no "special circumstance" waiver is required to be executed by the Project Officer to purchase such vehicles from non-U.S. sources. Because U.S. manufactured vehicles are unavailable in Rwanda, the Project intends to purchase vehicles from Code 935 sources.

Of the other items to be purchased, only those items which are not currently made in the U.S. (e.g. certain audiovisual equipment) or which, because of their very nature, cannot be purchased and shipped to Rwanda at a reasonable cost, will be purchased offshore. As such, USAID/Rwanda, in accordance with Agency Africa Bureau Guidelines, is maximizing US procurement whenever practicable.

The approximate division between US and non-US procurement is as follows:

($000's)	US	%	non-US	%	Total
Vehicles included	277	31	616	69	893
Vehicles excluded *	276	60	184	40	460

* $343,500 budgeted for vehicles

Significantly, when vehicles are excluded from the commodity listing, about 60 percent of the projected purchases are expected to have their source and origin in the U.S. It must be recognized, however, that this figure could drop if potential U.S. commodity suppliers fail to respond to purchase requests, a common occurrence in this part of Africa. The USAID Project Officer assigned to monitor this project will keep records of all commodities purchased by the project by AID Geographic Code and will report this information on a yearly basis to AFR/PD.

The list in Table 2, drawn-up with the assistance of the REDSO/ESA Regional Commodity Management Officer, was prepared with the intent of maximizing US purchases whenever practicable.

4. DFA Procurement under Grants and Cooperative Agreements

According to AID Handbook 1B, Chapter 16, when the total procurement element of a grant or cooperative agreement is $250,000 or less, the grantee must follow an order of preference for procurement: (1) U.S. only, (2) host country, (3) Code 941, and (4) Code 935. Since the authorized procurement source under DFA is Code 935, the $250,000 ceiling does not apply.

Table 2 : Equipment List

Item	Qty	Prob. Source and Origin	Procurement Agent	Budget (US $)
I. MARAIS MANAGEMENT COMPONENT				
01. Minibus (18-25 seat capacity)	1	EUR/JAPAN	USAID	35,000
02. Vehicle (4-WD double cabin)	1	EUR/JAPAN	USAID	35,000
03. Training Materials	-	US/HC/EUR.	CONTRACTOR	10,000
04. Computer Equipment	-	US/EUR/JAPAN	CONTRACTOR	10,000
05. Rural Engineering Equipment	-	US	PSA	115,000
06. Misc. Field Activity Equipment	-	US/HC/EUR.	CONTRACTOR	30,000
07. Misc. Field Equip. for DAHA	-	HC	CONTRACTOR	20,000
		Subtotal (I)		255,000
II. INTEGRATED FISH CULTURE COMPONENT				
01. Vehicle (small 4-WD truck)	2	EUR/JAPAN	USAID	40,000
02. Computer Equipment	-	US/EUR/JAPAN	CONTRACTOR	10,000
03. Fishing Equipment & Supplies	-	US	CONT/PSA	30,000
		Subtotal (II)		80,000
III. AGROFORESTRY AND SOIL CONSERVATION COMPONENT				
01. Vehicle (standard 4-WD truck	3	EUR/JAPAN	USAID/PVO	100,000
02. Motorbikes (125-185 cc)	7	JAPAN	USAID/PVO	21,000
03. Misc. Equipment	-	US/HC/EUR.	PVO	29,000
		Subtotal (III)		150,000
IV. NATURAL FOREST MANAGEMENT COMPONENT				
A. Mountain Gorilla Project				
01. Vehicle (small 4-WD truck)	2	EUR/JAPAN	USAID/PVO	40,000
02. Office Supplies & Equipment	-	US/HC/EUR.	PVO	40,000
03. Audio-Visual Equipment	-	US/JAPAN	CONTRACTOR	30,000
B. Nyungwe Natural Forest				
04. Vehicle (pick-up)	1	EUR/JAPAN	USAID/PVO	20,000
05. Vehicle (small 4-WD truck)	1	EUR/JAPAN	USAID/PVO	20,000
06. Motorbikes (125-185 cc)	3	JAPAN	USAID/PVO	7,500
07. Office Supplies	-	HC/EUR.	PVO	13,000
08. Educational Material	-	US/HC/EUR.	PVO	15,000
09. Tech. Materials & Field Equip.	-	US/HC/EUR.	PVO	16,000
10. Furnishings & Exhibiting Equip.	-	US/HC/EUR.	CONT/PVO	20,000

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Table 2 : Equipment List (cont.)

Item	Qty	Prob. Source and Origin	Procurement Agent	Budget (US $)
C. Karisoke Research Center				
11. Vehicle (small 4-WD truck)	1	EUR/JAPAN	USAID/PVO	20,000
12. Motorbikes (125-185 cc)	3	JAPAN	USAID/PVO	5,000
13. Computer & Office Equipment	-	US/EUR/JAPAN	CONTRACTOR	10,000
14. Laboratory Equipment	-	US/EUR.	CONTRACTOR	5,000
		Subtotal (IV)		261,500
V. MINISTRY OF PLANNING				
01. Vehicle	1	EUR/JAPAN	USAID	20,000
02. Computer	-	US/EUR/JAPAN	CONTRACTOR	15,000
03. Office Equipment	-	HC	CONTRACTOR	10,000
04. Household furnishings	-	US/HC/EUR	CONTRACTOR	30,000
		Subtotal (V)		80,000
VI. Project Coordination				
01. Computer Equipment	1	US/EUR/JAPAN	USAID/PVO	10,000
02. Office Equipment	-	H/C	CONTRACTOR	8,000
03. Vehicle	1	EUR/JAPAN	CONTRACTOR	20,000
04. Household furnishings	-	H/C	CONTRACTOR	30,000
		Subtotal (VI)		80,000
		Total (I-VI)		894,500
		Contingency (11%)		98,395
		Grand Total		992,895
		ROUNDED TOTAL		993,000

5. Local Cost Financing - Shelf Items

Imported shelf items are items imported and kept in stock to meet a general demand for these items within the country. Under pre-DFA rules, shelf items from Code 899 (Free World) sources could be financed if their total cost were less than $25,000 for any given project and did not exceed 10 percent of the AID funds available for local costs, and if each item costs the local currency equivalent of $5,000 or less. The Shelf Item Rule Dollar limitations for Code 899 procurement noted here no longer apply to DFA purchases.

6. Commodity Marking

Commodities purchased by the project will be appropriately marked with the AID handclasp emblem. The PSA will be instructed to ensure that goods it purchases are marked at source. The USAID will maintain a supply of emblems for distribution to MINAGRI for marking commodities purchased locally, as well as for marking the vehicles purchased for the project.

7. Procurement Schedule

Realistic advance planning for the procurement of all equipment and materials is essential for project success. Lists of needed commodities and anticipated costs will be prepared at the initial stages of the project and further refined before any procurement occurs. For the various entities involved in procurement, all will take into account the significant time required to complete some or all of the following steps: (1) contracting with the PSA (discussed in greater detail below); (2) preparing specifications and solicitation documents; (3) advertising; (4) preparing bids or offers by suppliers; (5) evaluating responses; (5) conducting negotiations; (6) issuing contracts or orders; (7) establishing payment documents; (8) manufacturing, inspecting and packing equipment; and (9) transporting and clearing equipment from customs.

Because of the disparate nature of this project, no target dates for project procurement can be established at this time.

8. Procedures for Employing the REDSO/ESA PSA IQC

The contractor and USAID will collaborate jointly in preparing the documentation required to permit employing the services of the PSA under the REDSO/ESA IQC for procurement services. USAID will prepare the PIO/C, with the contractor preparing the specifications. Before forwarding the PIO/C and specifications to REDSO, the Mission will ensure that sufficient funds (usually from 6-8 percent of the FAS value of the commodities) have been reserved for the PSA's fee).

REDSO Contracts will negotiate the work order with the PSA, providing cable notification to USAID once the work order has been signed. USAID is responsible for initiating the financing documents to pay the PSA's fee, as well as for the commodities. The fee will be paid directly by USAID, while payment of the commodities will be through a bank letter of commitment issued by AID/W. The PSA will be designated as the approved applicant to direct issuance of letters of credit to suppliers under the bank letter of

commitment. RCMO assistance will be provided as needed.

9. Contingency Plan for Procuring Vehicles Directly from U.S. Embassy Japan

Because of the uncertain availability of vehicles in Rwanda, the project will retain the option of utilizing the Central Procurement Office in the US Embassy in Tokyo to obtain vehicles and vehicle parts directly from Japan. Orders will be accepted for project vehicles on behalf of the grantee or procurement conducted by the host country itself. RCMO assistance will be provided as needed.

VII. MONITORING AND EVALUATION PLAN

A. PROJECT MONITORING

All project activities will be carefully monitored throughout the life of the project. The monitoring process will: (1) collect information that will subsequently enable both the USAID and GOR project managers to compare reported progress against planned inputs, outputs, and objectives; (2) alert project managers and policy makers to implementation problems requiring corrective action; and (3) provide information needed to prepare project evaluations, including information on conditions and assumptions which are critical to the success of the project.

B. PROJECT REPORTING

To ensure that the objectives of the project are attained, the following planning documents and reports will be produced.

1. A draft Annual Workplan will be prepared by the staff of each component and sub-component and submitted to the Project Management Committee for its review and approval within 120 days of the signature of the Project Agreement. This Annual Workplan will be revised based on comments from the Project Management Committee and will be submitted to USAID for review and approval by September 30, 1989, and annually thereafter. This workplan will specify the objectives, targets, and outputs of each activity underway or planned. The Annual Workplan will also outline the steps to be taken in reaching these objectives, and will specify those resource requirements necessary for its implementation (e.g. will contain budgets detailing actual, planned, and projected expenditures).

2. An Annual Report will be prepared in October 1990, and annually thereafter. These annual reports will summarize the activities carried out during the preceding year, as well as the progress made by the project towards attaining its output objectives.

3. A Final Project Report will be submitted in January 1994, three months prior to the PACD.

4. All annual workplans and annual reports will be prepared in both English and French. Other reports may be prepared in English and/or French as may be mutually agreeable to the GOR and USAID.

C. SUGGESTED METHODOLOGY FOR DATA COLLECTION

Monitoring project performance and evaluating the impact of the proposed project will entail the collection of selected data during the course of project implementation. The majority of this data will be collected by the entities implementing the project in the field. The project's evaluation plan emphasizes practicality over sophistication. Given the hilly terrain, poor road conditions and dispersed residential pattern in the proposed project areas, NRMP will encourage the use of simple, low cost data collection techniques, including rapid rural appraisal methods, and the extension-based monitoring systems, such as that developed by the Fish Culture project.

1. Fish Culture

The fish culture component of the proposed project will build upon the activities of the National Fish Culture Project (696-0112), which has already incorporated a monitoring and evaluation system into its extension program. This program has included: (a) monthly extension agent reports; (b) monthly supervisor reports; (c) monthly station reports; (d) detailed station pond records; (e) individual private pond records; (f) pond management evaluations; (g) pond censuses; (h) fingerling orders; and (i) pond harvest work sheets. Through these reports, data has routinely been collected on pond and station production (e.g. fish stocking rates, harvests, the level and cost of inputs used, fingerling distribution, and fish marketing). Data has also been collected on beneficiary characteristics, including the number and types of farmers involved in fish culture. and the effectiveness of the extension program. The National Fish Culture Project also involved a number of special studies which contributed substantially to the data base, including a socio-economic survey of fish producers.

Under the fish culture component of the NRM project, this effective management information system will continue to provide the information needed for project monitoring and evaluation. The procurement of data processing equipment will facilitate the analysis of the data. This will be particularly important since, with integrated fish culture, data will also need to be collected on crop and livestock production, and the interrelationships between these and fish production.

2. Marais Development

A study of the socio-economic issues important for marais development is envisioned as part of the marais management component of the project. This study will focus on the model marais and, in all likelihood, will entail a socio-economic survey which will provide a good set of baseline data. This study will most likely be undertaken by researchers and students from UNR. The researchers, themselves, will develop their own research plan and methodology. The baseline survey will recommend a follow-up program to collect the additional data needed to assess changes in socio-economic indicators and thus the impact of the project.

3. Agroforestry and Soil Conservation

GOR agencies, PVO's and communal authorities implementing reforestation, agroforestry and soil conservation activities will set up their respective monitoring systems. The information obtained from extension-monitoring systems will be routinely included in the quarterly and annual activity reports submitted to USAID/Rwanda. It will be used to assess the overall performance of the agricultural components of NRMP and in identifying implementation issues. The project will ensure that the monitoring system can effectively measure indicators of project progress, such as the effectiveness of soil conservation measures and tree plantings by farmers.

A preliminary assessment of the monitoring system set up under the CARE Gituza Forestry Project indicates that a system based on collecting pertinent

agroforestry and soil conservation data from reports of extension workers and close supervision of extension activities, can provide adequate information on extension activities and farmer response. A modification of this management information system could be used for the agroforestry and soil conservation activities envisioned under the Natural Resources Management Project.

4. Natural Forest Management

The collection of baseline data will be a major activity under the Natural Forest Management component of the project. Under the research component of the project, data will be collected on flora and fauna populations, use of the forest, and the physical characteristics of the forest. However, it is unlikely that, in the five-year life of the project, statistically significant changes in many of these variables will be observable. Nevertheless, the three PVOs that will manage these subcomponents will develop monitoring and evaluation systems which will: (1) provide information on project activities, and (2) monitor changes in forest use. Particular attention will be given to indicators such as: tourist visits and revenues, poaching violations, population levels within the forest boundaries (i.e. in Nyungwe).

5. Environmental Planning

In the initial months of the project, MINIPLAN, together with the resident advisor, will develop progress indicators for the project's efforts to improve the GOR's environmental planning and policy analysis capability. These measures could include the preparation and approval of strategy documents for various sectors (e.g. marais development, fish culture), actions taken to address selected environmental problems, and so forth.

D. PROJECT EVALUATION

In addition to the internal project monitoring activities described above, two external evaluations (a mid-term evaluation around June 1992 and a final evaluation around November 1993) will be commissioned by USAID/Rwanda to assess the success of the project in meeting its Goal, Purpose, and Output objectives. Technical assistance to carry out these evaluations will be contracted by A.I.D., and will be financed through the project. The evaluations will be designed to meet the criteria stipulated in AID's Evaluation Handbook (AID/W, April 1987). These are:

Relevance	Are the goals of the project still consistent with the development objectives of AID?
Effectiveness	Is the project achieving satisfactory progress towards its anticipated outputs.
Efficiency	Are the project's outputs being achieved at an acceptable cost compared with alternative approaches towards accomplishing the same effects?
Impact	What positive or negative effects have resulted from the project?

Sustainability Are the effects of the project likely to be sustained by farmers and GOR agencies after AID funding has stopped?

Apart from assessing the project's progress against its stated inputs and outputs, the mid-term evaluation should offer recommendations to improve project performance, while the final evaluation should determine whether the benefits generated will be sustained after AID funding has stopped. These evaluations should also review whether USAID/Rwanda has provided adequate management support to the project.

The evaluations will each involve a multi-disciplinary team, including experts in natural resources, agroforestry and soil conservation, an natural resource or agricultural economics, aquaculture, and social science. All evaluation team members should speak fluent French and have working experience in Africa.

In addition to the two evaluations, there will be a financial audit of the project in November 1992.

E. AUDIT PLAN

A financial audit of the project will be held in Year 3 of the project.

This NRM Project will provide funds to U.S. contractors and grantees, with no departure from standard methods of financing foreseen. In the event of a grant to an indigenous PVO, a financial management assessment will be required as a prerequisite. It is probable, however, that any grant benefiting an indigenous PVO would pass through a U.S. PVO meeting AID financial management standards.

VIII. SUMMARY OF ANALYSES

A. Technical Analyses Summaries

1. Marais Management

Small marais (wetlands) cover approximately 90,000 hectares of Rwanda. These areas are among the last land resources to be put into agricultural use in this country. Small marais show a significant potential for increased agricultural productivity. However, over the past few years, the development of marais lands has become increasingly uncontrolled. Many donors, large and small, have launched projects in the marais. The government, seriously understaffed in the agricultural engineering sector, can only monitor the largest of these projects. In 1987, in order to gain more insight into the options for improving the situation, the GOR conducted, with USAID financing, a study to develop a national strategy for small wetland development. The National Strategy Study made far reaching recommendations for the small marais. The most important of these are given below (the text within brackets indicates what steps the GOR has already taken to address these recommendations).

a. Authority on the development and management of small marais should be transferred to the commune level, and communal structures should be reinforced to effectively manage the small marais. [The Sixth Congress of the country's principal political party, the Mouvement Revolutionaire National pour le Developpement (MRND), which was held in Kigali in June 1988, approved the proposition that the resources of the small marais should henceforth be developed and managed at the commune level].

b To enable the communes to carry out this task, at least one agricultural technician should be posted at each commune. Thus, the training of technicians, particularly to an A2 level in rural engineering (génie rural), is a high priority.

c. In order to provide incentives for productive investment in marais, cultivation rights should be given for longer periods of time (e.g. 15 years) and should be automatically renewed under normal circumstances.

d. Farmers and, preferably, farmer organizations should participate directly in the management of the marais.

e. Further research should be carried out in the fields of: hydrology, soil fertility, local organizations, marketing and on socio-economic issues, in order to develop appropriate technologies to exploit marais in a sustainable and locally manageable manner.

f. A national inventory of wetland areas should be undertaken. [An inventory of Rwanda's wetlands is scheduled for 1989, with financing from FAO/PNUD].

g. Legislation governing the marais must be enacted, aimed at better defining the roles and responsibilities of those individuals and

groups involved in the exploitation of the marais. [Legislation covering the marais has been drafted with the assistance of FAO. The text is in final draft form in MINAGRI].

In December 1987, MINAGRI requested USAID assistance to follow-up on the Water Management Synthesis II project with additional study of the small marais sector. USAID provided FRw 20 million (approximately $250,000) from the monetization of PL 480 vegetable oil to MINAGRI to support a new program, entitled "Pilot Program for the Development of Marais" (PPM). The objective of PPM is to apply and fully analyze the recommendations of the WMS II study. This program collaborates with the communes of Tare and Mbogo in the Prefecture of Kigali, and Tumba Commune, in the Prefecture of Byumba, on the planning of field-level activities.

As indicated above, MINAGRI has taken several steps to implement the National Strategy recommendations concerning the small marais. Nevertheless, additional work needs to be done, not so much in terms of pure hydrological or agricultural management, but in terms of the social, organizational, economic and ecological aspects of marais development. Particular attention needs to be given to examining the watersheds as a single entity, i.e. assessing the impact of upstream activities on the development of any given marais, and the impact of marais development on downstream users.

At the present time, several donors are beginning, or have expressed interest in, financing the development of specific marais. A critical constraint, however, will be the ability of the government and the communes to monitor these activities and to ensure that they are technically and environmentally sound and consistent with the long-term welfare of local populations. It is the objective of the NRM Project to provide such capacity and, as a result, the benefits of the project will extend to marais development efforts throughout the country.

It should be noted that the funds available under this project will not be sufficient to meet all of the marais management needs that have been identified by the government. Therefore, USAID will seek to supplement project funding by buying into the AID/W-funded Agricultural Water Resources Management Project (AWRM).

2. Integrated Fish Culture in the Marais

A second component of the Natural Resources Management Project will involve the promotion of integrated fish culture/crop/livestock production systems in marais. There are two principal reasons for this focus. First, as is clear from the economic analysis of this project, integrated aquaculture offers great economic potential for marais development. Second, USAID has substantial experience in the support of fish culture in Rwanda, as a result of its very successful Fish Culture Project (696-0112) with the Service Pisciculture Nationale (SPN), a service within MINAGRI's Direction Generale d'Elevage. USAID wishes to build upon this strong working relationship and the accomplishments of that project.

Under the Fish Culture Project, USAID invested $2.45 million to develop the capacity of Rwandan farm families to build and maintain profitable on-farm

fish ponds. Specifically, the project renovated ponds and constructed facilities for the Kigembe Fish Culture Center, as well as five prefectural stations producing fingerlings. Training in fish culture was provided to 54 moniteurs, who now constitute the core of a fish culture extension service reaching 59 communes (out of a total of 143). In addition, the extension agents have provided technical advice for the renovation of 1081 ponds and the construction of another 721 ponds.

As a result of the project, average fish production in those farmer-managed ponds receiving SPN extension support increased from 340 to 1500 kg/ha/year (as of September 30, 1988). The total surface area of these ponds is 101 hectares. This has meant an increase in total national production of over 117 MT/year. As of December 1988, there were 2889 ponds, involving over 19,700 farmers (17,600 families). The biggest accomplishment of the SPN is that fish culture is now increasingly accepted among small farmers in Rwanda as a viable and economically attractive agricultural activity. It is presently seen as one of the more successful and attractive options for wetland development, both in an economic and a technical perspective, and is often used as a focal point for other marais development activities.

Experience has shown that using manure, mulch, and agricultural by-products to fertilize the ponds (to increase the plankton upon which the fish feed) substantially increases both fish productivity and the economic returns to the farmer. Integrated crop/livestock/fish culture was initiated at the Kigembe research center in late 1987. Specifically, research has been conducted on the returns to systems combining tilapia production with that of pigs, chickens, ducks, and rabbit. The results have been promising and, based on these results, the NRM Project will support an extension of integrated crop/livestock/fish culture to farmers.

During the life of the Fish Culture Project, approximately 50 "moniteurs piscicoles" were trained. As of the end of 1987, that number is insufficient to meet the training needs of farmers interested in fish culture. This is in spite of the fact that some of the moniteurs trained cover more than one commune. As a result, a number of fish culture efforts underway in the country are not receiving adequate support from trained fish culture technicians.

Under the NRM Project, USAID will provide a total of $1,212,000 to support the further expansion of integrated fish culture in marais. The project would be implemented by the SPN, which would work closely with the Division d'Amenagement Hydro-agricole (DAHA), which is charged with marais development. Investments made by the project (e.g. in fish pond construction and related activities) would follow requests by local communes to the SPN. The SPN would, in turn, be responsible for providing on-site supervision of all construction and implementation. USAID's acceptance of this implementation arrangement is predicated upon the continuing availability and involvement in the program of the current leadership of the SPN. In particular, should the current Acting Director not be available for at least the first two years of the project, USAID would require the involvement of a PVO or other institutional mechanism to help manage the project.

3. Sustainability of Hillside Production through Soil Conservation and Agroforestry

The objective of this component of the Natural Resources Management Project is to identify and promote soil conservation and agroforestry measures which would permit farmers to cultivate hillsides, while at the same time maintaining or increasing agricultural productivity levels.

Ninety percent of all farms in Rwanda are located on hill summits or hillsides. For these farms, soil erosion and decreasing soil fertility are serious problems. This is particularly true in the Zaire-Nile Crest, the highlands of Buberuka, and the volcanos area. These are regions where agricultural lands are generally located on steep slopes (of as much as 80 percent in some areas); where soils are easily erodible and subject to landslides; where the agricultural practices used are often inappropriate for such terrain; and where, due to population pressures, land is intensively cultivated.

This soil conservation problem is compounded by the growing shortage of fuelwood and other wood products in upland areas of Rwanda. As the country's population has grown, more and more of the natural forest cover has been converted to agriculture or cut for fuelwood and other wood products. Today, only a fraction of the original natural forest remains and most wood needs must be met from woodlots. Obtaining wood for fuel and for other uses has become increasingly difficult and more costly for many rural residents. Moreover, the loss of vegetative cover has exacerbated the problems of soil erosion in many areas.

Under previous USAID-financed projects, particularly the Ruhengeri Resources Analysis and Management Project (698-0463.06) and the Farming Systems Research Project (696-0110), natural resource management techniques have been identified which address the need for soil erosion control and for enhancing soil fertility and soil quality. These projects have also carried out significant work in agroforestry. In addition, USAID has financed several successful reforestation and agroforestry projects. These have included the CARE-Gituza Forestry Project (698-0502.96), the Communal Afforestation Project (698-0424.01), and Africare's Lake Nasho Resettlement Project (698-0502.96-01).

The NRM Project will build upon the experience gained in these earlier USAID projects. It will conduct additional research on soil conservation and erosion control and the stabilization of soils, and also disseminate various improved technologies which should increase agricultural productivity. The technologies supported by the proposed project will include:

a. the control of runoff to reduce water infiltration and over-saturation of soils;

b. the stabilization of land through the plantation of trees with deep roots and/or through the use of cover crops;

c. The improvement of the structure and the fertility of soils through the use of organic matter, particularly green manure and organic matter provided by agroforestry species; and

d. the restoration of degraded soils through reforestation and other techniques, including those of rural engineering.

A number of suitable measures to control soil erosion and landslides, and to improve soil fertility, including agroforestry techniques, exist that could be employed by the proposed project to meet the above needs. The technologies supported by the project will include the following:

Protection and Diversion Ditches

The most important anti-erosion technique in Rwanda consists principally of the use of infiltration ditches to reduce the adverse effects of runoff. Nevertheless, it has been demonstrated that infiltration ditches are not always appropriate, particularly for high altitude soils such as those in Ruhengeri. For very crumbly soils and for soils resting on bedrock (mother stone), infiltration ditches and terraces may exacerbate landslides and soil movement, due to the excessive accumulation of water in the soils.

Therefore, before other interventions aimed at soil protection (i.e. infiltration ditches and terraces, biological contours, hedgerows) are tried, steps must be taken to protect against excess water accumulation through the installation and improvement of ditches to divert water into channels (talwegs) and bottom lands. This is a new technique for Rwanda, and one which could be tested by the project, particularly in the communes of Nkuli and Mukingo.

On-farm Agroforestry and Covercropping

Surface erosion and landslides can be checked through the planting of agroforestry trees and covercrops along the contours of terraces, as well as in the fields themselves. Therefore, the project will sensitize farmers to the benefits of that technique and will furnish the support necessary to enable them to employ these techniques on their own farms. To this end, the project will undertake tests of new species and install them on selected "model" centers (at the rate of one center per commune). The project will also furnish material (seeds, bags, etc.) to the communes to create their own nurseries, one for each sector. At these communal nurseries, the beneficiaries could themselves produce the agroforestry plants that they choose.

The project will also encourage the use of soil stabilizing grasses and agroforestry species, as well as the use of cover crops, by furnishing seeds for multiplication according to their needs. The preferred trees will be those that have a multiple-use. In addition, the project will focus on soil stabilizing grass species which also provide a high quality forage.

Production and Use of Manure

Planting leguminous tree species or cover crops can increase soil fertility as well as protect soils from heavy rains. Prior to planting, cover crops can be turned into the soil for green manure. Agroforestry species and grasses can also be cut and used as green manure. Moreover, tree species can provide other benefits (such as fuelwood or fodder production). At the same time, the application of animal manure can greatly increase soil fertility.

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The project will, therefore, encourage farmers to increase the production of manure and, above all, of green manure. To this end, the project will furnish agroforestry species, as well as material for livestock production (e.g. building materials, veterinary products, etc.) to selected farmers.

The Restoration of Degraded Sites

There currently exist, particularly within the prefecture of Ruhengeri, many sites that are degraded or are rapidly becoming degraded due to erosion, declining physical and chemical soil properties, road construction and quarrying, and landslides. The Natural Resources Management Project will attempt to address these problems through a series of activities, including reforestation, introduction of vegetative cover and soil stabilization, and selected rural engineering works.

Given the limited size of the Project's budget, it is necessary to begin this exercise with an exhaustive inventory of degraded sites, with the objective of determining which sites should be given priority. The site restoration activities will be financed by the Project. To the extent possible, however, the local population will contribute within the framework of "Umuganda".

4. Natural Forest Management

Rwanda shelters a wide variety of plant and animal species, due to the combination of a large range of topographic and climatic conditions, which produce a significant variety of habitat types within a relatively small area. A country of only 26,338 km2, Rwanda includes mid-altitude afromontane forests, steep hills punctuated with lush valleys, rolling wooded savanna, dry and periodically flooded grassland plains, and extensive wetland systems. The afromontane forests of Rwanda, in particular, include a rich assemblage of rare and endangered species. The afromontane forests of Rwanda represent part of a regional zone of exceptionally high endemism, which extends into Burundi, southwest Uganda and adjacent Zaire. This is second only to Madagascar in species unique to the "old world", according to the conservation data base of the International Union for Conservation of Nature and Natural Resources (IUCN).

The remaining natural forests, savanna, national parks, and forest reserves are essential to the well-being of Rwanda's population. These areas provide vital ecological benefits, such as watershed protection, hydrological regulation, and erosion control. Many of these services have an impact throughout the country and internationally. Further, these sites are focal points for international tourism, which currently attracts more than $2.5 million worth of foreign exchange to Rwanda each year. Finally, Rwandans are showing more and more interest in recreational aspects of nature and wild areas, as evidenced by their increased visitation rates.

It is clear that the economic returns from "gorilla tourism" in the Parc des Volcans are substantial. Nevertheless, the small size and fragility of the gorilla population puts a serious constraint on growth of this revenue source. The diversification of tourism within the Parc des Volcans and into Nyungwe appears to be an option that would not only increase per tourist revenues but would also spread the benefits elsewhere in the country. At the

same time, there is a real need to "plow back" a greater portion of the receipts from tourism into the management of the forests and to the local population, which shoulders the majority of the opportunity costs associated with protection of the forests.

Despite the evident importance of the afromontane forests, and of the flora and fauna that they contain, to the long-term welfare of Rwanda, it is clear that their long-term viability is seriously threatened. The short-term gain to be had from the destructive "mining" the forests, surely pales in comparison to the benefits that would, in the long-term, accrue through non-consumptive uses.

Rwanda lacks both financial resources and expertise to plan or implement multiple-use management programs for its afromontane forests. Nevertheless, there is evidence of increasing GOR commitment to conserving these forests. This suggests that increased donor support at this time would be effective in generating further commitment from the government and, ultimately, its gradual absorption of financial and managerial responsibility for the conservation of these resources.

One component of the Natural Resources Management Project will therefore support efforts by the Office Rwandais du Tourisme et des Parcs Nationaux (ORTPN) and the Directeur General des Forêts (DGF) of MINAGRI to better manage and protect the two most important afromontane forests, the Parc National des Volcans and the Nyungwe National Forest. Implementation of this component will be through Cooperative Agreements with the three PVOs with ongoing programs in these forests: the African Wildlife Foundation, the Digit Fund, and Wildlife Conservation International (WCI - a division of the New York Zoological Society). These PVOs will, in turn, work through ORTPN and the D.G. Forets (the chief manager of forest reserves).

The NRMP funding will support (1) the development of a larger information base concerning the forests and their dynamics; (2) a vital increase in Rwandan participation in conservation activities, via education, training and policy planning; and (3) the active encouragement of additional economic benefits to local people surrounding the protected areas, as well as to the nation as a whole in the form of foreign exchange generated by tourism.

The proposed project will build upon the ongoing programs of these PVOs. The African Wildlife Foundation is currently administering the Mountain Gorilla Project in the Parc des Volcans. The Digit Fund is financing the Karisoke Research Center. Wildlife Conservation International is currently working with ORTPN in developing the tourism potential of the Nyungwe Forest Reserve under the USAID-funded Conservation of Nyungwe Forest Project.

AID is already providing some funding to two of these organizations. Approximately $25,000 is being provided to the Karisoke Research Center to renovate its facilities. In addition, under the Conservation of Nyungwe Forest Reserve Project (Project No. 698-0467), WCI has received a $127,900 grant from AID/W under a two-year cooperative agreement. The activities of the Nyungwe forest project include: (a) training of key Rwandan personnel in forest ecology, tourism management, and conservation education; (b) implementation of a conservation education program; (c) applied ecological research and monitoring; (d) evaluation and promotion of tourism and other non-consumptive

uses of the forest; and (d) provision of advisory assistance to the government in matters related to the conservation of the forest.

B. SUMMARY INSTITUTIONAL ANALYSIS

There are a number of ministries and other entities involved, either directly or indirectly, in the natural resources sector. Principal among them at the national level are MINIPLAN, MINAGRI, and ORTPN, the planned counterpart agencies for the NRM Project. In addition, both ISAR and UNR will be involved in the proposed project, through their research functions. Finally, the local communes play an important role in natural resources management, generally in collaboration with central ministries (e.g. by providing an extension function for new technologies).

The Ministère du Plan (MINIPLAN)

MINIPLAN is responsible for coordinating planning activities at the national level, the identification of pressing economic and financial problems, and the preparation of the broad outlines of the National Plan. MINIPLAN is also responsible for preparing Rwanda's development or investment budget. In the past, MINIPLAN has not had a strong reputation or political clout. It was considered to be badly organized and to suffer from lack of both human and physical resources. This situation appears to be improving dramatically, due to changes in the leadership and mandate of MINIPLAN which were instituted during the February 1989 reorganization of the government.

As part of this reorganization, MINIPLAN was named the principal GOR institution responsible for environmental planning and policy. Prior to February 1989, no entity had a true mandate to coordinate national level environmental activities. The only agency with any kind of environmental mandate was the relatively low-level 'Office of the Environment' within MINISAPASO, the Ministry of Public Health and Social Affairs. Given its institutional home, however, MINISAPASO's Office of the Environment focused on health-related environmental issues. The broader issues of resource conservation were largely ignored. Nevertheless, since this office was the only one in the government with any kind of environmental mandate, it was selected to organize and sponsor the First National Seminar on the Environment in September 1985. Subsequently, it coordinated the World BankOfunded efforts to prepare a National Environmental Strategy and Environmental Action Plan.

In February 1989, the responsibility for environmental coordination was transferred from MINISAPASO to the Ministry of Plan, as noted above. Responsibility for managing the National Environmental Strategy and Environmental Action Plan was also passed to MINIPLAN. It is generally felt that this move underscores the GOR's seriousness about broadly addressing the needs of the environmental sector.

At present, there is a temporary "environmental unit" within MINIPLAN which reports directly to the Minister of Plan. A more permanent institutional arrangement within MINIPLAN for the coordination and management of matters pertaining to the environment will be established after the completion of the National Environmental Strategy and the Environmental Action Plan later this year. Long-term technical assistance funded by the NRM

PPS

Project would be located in this temporary unit and, ultimately, in the permanent environmental unit that replaces it.

The Ministère de l'Agriculture, de l'Elevage, et des Forêts (MINAGRI)

MINAGRI is the ministry who's program affects, most broadly, the environment. The Natural Resources Management Project will be directly involved with three of MINAGRI's four Directions-Generals.

The first is the Direction General du Genie Rural et de la Conservation des Sols (Rural Engineering and Soil Conservation). The DGGR is composed of two Directions:

- The Direction du Conservation du Sol, which is responsible for all aspects of erosion control, and will therefore be involved in the soil conservation and agroforestry activities of the NRM Project; and

- The Direction du Genie Rural, which is the institutional home of the Division d'Amenagement Hydro-agricole. This division is charged with monitoring marais development activities in the country. As such, it will be the counterpart agency for the marais research and training component of the NRM Project.

The NRM Project will also be directly involved with the Direction-General du Forets (DGF). The DGF is responsible for forestry activities in the country, from strategic planning to the identification of appropriate species and techniques. The DGF is noteworthy for its relative depth in qualified personnel, including hundreds of foresters now working with projects in the field. Extensive international assistance has helped support the training of these cadres. The DGF will be involved in the soil conservation and agroforestry activities of the proposed project.

The third Direction General involved in the project will be that of Livestock (l'Elevage), which contains the Division de Peche et Pisciculture, the institutional home of the Programme Pisciculture Nationale (PPN). The NRM Project's fish culture activities will be implemented as part of that Programme.

The Institut des Sciences Agronomiques du Rwanda (ISAR)

ISAR, the GOR institution charged with carrying out agricultural research in Rwanda, will be involved in the research efforts of the NRM Project in the areas of agroforestry and soil conservation and marais development. ISAR is also the counterpart institution for the USAID-funded Farming Systems Research Project. As such, it is the directly responsible for the agroforestry and soil conservation work being undertaken by that project. Finally, ISAR sponsors AFRENA activities in Rwanda.

The overall research program of ISAR is very ambitious, given the relatively small staff available. In fact, ISAR's main problem at the moment is a serious lack of human resources. As a result of this manpower constraint, little research activity is currently underway in the selected forestry topics or in wetland development. Recently, however, the Institute

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has increased its commitment to applied research on agroforestry and erosion and seems intent on making a greater contribution in these areas.

The UNR Faculty of Agriculture

The Université Nationale du Rwanda (UNR) is the only public institution of higher education in Rwanda. UNR has nine faculties, one of which is the Faculty of Agriculture, which was created in 1974. The Faculty of Agriculture has three major responsibilities: (1) to train high-level agricultural specialists, (2) to conduct agricultural research and (3) provide information to the extension service.

UNR's involvement in agricultural research, while limited, covers a number of areas relevant to the proposed NRM Project. For example, UNR is the counterpart agency for the AID-sponsored Pond Dynamics Collaborative Research Support Project (the Pond Dynamics CRSP). Under this project, UNR researchers are collaborating with those from U.S. universities to gather data on the environmental and eco-climatic aspects of fish pond dynamics, as well as on the growth and feeding of Tilapia nilotica. UNR may also be involved in research financed by the project in areas such as wetland management and natural forest management.

Historically, UNR Faculty of Agriculture has faced a number of problems in meeting these responsibilities. Because of its small size and shortage of laboratories, research facilities and equipment (particularly microcomputers), UNR's ability to produce graduates has been limited. Until recently, UNR has been turning out barely 15 graduates annually, nowhere near what the country need. In the past, UNR has emphasized generalist training, which is probably no longer the most appropriate preparation for its graduates, given the highly specialized challenges of modern agriculture. Moreover, the lack of manpower and resources has limited the ability of the Faculty of Agriculture to address the agricultural problems actually facing the country.

A number of changes are underway which should to some extent address these problems. A number of donors are providing assistance to improve UNR's facilities and equipment and to train its professors. USAID is contributing to this effort, through its SAARFA project being implemented by the University of Minnesota (UM). SAARFA is specifically designed to involve faculty members in adaptive research activities through strengthening linkages with other research institutions throughout the country.

The Office Rwandais du Tourism et des Parcs Nationaux (ORTPN)

ORTPN has a status comparable to that of a ministry in that it is directly attached to the Presidency of the Republic. Created in 1974, ORTPN is responsible for the management and protection of Rwanda's two national parks. It is also legally responsible for the conservation of all natural flora and fauna outside of the parks. The application of this more general mandate, however, thus far has proven to be quite complicated, due to overlapping responsibilities and interests of other ministries. ORTPN has developed good relationships with several PVOs working in the afromontane forests. While USAID's assistance under the NRM Project will be offered through Cooperative Agreements to those PVOs, ORTPN should take an active role

in the management of the project.

Commune Support

The national territory of Rwanda is divided into ten prefectures encompassing 143 communes. The commune represents the lowest administrative unit in Rwanda. To be effective, the NRM Project will have to establish good working relationships with the communes hosting project activities. For the NRM Project, the most important role for the communes will revolve around the extension of new technologies. Extension services in Rwanda generally lack a single, direct line of technical support and administrative control. MINAGRI has no extension department, per se. Rather, extension agents are assigned to the local communes, even though they may be paid for by the central government. The local extension agents find themselves integrated into the local civil administrative structure, under the supervision of the burgomaster, while receiving instructions from MINAGRI via the 'agronome de préfecture' and the 'agronome de commune'.

The lack of a lack a single, direct line of technical support and administrative control, means that extension service personnel are often assigned multiple roles including non-agricultural rural development tasks and regulatory work. This, of course, undermines their effectiveness in extension. Further, monagris are poorly paid, often have no means of transport and very little material to use in working with the farmers. Many agents have little or no training when they begin their work and they often receive very little in-service or on-the-job training. There have access to very few appropriate extension or agricultural reference materials, and, because of their weak ties to research activities, their message is often out of date.

The explicit reform of the extension system at the commune level is beyond the scope of the proposed NRM Project. Nevertheless, to be successful the NRM project will have to strengthen extension activities in those communes in which the project will work. This will be done through improved training, materiel support, and the development of discrete, easy to disseminate technological packages. In the agroforestry and soil conservation component of the project, substantial reliance will be put on commune-level agents. In this case, some caution will be necessary to ensure that conflicting demands upon these individual's time do not undermine the success of the project. In the case of fish culture, on the other hand, a highly motivated and effective cadre of commune-level extension agents has already been trained, and is using a variant of the 'training and visit' system approach. This program could serve as a model for other activities.

C. SOCIAL SOUNDNESS ANALYSIS SUMMARY

The value of natural resources to people is only partly measured in monetary terms. Lands which retain their economic value through protection and improvement give vitality to rural economies and promote social stability. Watersheds which are well-managed improve health levels and prevent catastrophic seasonal flooding. Forests yield medicines, food, fodder, and flowers -- in addition to wood -- and provide work for the young, old, and infirm. The degradation of the natural resource base, by contrast, leads to the breakdown of precariously balanced economies, the disruption of social systems through migration and increased mortality, government instability, and an increasing dependency of individuals, families, and nations upon the uncertain intentions of others. The adverse effects of environmental degradation have been clearly demonstrated throughout the African Sahel.

The early social signs of natural resource deterioration already exist in Rwanda, in the form of increased rates of migration, unemployment, and disease prevalence in urban areas. Better management of the natural resource base can counter these harmful trends, as well as increase the equity of access of Rwandans to their patrimony and preserve this heritage for future generations.

The Social Soundness Analysis addresses the questions of: (1) how, in the Rwandan setting, natural resource management has been featured as a customary practice; (2) which individuals can be expected to benefit from improved natural resource management techniques and technologies; and (3) the impact on the overall society of a sustainable natural resource base.

1. Beneficiaries and Equity

Poorer families, as a rule, have fewer management options than do relatively wealthier ones. Their farms (surface area/person) are smaller; their resource base is of lower quality; their labor is less skilled and diverse; and their support systems are weaker (especially in the case of female-headed households). It is these families especially who will benefit from low cost soil enhancement technologies, greater availability of fuelwood, and alternative income generating uses for land. Farmers in general will benefit from watershed protection, which would regulate water flows and hence increase the reliability of water for crop production.

Female-headed households (21 percent of the total) are a special case of this group. Their farms are smaller on the average by 30 percent, their laborers fewer, their patrons weaker. Women in particular are often untouched by extension agents, left-out of training programs, only occasionally organize into permanent groups, and are dependent upon whimsical authorities for access to marais parcels. The overall potential benefits of sustainable resource management are likely to reach women only if women are intentionally identified as clients of development program activities.

The need to involve men and women in coordinated activities for hillside soil conservation and marais development is fundamental for successful natural resource management. Erosion control involves all farmers, since their disbursed parcels must be treated in a coordinated fashion in order to obtain the maximum benefit from soil protection technologies. This is also true for marais agriculture, since water use and production techniques (e.g. pesticide

application) at one end of the marais will affect farmers downstream. Better organized groups also are more willing to invest in land improvement and protect those investments. This is especially marked in the marais where, by increasing the stake of the "community" in the management and development of the land, greater care and protection of the resource will result. Resources such as trees, fish, and livestock are seen as security and savings by the rural poor, and willingness to sustain them can be promoted under conditions where the poor are guaranteed greater tenure security.

The equity of NRMP activities and widespread beneficiary incidence can be best promoted by:

a. Promoting tenure security of parcels, especially in the marais, to increase farmer willingness to invest in land improvement;

b. Involving farmers from the start in technology demonstrations and applied research trials;

c. Organizing hillside and marais families for improved technology adoption and marketing;

d. Working with private groups (e.g. associations, cooperatives, NGOs) to reduce the burden on government to implement development and to profit from private interests in the promotion of family welfare;

e. Making sure that women and women's groups are identified for training and outreach;

f. Disaggregating analyses by gender; and

g. Addressing the impact of natural forest management on conservation on indigenous ethnic groups.

2. Socio-Cultural Feasibility

The priorities of the GOR in the natural resource sector are laudable for demonstrating the awareness of the country's leaders of the constraints facing Rwanda vis-a-vis the resource base, and the socio-economic effects of resource degradation. Yet farmers, who historically have employed some sound land use practices (e.g., fallow, crop rotation, livestock and crop rotation), are not always receptive to national extension themes. Often this is due to the latter's ineffectiveness on some sites (lack of site-specific suitability) or increased labor demands. While farmers are demonstrating an eagerness to try improved technologies through the FSRP, RRAM, Fish Culture, and Gituza Forestry projects, the feasibility of NRMP interventions can be strengthened by:

a. identifying suitable site-specific technologies, which require greater farmer-researcher-planner collaboration;

b. improved understanding of labor constraints -- especially in eastern Rwanda but seasonally elsewhere as well -- which require that the payoffs of labor intensive technologies be apparent and forthcoming. This will require convincing demonstrations, continuous tracking,

and probably marketing interventions;

c. optimizing the tradeoffs between erosion control and soil fertility improvement technologies, on the one hand, employed even in the high-risk zones of the ZND, and land, labor, and materials, on the other, by displaying convincing demonstrations of technology effectiveness and researching the opportunity costs of land, labor, and capital;

d. undertaking market analyses and improving marketing methods for production of high value crops in the marais. Currently, lack of markets and poor marketing techniques make production of high value crops uninteresting to farmers in the marais;

e. assisting in the formation and training of associations and other groupings. Insufficient organization of farmers makes protection of high value marais crops (food and livestock) difficult and mitigates against their use; and

f. developing widespread public education campaigns and increasing distribution of economic spin-offs from forest-based remunerative activities. Insufficiently understood forest ecology and the near total lack of the public's sense of "ownership" of national park and forest land prevent greater public support for forest conservation.

3. <u>Impact</u>

While the introduction of improved techniques of soil conservation, agroforestry, fish culture, and marais management, will benefit producers by improving land use potential and concomitant production increases, greater impacts will accrue to the Rwandan society at large. These will include better health and nutrition from regular supplies of clean water; socio-economic stability through natural resource sustainability; and rural economic vitality, reducing rural-urban migration and unemployment.

To facilitate the attainment of these long-term benefits, the NRMP will need to:

a. Determine the optimal trade-off between production and resource improvement by monitoring intervention impact and participant resource allocations;

b. Educate/train individuals in forest ecology and improved resource management;

c. encourage widespread participation through assistance in group formation;

d. assure the sociological appropriateness of potential techniques through farmer surveys and monitoring;

e. promote applied research and links between researchers and farmers; and

f. undertake extensive public education campaigns to sensitize the population to the desirability of employing improved management techniques and technologies for the short-, medium-, and long-term, through workshops, seminars, publications, policy dialogue, collaborative endeavors, applied research, and demonstrations of technology effectiveness.

D. ECONOMIC ANALYSIS SUMMARY

Rwanda is an agricultural country. Approximately 90 percent of the Rwandan labor force earns its living from agriculture. Some 40 percent of the GNP was attributable to agricultural labor (1987). About 80 percent of export earnings come from agricultural products. Much of Rwanda's industry is agro-industry and much of the potential off-farm employment is likely to be in agro-industry or in some other industry based on natural resources. Rwanda depends on its natural resource base and a sustained, growing economy depends on maintaining the stability of that natural resource base.

In recent years, Rwanda's rapid population growth has led to more extensive and intensive farming practices. As a result, the natural resource base is becoming increasingly degraded and environmental stress is evident throughout the country. Confronted with the task of arresting the degradation of its natural resource base, the GOR must make some difficult financial and economic choices. If the degradation of the natural resource base is to be completely stopped, the GOR must be prepared to spend large sums of money. If the objective is to only slow the rate of degradation, lower investments will have to be made in the short run (the long run problems will still persist). There are economic tradeoffs between these two extremes.

The economic and financial analyses presented in Annex H, Economic Analysis, are only illustrative and should be interpreted with caution. They use assumptions collected in the field that cannot be readily verified by documented field research. Until reliable information is available, the analyses should be considered only indicative. It is recommended that the project collect data in sufficient detail to carry out accurate economic and financial analyses.

Soil Conservation and Agroforestry Interventions

The soil conservation and agroforestry interventions proposed are judged feasible. It is probable that farmers will be able to recover their investments of time and money through higher crop yields. The results of the analyses, based on conservative assumptions, show that crop yields will have to increase roughly to initial cropping year levels and remain there, rather than decline over time. In other words, the intervention must prevent a decline in yields over time in order to be feasible from the farmer's perspective.

These break even increases in crop yields are not unreasonable given the much higher increases obtained using similar interventions as documented by Farming Systems Research Project (FSRP). Because the assumptions used are conservative (relatively low farm gate prices, high costs and a high return on investment requirement), it is probable that the interventions will generate

substantially higher crop yields than those that would be required by the farmer in order for him to break even on his investments.

Forestry Plantations

Based on the values of wood products only (fuelwood and poles), forestry plantations are not likely to be economically or financially feasible. However, the wood benefits represent only a small portion of the total benefits. Reforestation under the auspices of the project should be carried out for soil conservation and watershed management reasons, not hoping for positive economic returns based on the wood values alone. Where the returns based on the wood values only are negative, the intervention should not be automatically rejected. The question is whether the (unquantified) environmental benefits will outweigh the extent to which the returns from the wood only are negative. The most intensive management alternative will yield the highest wood volume and quality (highest pole:firewood ratio) because of higher survival rates, and probably is the best alternative from the resource protection perspective.

The results of the analyses showed that most intensive management alternative, however, is also the most expensive alternative. The financially and economically most attractive alternative (based on wood benefits only), is also likely to be the least effective resource conservation alternative. The results of the analyses illustrate how expensive intensive forestry can be. Intensive forest management is not automatically synonymous with "good forestry." What may be biologically optimal for a particular site probably may not be economically or financially optimal.

The important point to retain is that the major purposes of the forestry plantations are to plant on agriculturally marginal or unsuitable sites and to promote soil conservation. The wood benefits, therefore, are incidental and a "bonus". In the economic and financial analyses, however, only the wood benefits are quantified because the resource conservation benefits are inherently difficult to identify and quantify. The environmental benefits, nevertheless, are present and real, though not included in the analytical spreadsheets. Their presence should be counted in the decision making process. The analytical results represent information for the decision makers, and should not be the sole decision-making criterion. They may help to "short list" the alternatives to a choice that best balances the economic and resource conservation objectives.

Fish Culture

The economics of aquaculture in the marais has been well documented. Based on previous analyses, aquaculture in the marais is financially and economically feasible and farmers compete for the opportunity to participat in aquaculture development programs.

The analyses presented in Annex H also address the economic returns to the integration of fish culture with livestock production (e.g. ducks, chickens or pigs) and improved gardening practices. The economic analyses presented under PPN auspices considered only fish ponds. If the returns to the fish ponds are as high as indicated, the farmer can afford to make additional investments towards full integration of the aquaculture activity --

in livestock infrastructure and improved gardening practices. In economic terms, the farmer will be able to spend up to the point where the NPV is zero, or where the discount rate used (which should reflect the opportunity cost of capital) equates benefits and costs.

The analysis demonstrates that a farmer could afford, other things being equal, to spend up to 34,605 FRw towards the requirements for an integrated system. This amount represents approximately 10 percent of the total cost of a pig installation, four percent of a duck installation and three percent towards a chicken installation.

This result was based on an average yield figure of 20 kg/are. Under efficient management, however, yields have reached as high as 64 kg/are (in a cooperative pond) which indicates there is much room for improvement. By increasing the yields in the analytical model to 60 kg/are, the amount the farmer could afford to invest in a fully integrated fish culture facilities is 254,000 FRW given the nine percent discount rate.

E. ENVIRONMENTAL ANALYSIS SUMMARY

An Initial Environmental Examination (IEE) recommending a negative determination for the project was included in the PID. However, the original project design, as envisioned in the PID, was significantly changed at the PID review meeting in AID/W. The Program component was dropped and AID/W recommended that a Biodiversity component be added. In the course of the Project Paper design, it was decided to update the IEE to reflect more accurately, the potential environmental impact of the project. The revised IEE, prepared by the REDSO/ESA Environmental Officer concludes that:

(1) The project's environmental impact, especially given the "no project" alternative, is highly beneficial.

(2) The subactivities related to research, training, education, and institutional support are accorded Categorical Exclusions.

(3) The subactivities related to the development of communal forests plans, soil conservation, nurseries and demonstration centers are accorded Negative Threshold Determinations.

(4) The subactivities related to construction of fish ponds should depend on a favorable Environmental Assessment.

(5) Integrated fish culture in the marais raises several environmental questions, relating to: its effect on the overall system hydrology and the activities of other users within the system; and the potential for the development of fish pathologies that could affect sensitive drawn systems. These questions and others raised in the revised IEE can, however, be adequately addressed through appropriately applied design criteria. It is the intention of the project to develop such criteria in accordance with the Environmental Assessment.

USAID/Rwanda will ensure that all construction carried out under the project is in conformity with sound engineering design standards and that all construction be supervised by the USAID/Rwanda PSC engineer under the general direction of the REDSO/ENG and reviewed by the REDSO/REO where necessary.

The specific recommendations relating to each conclusion are contained in the IEE. On the basis of the revised environmental examination, and providing that the recommendations relating to construction are followed during project implementation, a negative determination is confirmed as appropriate and recommended for the project.

F. SUMMARY ENGINEERING ANALYSIS

Construction/Engineering support to the project will be provided in four areas:

1. Development of a model small marais which will be used as a "laboratory" for research and rural staff training.

2. Expansion of the current fish culture project, including the demonstration of integrated fish culture practice for small farmers. This will include (1) the incorporation of low cost construction of hen houses, rabbit hutches, piggeries, etc. at the Kigembe National Fish Culture Center and at three prefectorial centers at Runyinya, Gikongoro and Rushashi, and (2) the construction of facilities at seven communal-level integrated fish culture centers.

3. Construction of an office complex located at Ruhengeri Prefecture to accommodate the project staff of the agroforestry and soil conservation component.

4. Construction of two interpretative centers, on in the Nyungwe Forest Reserve and the other the Parc des Volcans, under the Natural Forest Management component of the project.

Marais Development

In order to experiment with marais development in Rwanda, the project proposes to develop a small 50 ha marais as a pilot project. The development of this small marais will involve land topography and hydrology surveys, the construction of water supply canals for irrigation, and small dams for water distribution, landscaping, etc. Based upon results from topography and hydrology surveys, site plans for drainage or irrigation and detailed plans for water distribution systems will be prepared.

A small 75 m2 warehouse will be built at the site for storage of seeds and for crop drying. This warehouse will also contain a small office for the personnel responsible for the project. Proposed dimensions for this warehouse will be 10 m x 7.50 m, with a height of 3 m. This will be a single-story brick structure with corrugated iron roofing sheets supported on a steel or timber roof truss. The design should include skylighting, ventilation and security. Construction drawings could be based on the existing plans of the Local Crop Storage Project (696-0107) with some minor modifications to adapt to the site and to the project needs.

The site for this project component has not been selected. The GOR will submit the selected site to the U.S Project Officer for approval.

Integrated Fish Culture

The project under this component proposes to expand the national fish center operation at Kigembe to become a multi-purpose center (training, model-farm, monitoring, etc.), and three other prefectorial centers located at Runyinya, Rushashi and Gikongoro to be used as information centers and production centers at the regional level. Under this project component, in

addition to the work at the existing centers, seven communal integrated fish culture centers will be created in marais areas. These centers will each have one hectare of pond area, and will be used to demonstrate to farmers integrated fish culture on production ponds.

The engineering support to this project component, therefore, consists of the renovation or the enlargement of pond areas, as well as construction of fish ponds, hen houses, rabbit hutches, piggeries, etc. at the regional centers. Most of these facilities will be constructed using locally available materials such as bricks, timber, galvanized roofing, nails and cement. Unskilled and skilled labor are also available at the community levels.

Construction of an Office Building at Ruhengeri Prefecture

To accommodate the staff of the soil conservation and agroforestry component, an office building will be constructed in the town of Ruhengeri. This complex will consist of approximately 360 square meters and will house offices, reception area, conference room, library, toilets and a small store room. The cost of this building is estimated to be $140,000. USAID will contribute $100,000 to this construction and the GOR will contribute the rest. The office complex will be of simple construction and will be one story high. The foundation will be of masonry, the floor will be a concrete slab, walls will be brick with reinforced columns and a reinforced concrete collar beam. The roof will consist of wood or metal rafters and galvanized roof sheeting. Electrical and plumbing hardware will be of the quality locally available which is imported from either Kenya or from European countries.

Although, the site of this building has not been selected, utilities such as electricity and water services are available since the building will be located within the urban zone limit of Ruhengeri Prefecture.

Construction of Two Interpretative Centers at Nyungwe Forest and the Parc des Volcans

The goal of the conservation program is to inform the local communities about the value and the benefits of the environmental and economic importance of the these forest areas. Two interpretative centers will be built for this purpose, one in the Nyungwe Forest Reserve and another at Kinigi Commune adjacent to the Parc des Volcans. Not only will these centers be used as information centers for the surrounding communities and for Rwandan students, but they will also be used for tourist information.

These centers will measure approximately 150 square meters each and will house offices, a small museum, a projection room, gift shop, reception area, toilets and a small library. The cost of these buildings is estimated at $50,000 each. USAID will contribute $50,000 to the cost of constructing each center. In the event that the cost of these centers will exceed the amount above, the overrun construction cost will be covered by the GOR or other, non-USAID sources. These centers will be one story high. The structure and the materials to be used will be similar to the office complex at Ruhengeri (see above). It is noted that electricity and water are not available at the sites. Rain water will be collected through roof catchment by gutters, fed into underground cisterns, hand pumped to an overhead tank, and fed into the buildings by gravity. Electricity could be provided by a small generator.

The interpretative center of the Parc des Volcans will be located next to the existing buildings of the park reception center. Access could be created from the main road of the area. This land has a gentle slope and is found suitable for the proposed construction.

The site for the center in the Nyungwe forest has not been selected. The following criteria should be considered for actual selection: (1) availability of flat or gently sloped land; (2) availability of an access road and nearness to a community; and (3) reduced exposure of building to wind or rain (e.g. not on the top of a hill).

Construction Plans and Specifications

In all, the project will require four structural buildings - a small warehouse, an office complex and two interpretative centers. For these buildings, the project will contract a local architectural firm for the design and for the preparation of technical specifications, cost estimates and tender documents. The design for all buildings will incorporate, as recommended by the REDSO Engineer, the minimum seismic considerations, thus insuring the building's resistance to seismic forces. The buildings will have reinforced floor beams tying footings together, reinforced columns and reinforced ring beams. USAID/Rwanda with REDSO engineering assistance, will approve all plans, technical specifications, tender documents and cost estimates prepared by the architectural firm,

Engineering Support and Supervision

Project funds are budgeted for a Personal Services Contract (PSC) with a civil engineer who will be assigned to the AID Office. The engineer will provide support and supervision at all stages of the engineering/construction for each of the Project Components.

The PSC Engineer will work under the general direction of the REDSO/ENG, who will provide periodic inspections. REDSO/ENG will also be available to provide support at all stages of the construction process. A similar arrangement has been used to REDSO/ESA's satisfaction for the construction in other projects in the USAID/Rwanda a portfolio.

Cost Estimates

Cost estimates are based on experience with similar construction by AID over the past several years in Rwanda.

A.	Marais development	$ 170,000
B.	Integrated Fish Culture	575,000
C.	Office Complex	140,000
D.	Two interpretive centers	100,000
	TOTAL	$ 985,000

FAA Section 611(a) and 611(b) Requirements

Based on the Engineering Analysis in Annex K, it is determined that the requirements of FAA Section 611(a) have been met. Engineering and other plans necessary to undertake the construction activities have been, and will be, carried out and a reasonably firm estimate of the total cost and AID contribution for these activities has been prepared.

As discussed in the Engineering Analysis, it is determined that the standards and criteria in Section 611(b), pertaining to the Principles and Standards for Planning Water and Related Land Resources, have been taken into consideration.

IX. CONDITIONS AND COVENANTS

A. Conditions Precedent

The Project Agreement shall have conditions precedent in substance as presented below. Except for condition 6 below, A.I.D. may, on a case by case basis, agree to waive or modify any such condition at a later date based on proper written justification:

(1) Prior to any disbursement under the Grant, or to the issuance by A.I.D. of documentation pursuant to which such disbursement will be made, the Grantee shall furnish or have furnished to A.I.D., in form and substance satisfactory to A.I.D. a written statement specifying the names and titles of person(s) that will have the authority to act as the representative or representatives of the Grantee, together with a specimen signature of each such person certified as to its authenticity.

(2) Prior to any disbursement under the Grant, or to the issuance by A.I.D. of documentation pursuant to which such disbursement will be made, to finance local cost support, for each year of the Project, the Grantee will, except as the parties may otherwise agree in writing, furnish to A.I.D., in form and substance satisfactory to A.I.D., a Project Annual Work Plan reviewed by the Project Coordinating Committee and a budget detailing the expenditures that will be required to carry out the work plan.

(3) Prior to any disbursement under the Grant for construction, or to the issuance by A.I.D. of documentation pursuant to which such disbursement will be made, the Grantee will, except as the Parties may otherwise agree in writing, furnish to A.I.D., in form and substance satisfactory to A.I.D.:

(a) evidence that the Grantee owns, has acquired title to, or has otherwise arranged for long-term use of sufficient land for such construction and has taken the necessary steps to assure that adequate access and public utility services are available to the site(s).

(b) plans, specifications and bidding documents for such construction, and a contract for such construction prior to its execution with a contractor acceptable to A.I.D.; and

(c) a contract prior to its execution or other satisfactory arrangement for engineering supervision services for such construction with a contractor acceptable to A.I.D.

(4) Prior to any disbursement under the Grant, or to the issuance by A.I.D. of documentation pursuant to which such disbursement will be made, for construction of interpretative centers at either the Nyungwe Forest Reserve or the Parc des Volcans, the Grantee will, except as the Parties may otherwise agree in writing, furnish to A.I.D., in form and substance satisfactory to A.I.D.:

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(a) An estimate of the full cost of constructing and furnishing the centers; and

(b) Evidence of commitments from other funding sources (e.g. other donors, private voluntary organizations, or the Grantee) to finance those construction costs and costs of furnishing the centers that are not covered by A.I.D.

(5) Prior to any disbursement under the Grant, or to the issuance by A.I.D. of documentation pursuant to which such disbursement will be made, for the training of genie rural technicians in marais management, the Grantee will, except as the parties may otherwise agree in writing, furnish to A.I.D., in form and substance satisfactory to A.I.D.:

(a) a written contract or memorandum of understanding between the training center and the Grantee or its agent which guarantees that adequate training facilities will be available for the duration of this training program;

(b) a written curriculum for the training program;

(c) criteria for the selection of trainees.

(6) Prior to any disbursement under the Grant, or to the issuance by A.I.D. of documentation pursuant to which disbursement will be made for the construction of fish ponds and related facilities, an Environmental Assessment shall be completed in accordance with A.I.D. Regulation 16 which shall show no significant adverse environmental impact of such construction.

B. <u>Covenants</u>

The Project Agreement shall have covenants in substance as follows:

(1) The Parties agree to establish an evaluation program as part of the Project. Except as the Parties otherwise agree in writing, the program will include, during the implementation of the Project and at one or more points thereafter:

(a) evaluation of progress towards attainment of the objectives of the project;

(b) identification and evaluation of problem areas or constraints which may inhibit such attainment;

(c) assessment of how such information may be used to help overcome such problems; and,

(d) evaluation, to the degree feasible, of the overall development impact of the Project.

(2) The Grantee agrees to recruit and hire or assign in a timely manner all Rwandan personnel necessary to implement the Project. The Grantee further agrees to name such personnel in the first Project Annual Work Plan. In particular, the Grantee agrees to recruit and hire or assign in the first year of the project, individuals acceptable to A.I.D. to serve as (a) National Project Director, (b) Assistant Director of the Fish Culture Component of the Project, (c) Coordinator for the Marais Development Component of the Project, (d) Field Coordinator for the Soil Conservation and Agroforestry Component of the Project in Ruhengeri Prefecture, and (e) the Coordinator for the Environmental Planning Component of the project. The names and curriculum vitae of the personnel shall be submitted to A.I.D. by the Grantee within 120 days of the date of signature of this agreement, except as otherwise A.I.D. may agree in writing.

(3) The Grantee agrees to take prompt action to bring into government service all new personnel recruited for positions in the project. The Grantee also agrees to actively consider women, as well as men, in selecting candidates for participant training and in recruitment for positions under the project.

(4) The salaries of selected Rwandan project staff will be initially covered by the USAID portion of the project and the Grantee will take responsibility for these salaries beginning in Year 3 of the Project. Prior to the approval of the Second Annual Work Plan of the Project, the Grantee will, except as the Parties may otherwise agree in writing, furnish to A.I.D., in form and substance satisfactory to A.I.D., evidence that the Grantee has submitted for inclusion in the MINAGRI budget the salaries of said Rwandan nationals. Prior to the approval of the Third Annual Work Plan of the Project, the Grantee will, except as the Parties may otherwise agree in writing, furnish to A.I.D., in form and substance satisfactory to A.I.D., evidence that the salaries of said Rwandan nationals will be paid for out of the national budget.

(5) The Grantee agrees to promptly identify and nominate all persons for long- and short-term training financed under the Project. The Grantee agrees to provide travel documents to persons nominated for long-term training in a timely manner. The Grantee agrees to establish arrangements to assure that all personnel completing long-term training under the Project will return to Rwanda to serve as employees of the respective Participating Agencies and that such personnel are promptly assigned to positions commensurate with the training and experience they have received under the Project.

(6) The Grantee will ensure that a Project Coordinating Committee is established within 2 months of the signature of the Project Agreement, with representatives appointed from the Ministry of Agriculture, ORTPN, the Ministry of Plan, and USAID with the mandate to plan Project activities consistent with the purpose and objectives of the Project and to review and approve annual Work Plans.

(7) The Grantee will ensure that the Participating Agencies allocate funds to the Project, and assume increasing responsibility for local cost budgets in the amounts and for the purposes specified in Annex 1 of the Project Agreement.

(8) The Grantee will prepare and approve a National Strategy for the Fish Culture Sector in Rwanda.

(9) The Grantee agrees that, in order to permit the Karisoke Research Center to effectively carry out its research program, access to that Center will be restricted to center staff, government and donor officials, visiting scientists and researchers, and individuals expressly invited by Center staff. Visits to the Center for the sole purpose of tourism will be discouraged.

(10) The Grantee agrees that access to the Parc National des Volcans and the Nyungwe Center will be free for groups visiting these two forests under the auspices of the Project's Conservation Education Program. Such access will be scheduled in advance, and ORTPN will be notified in advance of any visits. All such groups will be accompanied by Project personnel while they are in the forests.

(11) Within 6 months of the signature of the Project Agreement, Representatives of the Conservation of Nyungwe Forest Reserve Project will be made full members of the Commission des Forets Naturelles de la Crete Zaire-Nil, which serves as the coordinating body for government and donor efforts in natural forest management in the Nyungwe Forest Reserve.

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

ANNEX A

Life of Project:
From FY 89 to FY 94
Total U.S. Funding: 7.933 million
Date Prepared: 4/15/89

Project Title & Number: Natural Resources Management Project (698-0129)

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Project Goal	**Measures of Goal Achievement**		
Sustained long-term agricultural production	- Reduced degradation of Rwandan crop lands, watersheds, and natural forests.	Review of environmental analyses and issues papers done by the GOR and donors during coming 10 years.	Protection of the natural resource base is critical for the long-term viability of Rwandan agriculture.
	- Yields/ha of basic food crops increase by 100%. over next 20 years.	MINAGRI annual surveys.	
PROJECT PURPOSES			
1. Erosion on hillsides reduced.	- Reduced siltation levels in selected rivers.	Siltation testing carried out on selected rivers where the project is active.	
	- Stable or increasing yields from hillside agriculture	MINAGRI annual surveys (over long-term)	Unless erosion is reduced, yields from hillside agriculture will invariably steadily decline. Hence, stable or increasing yields from hillside agriculture would be an indicator that soil erosion problems are being addressed.
2. Sustainable Use of Wetlands Promoted.	- Stable or increasing crop yields from small marais.	MINAGRI annual surveys	Unless marais are cultivated in an ecologically sound manner, long-term production will decrease.
	- Increasing fish production from marais.	Project records	Fish production is an economically attractive and environmentally appropriate crop for marais.
3. Rwanda's Natural Forests Protected	- Evidence of reduced encroachment on forest boundaries.	ORTPN records, aerial photos	Protecting the natural forests is necessary to protect the highland watersheds, which is in turn necessary to assure optimal water availability for crop production (on a geographic and seasonal basis).
4. Greater coordination by GOR of activities affecting the natural resource base.	- Explicit efforts made (e.g. strategy studies, conferences and workshops) to coordinate efforts of GOR and donors which have an impact upon the environment.	Perceptions of GOR and donor representatives (from interviews conducted by evaluation team.	Current development activities affecting the natural resource sector are not adequately coordinated, resulting in less than optimal resource allocation.

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NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Project Outputs	Magnitude of Outputs		
Research and Training in Marais Management			
Technicians trained in marais management and working in the field on marais-related activities.	30 individuals trained in rural engineering with a focus on marais management (an 18 month course), equipped, and assigned by MINAGRI to work on marais development in selected communes	Project Progress Reports	Murambi training facility is available for extension training on a timely basis.
Research completed on marais development and management issues.	At least three studies completed covering issues such as hydrology and water management, soil science, agronomy and socio-economics; and findings applied to the development of a model marais.	Studies completed and copies delivered to USAID. Quality reviewed by evaluation team.	
One 50 ha. model marais managed on a sustainable basis, incorporating lessons learned from research undertaken by the project.	Production levels in the marais increase by 20%, without evident environmental degradation.	Progress reports. Quick and dirty environmental analysis during evaluation.	Pressure, especially from local authorities to "develop" the marais can be held off until the needed studies are completed.
Division Amenagement Hydro-Agricole (DAHA) strengthened.	At least one permanent engineer added to DAHA staff.	Condition Precedent met.	
	DAHA staff trained in various marais development areas (by TA advisors, and through in-country and short-term training.	Project Progress Report	A qualified technical advisor can be recruited locally.

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Project Outputs (cont.)	Magnitude of Outputs (cont.)		
Aquaculture in the Marais			
Increased numbers of productive fishponds.	The SPN actively providing extension services and fingerlings to 2500 fishponds (up from 1600 fishponds in 1988).	Project reports	Current leadership of the Projet Pisciculture Nationale continues for at least the first two years of the project, in order to ensure continuity and allow enough time to train a replacement.
Creation of integrated fish culture-crop-livestock production enterprises in marais areas.	Model ponds integrating fish culture and crop and animal production established in 7 marais areas.	Project reports	
Increased production of pond fish per unit area.	Average annual yield of fish from ponds benefitting from extension by the SPN increased to 18 kg/are/year (up from 14.6 kg/are/year in 1988). At least 10% of ponds producing over 25 kg/are/year.	Project reports	
MS degree training in fish culture.	Two MS degrees awarded.	Project reports	A qualified individual can be identified to begin degree training in fish culture
Applied research in marais development and aquaculture.	Three research studies completed in areas such as fish culture economics and marketing, soil fertility and erosion in the small marais, water management in the marais, and socio-economic issues.	Study documents delivered to USAID.	
Increased SPN capability for extension and adoption of integrated fish culture/crop/animal techniques.	50 MINAGRI fish culture extension agents receive in-service training in integrated fish culture/crop/livestock techniques and actively extending these techniques at the commune level. 20 new fish culture extension agents training and actively promoting fish culture at commune level.	Project reports. Informal sample of former trainees by evaluation team.	

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Project Outputs (cont.)	Magnitude of Outputs (cont.)		
Soil Conservation and Agroforestry			
Implementation of appropriate soil conservation and erosion control measures on degraded or fragile lands.	An inventory of soil erosion problems completed for 5 communes in Ruhengeri Prefecture.	Document prepared and copies presented to USAID.	A PVO will be willing to help implement the project, sharing the costs of fielding a resident advisor in Ruhengeri.
	Commune forestry plans prepared for 5 communes in Ruhengeri Prefecture.	Documents prepared and copies presented to USAID.	Agroforestry and soil conservation technologies exist of can be developed which will be economically attractive to farmers in the near term even without the complementary introduction of new crop varieties.
	Effective agroforestry, soil conservation and erosion control measures taken on 100 ha of communally- and privately-owned land in each of 5 communes in Ruhengeri Prefecture.	Project reports	
Increased extension of proven soil conservation and erosion control techniques.	50 MINAGRI extension agents trained in soil conservation and erosion control techniques and actively extending these techniques at the commune level.	Project reports	
Communal research and demonstration centers established.	Five communal demonstration centers established.	Project reports	
Sector nurseries strengthened.	50 sector nurseries strengthened.	Project reports	
MS degree training in soil conservation.	One MS degree awarded in soil conservation	Project reports	
Applied on-farm research in agroforestry and soil conservation.	An applied research program established within ISAR aimed at refining soil conservation agroforestry and techniques for the highlands of Rwanda.	Research reports completed containing recommendations with regard to agroforestry and soil conservation technologies.	An agreement will be reached with AFRENA to carry out agroforestry research.

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Project Outputs (cont.)	Magnitude of Outputs (cont.)		
Natural Forest Management			
Research completed on the physical, biological, and socio-economic environment of the afromontane forests, and its links to agricultural production in the lowlands.	Three research studies completed on physical, biological, and socio-economic aspects of the Nyungwe afromontane forest. Three research studies completed on the Parc des Volcans forest.	Research reports delivered to USAID. field research.	Researchers will be willing to shoulder some of the costs of
Education efforts undertaken to promote the multiple use management and conservation of remaining natural forests.	Active conservation education programs established (involving school visits, teacher training, school field trips, vocational seminars, commune-level meetings) to familiarize people living in and around the Nyungwe forest of the importance of the forest.	Project reports.	
	The conservation education program of the Mountain Gorilla Project expanded.	Project reports.	
Interpretive centers and related facilities constructed	An interpretive center and staff accomodations constructed and fully equipped at Nyungwe forest. An interpretive center constructed and fully equipped at Kinigi for the Parc des Volcans.	Building inspections.	Other Nyungwe donors provide funds towards the construction of the Nyungwe interpretive center. WCI and/or GOR provide additional funds to construct the Parc des Volcans center.
MS degree training in conservation and park management.	3 MS degrees awarded to Rwandan counterparts.	Project reports.	
In-country training for Rwandan counterparts and park guides.	Formal in-country training received by 10 counterparts and park guides in the two forests.	Project reports.	
Improved Coordination of Natural Resource Activities			
MINIPLAN plays positive role in coordinating environmental policy.	Role of MINIPLAN in coordinating environmental actions and formulating policies clearly delineated.	Survey of perceptions of donor and GOR representatives from interviews conducted by evaluation team.	
Environmental action plan developed and being implemented.	Action Plan approved by GOR and action underway of some of its recommendations.	Copy of document delivered to USAID.	
National fish culture strategy developed.	Strategy drafted and approved by GOR.	Copy of strategy document delivered to USAID.	
Marais development strategy approved.	Draft strategy approved by GOR.	Copy of strategy document delivered to USAID.	
National seminars, workshops, and coordinating meetings held involving a wide range of Rwandans involved in environmental issues.	___ Seminars, workshops, etc. held.	Project and USAID records.	

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NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Project Inputs (cont.)	Magnitude of Outputs (cont.)		
USAID			
Long-term Technical Assistance	$1,422,000, 7.5 p/y		
Short-term Technical Assistance	694,500 36 pm		
Equipment	505,500		
Vehicles	355,000 13 trucks/jeeps		
	34,000 10 motos		
Construction	545,000		
Other Costs	2,115,000		
Long-term Training	180,000 - 3 MS		
Short-term Training	219,000 - 30 p/m		
In-country Training	580,000		
Evaluation and Audit	150,000		
Contingency & Inflation	700,000		
Total USAID Contribution	$7,900,000		
GRANTEE			
Training Costs	345,000		
Infrastructure/Construction	300,000		
Commodities	51,000		
Local Operating Costs	2,483,000		
Contingencing and Inflation	324,000		
Total GOR Contribution	3,503,000		

ANNEX B - MARAIS MANAGEMENT

1. Introduction

This annex discusses the global context of marais (wetland) development in Rwanda and the possibilities and problems entailed in this endeavor. It recommends that USAID limit its marais development activities under the NRM Project to small marais, and presents a summary of the lessons learned in marais development to date. Three critical constraints to sustainable marais development in Rwanda are identified. These are (1) the absence of sufficient understanding of the ecology and dynamics of marais; (2) lack of field-level technicians with adequate training in marais management; and (3) the inability of the GOR's central administration to monitor and direct the numerous marais management activities underway. The marais management component of the NRM Project will address these three concerns.

2. The Hydrology of Rwanda

The hydrology situation of Rwanda is determined by the Zaire-Nile Divide, which runs from north to south at an altitude of around 2500 meters. The area west of the divide (about a tenth of Rwanda's territory) drains via Lake Kivu (at an altitude of 1460 m) and the Rusizi river towards Lake Tanganyika and ultimately to the Zaire River. The drainage pattern is short, with numerous small streams draining the west flank of the divide directly into Lake Kivu.

The eastern part of Rwanda has a much more intricate drainage pattern. The density of small streams is high. The Nyabarongo - Akanyaru - Akagera river system, draining the entire Nile basis region of Rwanda, has a length of over 600 km. The outlet at Kagitumba (altitude around 1200 m) drains an area of 40,450 km2.

Rwanda has twelve distinct agro-climatic regions, which can be regrouped into three basic ecological zones: the Highland Zone (composed of the Volcanic Region and the Zaire/Nile Divide; above 1900 m); the Middle Altitude Zone (composed of the Central Plateau, Buberuka Highlands, Granite Ridge, Impara, and Lake Kivu Fringe, with altitudes ranging from 1500 to 1900 m); and the Lowland Zone (Mayaga, Bugesera, Eastern Plateau, Eastern Savanna,and with Imbo Region, with altitudes between 900 and 1500 m).

The average temperature in Rwanda is 19 degrees centigrade, which is, because of the country's elevation, much lower than its equatorial location would indicate. The high elevation also results in only a moderate yearly rainfall, far less than in lower lying equatorial regions. Precipitation is highest in the mountain regions of the Divide, at 1400 mm or more, and decreases towards the east, with less than 800 mm near the border with Tanzania. The precipitation pattern is typically monsoonal, with two wet and two dry seasons. The duration of the seasons varies among the agro-climatic regions, with longer dry seasons in the east and longer rainy seasons at higher altitudes.

The four climatic seasons in Rwanda are: (1) umuhindo: the short rainy season lasting from the middle of September until the middle of December. This is the first growing season; (2) urugaryi: the short dry season which

runs from the middle of December until the middle of February. In the higher regions, this season often passes unnoticed because rainfall is reduced, rather than absent; (3) itumba: the long rainy season from the middle of February until early June. This is the second growing season; and (4) icyi: the long dry season lasting from early June until the middle of September.

Most of the country has little or no rainfall for two or more months. Traditionally, cultivation in the marais takes place during this season. Because agricultural production from the wetlands is becoming more and more important, this season is now generally referred to as the third growing season.

Little fundamental research has been carried out to date on the impact of the afromontane forests on the hydrologic situation and climatic conditions in Rwanda. A study of this relationship would be complicated by a lack of long-term data and the unreliability of the limited data that is available. It is clear, however, that the afromontane forests on the Zaire-Nile Divide have a regulating effect on the water balance in the region. A decrease in forest cover would lead to increased evaporation, decreased water infiltration into the soil profile (as soil becomes bare and compact), and increased surface run-off, which in turn would result in more erosion on the slopes and in the streams and rivers. In contrast, during the dry season less water would become available in the absence of these forests, since less water would be stored in deforested watersheds. Moreover, since Rwanda lies on the watershed of two of Africa's major river systems, the impact of declining vegetative cover in the highlands extends far beyond the country's boundaries.

3. The Wetlands (Marais)

Formation. The present day landscape of Rwanda is the result of the geological faulting which occurred during the Cretaceous and Tertiary periods, and formed rift valleys and mountain chains, the highest of which is the Zaire/Nile Divide. The geological faulting, together with the volcanic activity it invokes, resulted in a complicated drainage system in Rwanda. Drainage to the north was interrupted by the Birunga chain of volcanos. This caused parts of Rwanda to drain to the south as part of the Zaire watershed, while the remainder drained to the east, with minimal slopes, towards Lake Victoria.

During the drier periods of the Quaternary Period, water levels in Lake Victoria dropped, increasing the slopes of the rivers. This improved the drainage of the highlands, but the existence of alluvial deposits blocked the rivers and resulted in the formation of many valley lakes and large areas of marshes with organic soils. These valley bottoms, generally called 'marais', cover about 180,000 hectares, or 7 percent of the territory of Rwanda.

Definition of Marais Lands. Though the meaning of the word 'marais' means literally marsh or swamp, in the Rwandan context all valley bottom lands are called marais lands. Included are also very small depressions (bas-fonds). The Rwandan government is currently preparing a law for the development and management of the marais. This law defines the marais lands in the following terms" "Marais lands consist of the colluvional and alluvional valleys and the areas alongside rivers and lakes, characterized by the accumulation or the flow of water, even during the dry season, and having

soil and vegetation features distinctively different from those on the surrounding hills."

Several classification models have been proposed for the Rwandan marais. Because of the enormous variety in physical features, and the frequent non-homogeneity within the same marais, a simple classification was proposed by the Water Management Synthesis II Study (1987). One category is the large marais, which border the major water courses. This category includes the following valleys: Nyabarongo, Akanyaru, Akagera, Rusizi, Rugezi, Mukungwa, Muvumba, Mwogo, Mbirurume, Kamiranzovu, Rukarara, and Nyabugogo. These represent about half of the total wetland area. All other marais would then fall into the category of small marais.

It is important to classify the marais according to size because development efforts become significantly more complicated, environmentally and technically, as well as more costly, with increased size. Recently, the distinction has become even more important, as the GOR has announced that it intends to transfer the authority to develop and manage the small marais to the communes.

Wetlands also differ from hill slopes in terms of tenure structure. Traditional land rights are applied on hill slopes (even though formal titles of property are rarely established, and the land registry system covers only a small portion of the country). The valley bottoms, on the other hand, are generally publicly owned. Upland farmers wishing to crop marais land must obtain permission from communal authorities. The commune assigns the right to farm, but not to own, the marais land. In addition, some restrictions are usually made as to the use of the marais plot. For example, the planting of trees or perennial crops is generally prohibited.

Evolution of Marais Use The expansion of agriculture in Rwanda has gradually spread to lands that are less accessible, have lower potential, and constitute more fragile environments. The valley bottom lands are, together with the rain forests and the eastern savanna zone, among Rwanda's last land resources to be put into agricultural use. 1/

Until the 1950s, the marais were primarily used for grazing. Though there was cultivation in marais as early as the 1920s, large-scale intrusions only began in the 1950s. Because small marais were easier to reclaim and manage by individual small farmers than were larger marais, the clearing of the wetlands started with the small marais. At present, virtually all small marais are cleared and put into agricultural use. Most parts of the large marais remain, however, under natural vegetation.

Four evolutionary stages can be distinguished in the development of Rwanda's wetlands.

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1. It should also be kept in mind that marais have other important uses. For example, drinking water is found in sources located at the foot of the hill slopes. Surface water is used to provide urban areas with drinking water. Clay is mined in the marais for brick making, and sand for construction works is excavated from stream beds.

Stage 1: The marais remains covered with a natural vegetation of papyrus and herbaceous plants. Most of the large marais are still in this stage.

Stage 2: The natural habitat is interspersed with extensive use for periodic grazing. Marais in this stage can still be found in eastern Rwanda, where population pressure is relatively low and not all available hill land is yet cultivated.

Stage 3: Mixed use of the marais for grazing lands and crop production. The conversion of marais from grass to arable land occurs gradually, as arable land on the hill slope is used up. Most small marais in the Middle Altitude Zone are in the final part of Stage 3. Grazing lands are rapidly disappearing, all marais land resources are cultivated during the third growing season, and there exists a growing tendency to cultivate the marais also during the rainy seasons.

Stage 4: The marais are used for intensive crop cultivation. Water management practices are improved, beds are enlarged and mineral fertilizers are applied. Wetlands used for rice or tea production fall into this category.

The GOR has, for a long time, given scant attention to the development, protection, and management of resources in the marais. In 1984, the first initiatives were made, and planners began to realize the need for developing an appropriate marais technology. Many marais development projects have yielded disappointing results and, it is clear, many environmental and technological issues have yet to be resolved.

4. Government Intervention in the Marais

In spite of the fact that the marais are publicly owned, there is no direct intervention by MINAGRI in most of the small marais. Rather, they are managed by the peasants themselves. Agronomy extension agents in the communities normally limit their activities to the hills.

The management of government and donor supported marais development projects is primarily the responsibility of the Division Aménagement Hydro-Agricole (DAHA) of the Direction Generale du Genie Rural and Soil Conservation. Unfortunately, the lack of skilled personnel is a serious constraint to the effectiveness of the DAHA, and to marais development efforts by the government in general. The staff of the DAHA consists of three individuals (A_0 level). To meet current responsibilities alone, this department needs more or less double the current number of staff. Funding has also been a serious constraint. Even though authority for the small marais is being devolved to the communes, a strong central agency will be necessary to support and monitor these efforts.

5. Large Wetlands Management

Characteristics of Large Marais Unlike the small marais described in the next section, the large marais are still mostly uncleared. Their surface areas range from 1000 to over 25,000 hectares each, covering valley widths of

1 km (near Kigali) to over 10 km (on the Tanzanian border). The large marais are still mostly covered by natural vegetation of papyrus (Cyperus papyrus) with a few palm trees (Phoenix reclinata). Well-defined river beds have developed over time, delineated by ridges of alluvial deposits of mineral soils (the result of surface erosion on the hills upstream). The marais on the fringes of the main stream cover the remaining flat lands in the valleys. Their surface often lies well below the levels of the ridges.

The soils of the large marais are, almost without exception, organic, and extend several meters into the profile. (In many locations, organic deposits go to a depth of more than 10 meters). The large marais behave like large flood plains during the long rainy season (March to May), when they are inundated by several meters of water. In this way, the perform an important buffer function in the Rwandan hydrological network, reducing peak discharges and helping to maintain dry season river flows.

The agricultural development of most of the large marais is extremely difficult. The organic soils of the large marais are subject to considerable subsidence upon drainage, making the installation of infrastructure (canals, constructions, etc.) difficult and expensive. 2/ In addition, organic soils can turn sterile when over-drained. Finally, developing the large marais for year-round cultivation would decrease their effectiveness as a hydrologic buffer, and the downstream repercussions (mostly outside Rwanda) might be severe.

The need to expand agricultural output in Rwanda is too great to permit the country to completely forgo use of the large marais. Fortunately, however, the Government of Rwanda is becoming increasingly aware of the dangers of draining the large, organic marais rapidly and entirely. Large scale projects in the large marais are still being planned, but detailed Master Plan Studies are now a prerequisite. In the ongoing Nyabarongo Valley Master Plan Study (carried out by SOGREAH of France and financed by the IDA), an environmental and ecological study has been included. Similarly, in the planning of the Rusumo Hydro-electric dam (part of a project called the Organization pour l'Aménagement et le Développement du Bassin de la Rivière Akagera) serious questions are raised on the ecological impact.

In the meantime, Rwanda encourages slow reclamation of small portions of the large marais by the surrounding populations for cultivation during the dry season. In this way, the large marais are slowly reclaimed, an approach that should be potentially less dangerous than ambitious large-scale interventions.

<u>USAID's Options for Developing the Large Marais</u> The NRM Project will not get involved with large marais. There remain important technical risks associated with rapid, large-scale marais clearing activities, and the proposed project will have neither the resources nor the technical expertise needed to design complex and ecologically sensitive projects. Assessing the impact of marais projects could, logically, fall within the context of the NRM

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2. In the Bahima Marais Project, for example, the dry season sweet potato crop was lost after the first rainfall in 1986, and in November of that year, the entire marais was flooded several times.

Project. However, a number of donors are already preparing studies for large marais projects. Such efforts are extremely costly and their complexity requires the input of highly specialized expertise. The proposed project will not have the resources needed to contribute to this effort. USAID will remain, therefore, a careful observer of developments in the large marais, rather than an active participant in them.

6. Small Marais Management

The small marais represent about 50 percent of the total wetland area of Rwanda, or an estimated 90,000 hectares. Aside from surface area, they are different from the large marais in a number of ways. Unlike the large marais, the small marais are almost all cultivated, especially during the dry season (i.e. the third growing season). Moreover, they generally have little or no remaining natural vegetation. Undeveloped small marais can only be found in the eastern part of the country and at high altitudes on the Zaire-Nile Divide, where climatic conditions or soil acidity levels do not favor agricultural use, or where they are located in protected forest areas.

Most small marais are drained by a single stream, which carried water throughout the year (although the discharge can be quite low at the end of the dry season). Proper water management is one of the most difficult aspects in cultivating marais soils, particularly given seasonal fluctuations in groundwater levels. In a single marais, some areas may be over-drained, while nearby the soil is water logged. Similarly, flash flooding can be a serious problem for marais agriculture.

In most cases, small marais have mineral, rather than organic soils (in contrast to large marais). The exceptions are small marais at higher altitudes in the Zaire-Nile Divide in the volcanic north, which contain predominantly organic, strongly acidic soils. Organic soils have low water holding capacity. Moreover, organic soils in marais tend to be quite acid. Some marais soils have a deep permeable profile, others are too permeable or too compacted. Almost all of the marais soils, once overly drained and dry, will suffer irreversible desiccation. This is because of the high concentration of iron and smectite clays that become very hard when dried. In general, material eroded from hill slopes is heavily weathered and, consequently, is rich in oxides. These may tie up certain nutrients, lowering the fertility of the soil. The correction of nutritional deficiencies is easy for some elements and impractical for others.

Various techniques can be employed to correct soil and water problems in marais. These include the use of selected cultivation practices, such as mounding and the construction of raised beds; the addition of lime and organic or inorganic fertilizers; and capital investments to physically modify water flow and the soil profile (e.g. canal construction and land levelling). Unfortunately, there is not always a strong correlation between the level of investment in marginal soils and the resulting yield increases.

While most small marais are cultivated by subsistence farmers, these farmers have generally not used the land to its fullest potential. For example:

- Most of the marais are only cultivated during the long dry season (May-December) and consequently yield only one harvest per year, compared to two harvests from the hillsides. With proper management, two harvests are possible in the marais.

- Subsistence crops are the norm in the marais (e.g. sweet potatoes and sorghum), while cash or high value crops, such as vegetables, are rarely grown.

- Yields are relatively low and do not appear to differ much from those obtained on the hill soils.

There are a few well-managed marais, i.e. marais where more than one crop is harvested per year, where farming practices are very intensive, and where yields are quite high. These examples confirm that the marais can support intensive exploitation without environmental degradation.

There are three fundamental constraints faced by farmers in marais.

- Farmers have no secure or clear legal rights to marais lands that they cultivate. This greatly reduces the farmers' incentives to improve the land's productivity or to protect its long-run viability. The GOR has, recently, encouraged private "entrepreneurs" (often government officials and traders) to put marais lands under intensive cultivation. Sometimes, this has led to the eviction of the local farmers who initially cleared the area.

- Markets for cash crops do not exist. Therefore, there is no incentive for farmers to grow them. A market for higher value crops could provide more profit for producers and thus increase their incentive to make needed improvements.

- Farmers have not organized themselves into cooperative groups to make physical improvements to the land or to market the output. The lack of cooperative organization is a particular constraint to marais agriculture, since cooperation is needed to coordinate water usage and to implement certain improvements (e.g. the construction of small irrigation or drainage works).

In spite of the problems discussed above, very few small marais remain uncultivated. Moreover, many donors have initiated small marais development projects. Two types of small marais projects can be distinguished: (1) projects directed towards the farmers, such as the French assisted "Operation Petits Marais" in Gitarama Prefecture; and estate projects, including irrigated rice production, tea estates, sugar cane plantations, and some vegetable production units.

The results of small marais projects thus far carried out are mixed. The WMS II study concluded that, when donor projects employ traditional cropping patterns in the marais, the results are no better than those in farmer-managed marais. On the other hand, while estate projects have succeeded in raising significantly the production levels of marais lands, the costs attached to these intensive projects have generally been prohibitive. For example, the rehabilitation of the Cyili Rice Perimeter, which is currently underway, will

cost up to FRw 1 million ($ 13,000) per hectare, including the construction of a new, government-operated rice mill. As demonstrated below, investments of more than $3,000 per hectare in marais are difficult to justify economically, given current production and marketing potential in Rwanda.

Marais development has often been based on the assumption that the problem is the result of poor drainage and that, if the marais were drained, it would become more agronomically productive. This an erroneous assumption. Rather, marais should be viewed as irrigation projects, and their development should be done on that basis. The focus of drainage projects is at the lower end, or outlet of the project. Irrigation projects, on the other hand, start at the upper end, the management of inflow and ensuring that water is uniformly available to the land in the perimeter. 3/ Focusing on irrigation, rather than on drainage, should help avoid some of the problems that have been encountered in marais development in the past. The ultimate objective is to ensure that the water resource is effectively used, that there is no erosion, that the soil resource is preserved, and that crop production is optimized over the long run.

7. A National Strategy for Marais Management

Over the past years, the Government of Rwanda has observed the development of marais lands becoming increasingly uncontrolled. Many donors, large and small, have initiated projects in the wetlands. The government, heavily understaffed in the agricultural engineering sector, can only monitor the largest of these projects.

In order to gain more insight into the options for improving the situation, a study on the need for a national strategy for small wetland development and management was carried out in 1987. USAID supported this study through its Water Management Synthesis II project.

The final strategy document, Report sur la Strategie nationale pour le développement et la Gestion des Petits Marais was published in December 1987. The National Strategy Study made far reaching recommendations for the small marais. The most important of these are:

a. Authority for the development and management of small marais should be transferred to the commune level, and communal structures should be reinforced to effectively manage the small marais.

b. To enable the communes to carry out this task, at least one agricultural technician should be posted at each commune. Thus, the training of communal technicians, particularly to an A_2 level in rural engineering (genie rural), is a high priority.

3/ An early project developed by the French near Gitarama was reported to have failed because it was overdrained and the soils became too dry and hard for plant growth. Similarly, attempts to develop several marshes in southern Rwanda and northern Burundi with French technical and financial assistance, and using heavy machinery, led to the desiccation of the marshes and the formation of a hard pan which will probably prohibit all future cultivation. The use of heavy machinery, which compacted the soil, probably exacerbated the problem.

c. In order to provide incentives for productive investment in marais, cultivation rights should be given for longer periods of time (e.g. 15 years) and should be automatically renewed under normal circumstances.

d. Farmers and, preferably, farmer organizations should participate directly in the management of the marais.

e. Further research should be carried out in the fields of: hydrology, soil fertility, local organizations, marketing and on socio-economic issues, in order to develop appropriate technologies to exploit marais in a sustainable and locally manageable manner.

f. A national inventory of wetland areas should be undertaken.

g. Legislation governing the marais must be enacted, aimed at better defining the roles and responsibilities of those individuals and groups involved in the exploitation of the marais.

A number of steps have been taken to implement these recommendations. First, the Sixth Congress of Rwanda's principal political party, the Mouvement Revolutionaire National pour le Développement (MRND), which was held in Kigali in June 1988, approved the proposition that the resources of the small marais should henceforth be developed and managed at the commune level. In addition, an inventory of Rwanda's wetlands will begin in 1989, financed by FAO/UNDP. Also, legislation covering the marais has been drafted with the assistance of FAO. The text is in final draft from and is currently being discussed within MINAGRI.

In December 1987, MINAGRI requested USAID assistance in following up on the Water Management Synthesis II project with additional study of the small marais sector. USAID provided FRw 20 million (approximately $250,000) from the monetization of PL 480 vegetable oil to MINAGRI to support a new program, entitled "Pilot Program for the Development of Marais" (PPM). The objective of PPM is to apply and fully analyze the recommendations of the WMS II study in the development of the Bahimba marais (estimated area: 300 hectares). This program collaborates with the communes of Tare and Mbogo in the Prefecture of Kigali, and Tumba Commune in the Prefecture of Byumba, on the planning of field activities.

Based on the recommendations of the Small Marais Strategy, the Government is attaching highest priority to:

a. Education and training of communal technicians;

b. Reinforcement of the communal structures to direct effective management of the small marais;

c. A national inventory of the wetland resources;

d. Development of appropriate technologies to optimize marais use in a sustainable and locally manageable manner;

e. Physical implementation of small marais development projects.

8. Lessons from Small Marais Development Efforts

The national strategy drew a number of lessons from the earlier efforts at small marais development in Rwanda and, based on these lessons, made the following recommendations:

- Small marais act as a buffer for river flow, forming an integrated link in the hydrology of the whole country. Therefore, any program constructed to aid development of the small marais should also consider the impact of the proposed changes on the overall hydrology of the region. This further implies that marais development should be approached on a watershed-wide basis.

- Currently, farmers control water table depth by alternating between irrigation and drainage according to the season. Available evidence suggests that this approach gives the optimum water management control. Therefore, unless information exists to the contrary, farmers should not be encouraged to change their strategies.

- Planners of water management improvement projects in the marais should consider both drainage and irrigation. When the focus is on drainage alone (as has been the case with some donors projects.

- Consideration must be given to incorporating erosion control measures into both the design and implementation of marais projects.

- While most crops can be grown in the marais, each will have different water requirements and will tolerate a different degree of water logging. While assuring a compatibility between crops cultivated and hydrological and soil conditions can be a very complex task, particular crop requirements should be considered in project design.

- Knowledge of water management parameters in the marais is so limited that sound engineering design is greatly hampered. To improve the success rate of technical interventions, long-term research on water management practices in the marais is needed.

- The management of small marais should rest with farmers and with farmers' organizations. Experience has shown that the public sector simply cannot adequately manage small irrigation systems in developing countries, particularly given the high cost of construction, maintenance and operation.

Conclusions

Three critical constraints to sustainable marais development have been identified above. These are (1) the absence of sufficient understanding of the ecology and dynamics of marais; (2) insufficient numbers of field-level technicians with adequate training in marais management; and (3) the inability

of the GOR's central administration to monitor and direct the numerous marais management activities underway. The marais management component of the NRM Project will address these three concerns by supporting research in the marais, the training of A2 technicians in marais management, and institutional support to the Division Aménagement Hydro-Agricole of the Direction Général du Génie Rural et de la Conservation des Sols.

Research

The project will support the in-depth research needed for sound marais management. This will include studies of hydrology and water management, soil science, agronomy, and the socio-economics of marais development. The hydrological research would include analyses of water table depths, groundwater movement, the appropriate size and depth of channels for proper irrigation and drainage, and so forth. Research on marais soils would include analyses of the characteristics of marais soils and changes in soil fertility. Agronomic research would be aimed at determining which crop varieties are most appropriate to marais cultivation (e.g. an analysis of crop water requirements, resistance to inundation, etc.), cultivation practices, and the interrelationship among farming systems (e.g. the impact of crop production on fish culture). The socio-economic research would include analyses of local organization, crop marketing systems, production economics, and so forth.

To serve as a focus for this research (and to provide a training ground for field level technicians), project will support the development of a model small marais. The results of the research would then be applied to guide the development and management of the model marais and to test their practicability and validity. One objective would be to develop dependable design criteria which could be used to evaluate marais development proposals and implementation performance.

Training of A2 Technicians

Additional trained technicians are needed to reinforce the capacity of the communes to carry out and monitor marais development efforts. In particular, these technicians must be sensitized to the critical environmental issues involved in marais development. To begin to meet this need, the NRM Project will finance the training of 30 technicians in rural engineering (génie rural) with a focus on marais development. This training, which will consist of course work and field work (stages), will take place over approximately 18 months at a government-operated training facility near Gitarama. The training will cover a number of areas, and will be aimed at giving the trainees well-rounded capabilities in sustainable marais production, including marais agricultural practices, rural engineering, soil conservation, topography, and water management. Upon completion of the training program, these new technicians will be employed by MINAGRI and assigned to communes, other donor projects, and so forth.

Institutional Support for Marais Management

USAID will also fund activities to strengthen the Division Aménagement Hydro-Agricole (DAHA). As noted above, the DAHA is currently understaffed and under equipped. The project will encourage the GOR to recruit or assign an

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additional rural engineer to this staff. This individual will serve as coordinator of the project, supervising both the training program and the marais development activities. The project will also finance the services of a resident advisor, on a three-quarter time basis, over a 24 month period. Finally, USAID will finance commodity procurement (e.g. vehicles and computer equipment), and short-term training for DAHA staff.

ANNEX C - FISH CULTURE IN THE MARAIS

A. Historical Background

The Belgians introduced fish culture into Rwanda and encouraged the construction of fish ponds during the 1950s. By the end of that decade, there were over 2000 ponds in Rwanda. However, these ponds were only producing an average of 4 kg/are/year (an are is 1/100 of a hectare), results that were considered mediocre at the time.

During the 1960's fish culture stagnated. This loss of momentum was caused by: (a) the abandonment of fish culture by farmers who had adopted it because of official pressure to do so; (b) the limited market for fish due to the relatively low level of fish consumption in the country; (c) a lack of trained fish culture technicians; and (d) an inadequate technical understanding of fish culture under Rwandan conditions.

In 1967, the Food and Agriculture Organization of the United Nations (FAO) undertook the first in a series of fisheries development projects. The initial intervention (1967-70), involved a survey and appraisal of inland fishery resources. The performance of seven fish culture species was examined, including carp and three tilapia species. These were Tilapia rendalli and T. macrochir, both of which came from the Congo, and T. nilotica, an indigenous species. Production levels of between 4.5 and 5.8 kg/are/year were reported for tilapia in monoculture. The FAO implemented a second project in 1972-73. This project, however, was oriented towards capture fisheries, with aquaculture as only a peripheral activity.

In 1978, the Canadian International Development Research Center (IDRC) implemented "Projet Empoissonnement des Lacs du Pays et Développement de la Pêche" (ELADEP). This project, which focused on lake fisheries, continued through 1981. It involved only limited aquacultural work (e.g. fingerling production and diet studies). The lack of any effort in aquaculture extension limited its ultimate impact of fish culture in Rwanda.

During this time, the GOR launched several other efforts to rejuvenate its fish culture program. A Peace Corps volunteer assisted Rwandans in assessing the potential for fish culture in the country. A team of North Koreans assisted GOR staff in efforts to increase grass carp fingerling production. Finally, numerous PVOs began small fish culture projects in various communes

These efforts met with only limited success for a number of reasons. First, they generally attempted to introduce new systems and new species, rather than to improve existing systems or the performance of indigenous species. Second, they gave inadequate attention to the applied research necessary to adapt fish culture technologies to local conditions, and did not examine the constraints to adoption faced by the Rwandan farmer. Finally, these early fish culture projects were implemented in an uncoordinated manner, with little attention to long-term sustainability.

B. USAID'S National Fish Culture Project

1. Background

In 1982, there were reportedly 1,492 fish ponds in the country, with a total surface area of 120 hectares, and producing 4 kg/are per harvest. In addition, there were 26 government-supported fish stations, most of which were in a state of disrepair and neglect. At that time, at least seven different species of fish were being cultured. However, stock quality was poor. There was no infrastructure to produce and distribute quality fingerlings. Most farmers raised a mix of tilapia, which were stocked at unknown rates, and grown in unmanaged ponds long periods of time (12-18 months). Virtually no aquaculture extension program existed, and few aquaculture technologies suited to Rwandan conditions had been identified.

In 1983, the USAID-funded National Fish Culture Project (Projet Pisciculture National - PPN) began. The objective of this project was to develop the capacity of Rwandan farm families to build and maintain productive on-farm fish ponds. The most important constraint to achieving this purpose was seen as the inadequate training of farmers in improved techniques of fish culture. To address this problem, the project focused particularly on improving fish culture extension in Rwanda.

Two long-term advisors in fish culture, one in training and the other in extension were provided by Auburn University's International Center for Aquaculture. These advisors were assigned to Rwanda from May 1983 until February 1988 (for a total of 110 person-months of assistance). Both worked closely with counterparts, who were assigned to the project in mid-1984. Five person-months of short-term technical assistance were provided in the several areas, including water-born disease, rural sociology, fish production, and hatchery management.

A host country project director assumed administrative and financial responsibility for the project and played a decisive role in policy making. Unfortunately, a number of management problems and interpersonal conflicts undermined project activities in its initial years. These problems were only overcome when the host country director left the project in October 1986, and the GOR extension counterpart took over responsibility for the project. Under this new leadership, the performance of the fish culture project improved dramatically and notable progress was made in spite of the diminished funds and limited time remaining.

The PPN program concentrated in eight "aquaculture zones", which include approximately 75 percent of existing fish ponds. These are: Cyangugu, Rushashi, Gitarama, Nyabisindu, Gisenyi North, Gisenyi South, Butare East/West, and Butare South.

2. Accomplishments

In spite of early implementation problems, the National Fish Culture Project was very successful at meeting its objectives. By the end of 1988, there were 2959 ponds in the project area, with a total surface area of 101 hectares. Nearly 10,750 families are involved in fish culture in the project area. Average fish production had increased from 3.4 kg/are/year to

15 kg/are/year by 1988. Around 1157 new fish ponds had been built and another 1,322 ponds had been renovated. Improvements and renovations were made on six fish culture stations. Two hatcheries, each capable of producing 15,000 fingerlings per month, were established. Appropriate hatchery techniques were developed for Rwandan conditions, and over 600,000 fingerlings were distributed to farmers.

To facilitate the project's training program, training facilities were constructed at the National Fish Culture Center at Kigembe. These included a classroom, dormitory, and dining facilities. At this training center, 55 extension agents (moniteurs) participated in a three-month technical training program in fish culture, prior to being assigned to the field. This training emphasized practical skills. Each moniteur was assigned his own fish pond to manage during the course of the program, and trainees participated actively in constructing ponds at the Kigembe station.

In addition, eight extension supervisors received training in fish culture in the Ivory Coast; six individuals were trained in fish station management; and numerous special training sessions were conducted at the Kigembe Center for farmers, local administrators, and others.

Technical Aspects of Fish Culture in Rwanda

Rwanda's environment offers particular constraints for aquaculture. The country's mountainous terrain imposes limitations on pond size and logistics, and the high elevations provide a cool climate which affects fish growth and production. Most fish ponds are found at altitudes of 1300 to 2500 meters, where night air temperatures can fall below 10 degrees centigrade and the afternoon air temperature rarely reaches 35 degree centigrade. The average fish pond is a hand-dug diversion pond with a water area of roughly 4 ares.

There was initial concern that fish culture was not economically feasible in Rwanda because of its high altitudes and cool climate. Subsequent work has demonstrated, however, that the primary limiting factor in fish culture in Rwanda is the quantity of inputs, followed by their quality. With good quality fingerlings and adequate quantities of fertilizer and feed, there is no biological reason why Rwandan farmers cannot obtain production levels of 20-25 kg/are/year. Higher production is possible, but secondary factors, such as temperature and elevation then come into play. Higher production may also be limited by water quality, since areas outside the volcanic region or the north have soft acidic water.

The overriding objective of the Fish Culture Project was to assist farmers in obtaining the highest possible production from fishponds with only moderate expenditures in time and with no cash investment requirements (except for an investment in fingerlings).

Three major constraints to fish culture production were addressed by the Project. These were: (1) species selected and fingerling availability; (2) poor pond management, and (3) inadequate extension.

Fish Stock and Fingerling Production

The fish culture project began with an effort to determine the most

appropriate species for Rwandan conditions. A wide range of alternatives was available, including tilapia, common carp, grass carp, and Clarias. Each species had been promoted to Rwandan farmers at one time or another. Experience indicated that adequate nutrients were not available to raise carp. Nor were grass carp or Clarias hatchery operations well identified. Therefore, tilapia were chosen as the culture fish and, of these, Tilapia nilotica, which is indigenous to Rwanda, was deemed the most appropriate. Since the local T. nilotica stock, both in the wild and at the country's fish stations, were found to be generally a cross between T. nilotica and T. macrochir, the project imported pure, cold tolerant, T. nilotica stock (22 female and 18 male fish) from Auburn University.

A serious problem for farmers prior to the project was the chronic shortage of fingerlings. This was attributed to cooler temperature inhibiting the reproduction of brood fish. Under the project, hatchery techniques were improved and production levels of 13,000 to 15,000 fingerlings per month per station were attained. With two hatcheries, one at Runyinya in the south and another at Rushashi in the north, some 30,000 fingerlings could be produced monthly, a level adequate to meet the country's estimated need. Between 1984 and 1988, over 870,000 fingerlings were distributed to farmers. These fish were sold at a subsidized rate of 3 FRw each, delivered to the farmer (production costs were 3.9 FRw apiece, exclusive of transport).

Pond Management

In the early stages of the project, major weaknesses were identified in pond management by farmers. These included poor water regulation, inadequate pond fertility, and infrequent harvesting.

Correcting water regulation involved convincing farmers to stop water from flowing through their ponds (a practice that had been encouraged under previous projects). Water flowing continuously through a pond lowers the water temperature by up to 4 degrees centigrade and, as a result, decreases the nutrient (plankton) levels on which the fish feed. Correcting this involved installing water regulation structures (inlets and outflows) and maintaining appropriate water depths.

With respect to pond fertility, it was found that pond water sources in Rwanda were generally soft and acid, with low natural fertility. Thus, they required fertilization to support an acceptable level of fish production. With limited resources, Rwandan farmers must rely on animal and/or green manure, and dried or fresh vegetable matter in the form of compost, to improve pond fertility.

Another factor that contributed to low output was the fact that harvests were scheduled infrequently, with many ponds harvested only once every 12 to 18 months. Under the Fish Culture Project, farmers were encouraged to harvest their ponds every 7-10 months, as soon as the fish were marketable. With improved nutrient availability, growth rates increased, and fish could be harvested sooner.

Table 1 presents a summary of pond management practices recommended by the project for Tilapia nilotica production in Rwanda.

Table 1: Recommended Pond Management Practices for Tilapia Nilotica

Practice	Component	Recommendation
Water Regulation	Shallow End Depth	40-50 cm
	Deep end Depth	120-150 cm
	Control Mechanism	"on/off" method no flow-through
Fertilization	Compost enclosure	not located at inlet one per are 10% of area of pond enclosed
	Initial Application	Minimum of 0.5-1.0 m3/are
	Subsequent Applications	10% by volume, weekly
	Quality (minimum)	80% vegetable matter 20% manure
	Mixing	Well mixed daily
Feeding	Quality	Whatever is available (e.g. leaves, household wastes
	Quantity	As much as possible
	Frequency (minimum)	one a day, five days a week
Stocking	Size	approximately 10 grams
	Initial Density	1 fish/1.5 m2
	Maximum Density	1 fish/m2
Harvesting	Partial (sampling)	As from 4th month
	Complete	After 7-9 months

Fish Culture Extension

Currently, agricultural extension in Rwanda is fragmented by multiple, uncoordinated efforts at the local level of the separate divisions of MINAGRI. Moreover, regulatory work is often mixed with technical assistance. The resultant low level of effectiveness has resulted in an examination of the applicability of the World Bank Training and Visit System to Rwanda's extension program. While at the present time, aquaculture extension stands as a distinct activity, the long-run placement of fish culture extension within MINAGRI must be carefully considered, especially as fish culture moves from a discrete activity to one of integrated agriculture. The transition from donor project to routinized source of technical assistance within MINAGRI is particularly critical in light of the introduction of the T & V system.

Rwanda is a mountainous country with limited means of transportation. Experience under the PPN has shown that extension agents, travelling by bicycle, can adequately cover a "zone" within a 15 km radius. Within this zone, an agent can visit 10-15 sites, or approximately 35-40 ponds, per week. As the agents initial group of fish farming families progress through a series of successful harvests and yields increased, the frequency of visits can be decreased from once a week to twice a month, and additional ponds can be added. Each extension agent is supervised by an agronome, who visits each agent twice a month to assess his/her activities in the field. Agronomes are also designated as the principal aquaculture officer for the region. In that capacity they maintain contacts with other government officials, coordinate the distribution of fingerlings and materials, and organize monthly meetings with the agents and collect, correct, and collate monthly reports. Observers have concluded that, at both the national and local level, the personnel of the PPN are some of the most effective extension agents in Rwanda.

Considering the state of development of aquaculture as an enterprise in the country, it is recommended that the present force of aquaculture extension agents continue to operate on a commune-wide basis in the 60-70 communes where aquaculture is (or could be) a significant activity. Due to the special attributes of fish culture, fish culture extension and input supply should remain unified. The long-term goal should be integrating aquaculture into the national extension service.

Aquaculture Facilities

At the beginning of the Fish Culture Project, all 26 of the existing aquaculture facilities were visited and evaluated as to their possible role in a national aquaculture program. The Kigembe center, which was established in 1954, has played a major role in the project, and in the development of fish culture in Rwanda. Not only has this facility served as project headquarters and training center, but it has also become the primary demonstration site for integrated aquaculture, with large scale demonstration of fish-pig, fish-duck, fish-chicken, and fish-goat culture. Production from several of the center's integrated ponds has exceeded 40 kg/are/year, and the sale of animals, eggs, and other outputs has helped defray the cost of station operations.

Six facilities were chosen to participate in the program, based on size, physical state, geographic location, and accessability. Each station was selected with a specific role in mind. Nkungu, the largest station, was used for trials of food fish production and marketing. Rugeramigozi, with the largest number of ponds of the same size, was designated as the site for production trials, where different management systems were compared. Ndorwa, at an altitude of 2200 meters, was selected to provide information about growth and reproduction at high altitudes. Runyinya, Rushashi, and Bwafu were designated as regional hatcheries (although Bwafu was later given lower priority, since its region could easily be supplied by Runyinya).

For the facilities chosen, the project (a) renovated ponds and water supply canals (including the construction of offices, storerooms, and holding tanks), (b) installed sluice gates, dams, etc. to regulate water; (c) installed inlets and drains; and (d) equipped the facility with aquaculture and office supplies, including nets, graders, scales, etc. All six stations

were operated by trained managers, under the direct supervision of the Extension Service.

One major problem that is still unresolved is the long-term use of the nearly 20 facilities that were not included in the Fish Culture Project. There is a serious need for a national aquaculture strategy which would include planning for the disposition or use of these other facilities. In most cases, they should be sold or leased to farmer cooperatives or private entrepreneurs. The PPN program could be run more efficiently and at a lower cost with only key stations remaining under MINAGRI control. This divestment would provide income to the government while lowering project costs and coordination headaches.

Socio-economic Issues

Fish ponds are generally located in the marais (wetlands). Unlike in the hillsides, however, the marais lands are for the most part publicly owned. Short-term use is allocated by the local government administrator (burgomaster). Long-term allocations of marais land are approved and registered by MINAGRI. Homes are not generally located in marais areas, for the practical reason that they are subject to periodic flooding. Traditional rules also reserve marais for collective use, and government law has institutionalized the pattern. This holds true for fish ponds, as well, approximately two-thirds of which are operated collectively.

Fish farming is largely a male realm of endeavor, although approximately 550 women are on the extension roles of the PPN, primarily through involvement in collective ponds. Relatively few women individually own ponds. Part of the reason for this may be that fish culture involves certain tasks that demand more strength (e.g. pond construction). Fish farming does, however, involve all family members and, in general, roles according to sex or age are not clearly defined.

Many different agencies and organizations are engaged in fish culture and related activities in Rwanda. No mechanism currently exists, however, to facilitate information exchange and other forms of cooperation. Within the GOR, the Ministry of Youth and Cooperatives (MINIJEUCOOP) works with farmer groups and fields a commune-level "cooperative trainer". For youth groups growing fish, the youth director manages the fish culture activity, sometimes with project assistance. School ponds are operated by the Ministry of Primary and Secondary Education (MINISUPRESS). Prison ponds are operated by the Ministry of Justice. The National University of Rwanda does fish research at its ponds at Rwasave. MINISANTE (the Ministry of Public Health) has ponds connected with nutritional and health centers. The Ministry of Interior is involved with commune-sponsored projects. Local representatives of these groups may or may not consult with staff of the Programme Pisciculture National. Sometimes they proceed without advice and often internal constraints or prejudices may contradict recommendations given by project personnel. Some facilities set a bad example for farmers, teach incorrect or inefficient techniques, or involve dead-end efforts with inappropriate species. This is both a problem for, and a justification of, a national-level Fish Culture Project.

C. Proposed Project Activities

Under the NRM Project, USAID will support the expansion of integrated fish culture in marais. The project would be implemented by the SPN, which would work closely with the Division d'Aménagement Hydro-agricole (DAHA), which is within the Direction Generale du Genie Rural et de la Conservation des Sols and is charged with marais development. Investments made by the project (e.g. in fish pond construction and related activities) would follow requests by local communes to the SPN. The SPN would, in turn, be responsible for providing on-site supervision of all construction and implementation.

USAID's acceptance of this implementation arrangement is predicated upon the continuing availability and involvement in the program of the current leadership of the SPN. The PPN, as currently operating, represents a philosophy and hands-on approach which, in the opinion of USAID, is vital to the success of fish culture extension in Rwanda. Hence, continuity in the leadership of the PPN is essential, especially given the relatively limited number of trained fish culture technicians in the country. Should the current Acting Director not be available for the initial two years of the project, USAID would consider requesting a modification to the project agreement to involve a PVO or other institutional mechanism to help manage the project.

Under the "Integrated Fish Culture in the Marais" Component of the NRM Project, USAID would finance research, technical assistance, training, extension, and various construction activities. The GOR contribution to the project will be in the form of staff salaries and infrastructure that will be put at the disposition of the project.

Personnel

The GOR contribution to the project will include the salaries, over the life of the project, of the Director of the Fish Culture Service, a Training and Extension Specialist, and a Data Processing Specialist. These individuals are already assigned to the SPN. The Fish Culture Director will be responsible for the operation of the service, will coordinate fish culture activities, and oversee the financial management of this component. The Training and Extension Specialist (AO-level) will plan, organize, and contribute to the training of fish culture extension agents and farmers. This person will also monitor extension activities under the project. The data processing specialist (AO-level) will be responsible for collecting and processing statistical data on fish culture in Rwanda, particularly with respect to the extension program.

As noted above, the GOR will also recruit an assistant Fish Culture Director who will assume responsibility for the management of the project in the absence of the Fish Culture Director. The GOR will also contribute the salaries of various support staff (e.g. a secretary, a typist, an accountant, and three chauffeurs). Finally, the GOR will cover the salaries of extension agents and laborers.

Technical Assistance

USAID will finance technical assistance to meet specific needs identified by the SPN. This may include assistance in conducting in-country training or

in carrying out the research program. This technical assistance may be from either local or expatriate sources. Particular attention will be given to the possibility of buy-ins to centrally-or regionally-funded AID projects. This would be sufficient to provide a total of 10 person months of expatriate technical assistance over the life of the project (2 person-months per year). If the technical assistance is procured locally, or under buy-in agreements with other AID projects, a greater level of technical assistance could be obtained for this funding level.

Research

The NRM Project will fund applied research in the following areas:

(a) aspects of integrated fish culture;
(b) the commercial, socio-economic, and organizational issues of fish culture within the context of marais development;
(c) hydrology and water management issues as they affect fish culture in marais;
(d) crop production, soil fertility, and related issues of fish culture in marais

Part of this research budget would be directed towards students and faculty of the National University of Rwanda, and part would finance studies by the Institut des Sciences Agronomiques du Rwanda (ISAR). The research funds would be allocated based on proposals submitted by researchers, and would be expended in Years 1 to 3 of the project.

Training

The NRMP will fund two Masters degrees in fish culture, one of which is intended for the Fish Culture Director. One candidate would depart in Year 1 of the project, and the second in Year 3. Additional funds will be set aside for third country training and study tours. Funding will also be provided for in-country training in fish culture, particularly directed at fish culture in the marais. This would include the training of up to 20 new moniteurs (the courses for new moniteurs would last 6 months, with each course having 10-15 students). These 20 new moniteurs will be selected from a set of priority communes and will have at least 3 years of post primary education.

In addition, six members of a mobile extension team will be trained. This team will provide on-site technical assistance to farmers, cooperative members, and moniteurs in the construction of fish ponds and facilities for integrated fish culture (e.g. piggeries and hutches above the ponds), and in the establishment of fish culture operations. Further, approximately 45 Pisciculture National moniteurs will receive training, particularly in integrated crop/livestock/fish culture under marais conditions. Finally, funds will be set aside for training of students, cooperative members and farmers in integrated fish culture.

The above training will be offered at the Kigembe Training Center, near Butare. The use of this center will be part of the GOR's contribution of the project. The in-country training programs would be expended over the life of the project.

Support for Extension Activities

USAID will support the operational costs of an expanded fish culture/marais development extension program (exclusive of training costs). This will include funds to pay the salaries of newly recruited Pisciculture National moniteurs for the first two years (conditional upon MINAGRI signing an employment contract with these individuals upon completion of their training and shouldering the recurrent costs of their salaries after Year 2 of the project). The salaries of these newly trained moniteurs over a three year period will represent part of the contribution of the GOR to the project.

As part of its contribution to the project, the GOR will also meet, for the duration of the project, the salaries of 8 regional supervisors and 45 fish culture extension agents currently employed by the PPN. The regional supervisors will closely monitor the activities of the extension agents. The GOR will also support the salaries of 6 members of a mobile extension team, which will be recruited within the framework of the project. Their role will be principally to undertake pond construction and related activities that the farmers and extension agents are not adequately trained to do. These individuals will be responsible for the construction of the integrated fish culture centers at the commune level.

Two small four-wheel drive trucks will be purchased under the project (one in the first year of the project, and a replacement in Year 3). These trucks will be used to transport fry, fishing equipment, and the mobile team. Additional funding will be provided to cover the operating and maintenance costs of these vehicles. The project will procure a limited amount of computer equipment to enable the staff at the Kigembe Fish Culture Center to aggregate and analyze fish production statistics. Funds will also go into a revolving credit fund to enable moniteurs to purchase bicycles. Finally, the project will procure fishing equipment (e.g. nets, tanks, scales), audio-visual materials, and other equipment and supplies needed to implement the research, training, and extension aspects of the fish culture program. These funds would be expended over the 5-year life of the project.

Construction

Under the NRM Project, funds will be provided by USAID to construct up to 7 communal fish culture centers in marais areas. These stations, each having 1 hectare of pond area, will be used to demonstrate integrated fish culture practices to farmers. These communal stations will be managed by "groupements" formed by farmers with individually operated ponds, with the Service de Pisciculture National providing technical assistance. It is assumed that the local community will make an in-kind contribution to these investments (e.g. labor, local materials, etc.). Some funds provided by USAID could be placed in a revolving fund to provide credit to enable farmers and cooperatives to purchase livestock for use in integrated fish culture/livestock production systems. Construction of the communal fish culture centers would be completed by Year 3 of the project.

Additional funds will be provided for additional construction at the Kigembe station and three regional stations. This will include the enlargement of pond areas at the regional stations, as well as constructions (hen houses, rabbit hutches, piggeries, etc.) to expand integrated aquaculture

practices on production ponds. Construction at the Kigembe and regional centers would be completed by Year 2 of the project. Some funding will also be made available to cover the initial operating costs of the above communal and regional fish culture centers.

The GOR will make available to the project its facilities at the Kigembe Fish Culture Station for the training of personnel and farmers. Other fish culture stations (e.g. Runyinya, Nkungu, Gitarama, and Rushashi) will also be available. Land for the construction of the 7 integrated fish culture centers will constitute part of the GOR contribution to the project. In addition, the government will cover the salary costs of laborers at the Kigembe Station and other fish culture stations.

ANNEX D - SOIL CONSERVATION AND AGROFORESTRY ANALYSIS

A. Introduction

The Natural Resources Management Project will have five components: (a) marais (wetlands) management; (b) fish culture in the marais; (c) natural forest management; (d) support in environmental planning; and (e) agroforestry and soil conservation. This annex focuses on the agroforestry and soil conservation component of the Project, which is geared to highland areas of the country. The total budget available for agroforestry and soil conservation activities under the NRM Project is $1.675 million, or approximately $335,000 per year over the five year life of the project.

Section B of this annex presents a brief overview of land-use practices in Rwanda's uplands. Section C discusses and makes recommendations concerning alternative agroforestry and soil conservation techniques that might be appropriate for upland areas. Section D of the annex outlines the administrative structure and approach to be used in implementing the agroforestry and soil conservation component of the proposed project.

B. Land-use Practices in Rwandan Uplands and Related Soil Conservation and Improvement Issues

1. Upland Use and Soil Conservation

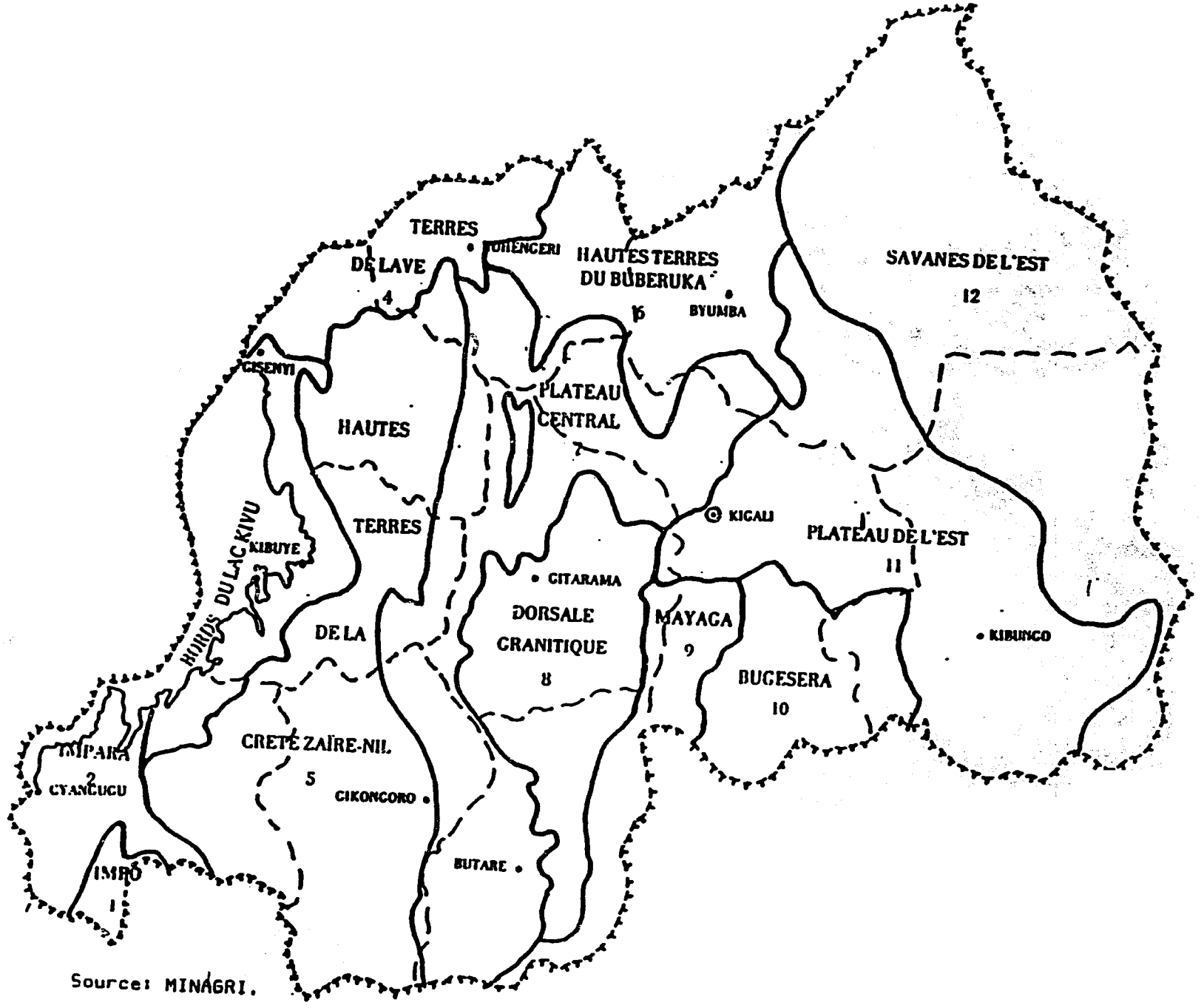
Rwanda is composed of 12 agroecological zones, which vary according to physical, climatological and biological features. The altitude varies between 1400 m (at Lake Kivu) and over 4000 m (volcanos region). The annual average temperature averages 19°C and becomes warmer when moving from the high altitude in the volcanos region and the Zaire-Nile divide to the lower altitudes in the eastern part of the country.

This technical analysis is limited to 3 of the country's 12 agroecological zones, each of which is in the Ruhengeri prefecture: a) the Buberuka Highlands; b) the Lava land and; c) the Zaire-Nile divide (see map 1).

The Agroforestry and soil conservation component of the Natural Resources Management Project will be implemented in five communes of that area, Nkuli, Mukingo, Butaro, Cyeru and Nyamugali (see map 2).

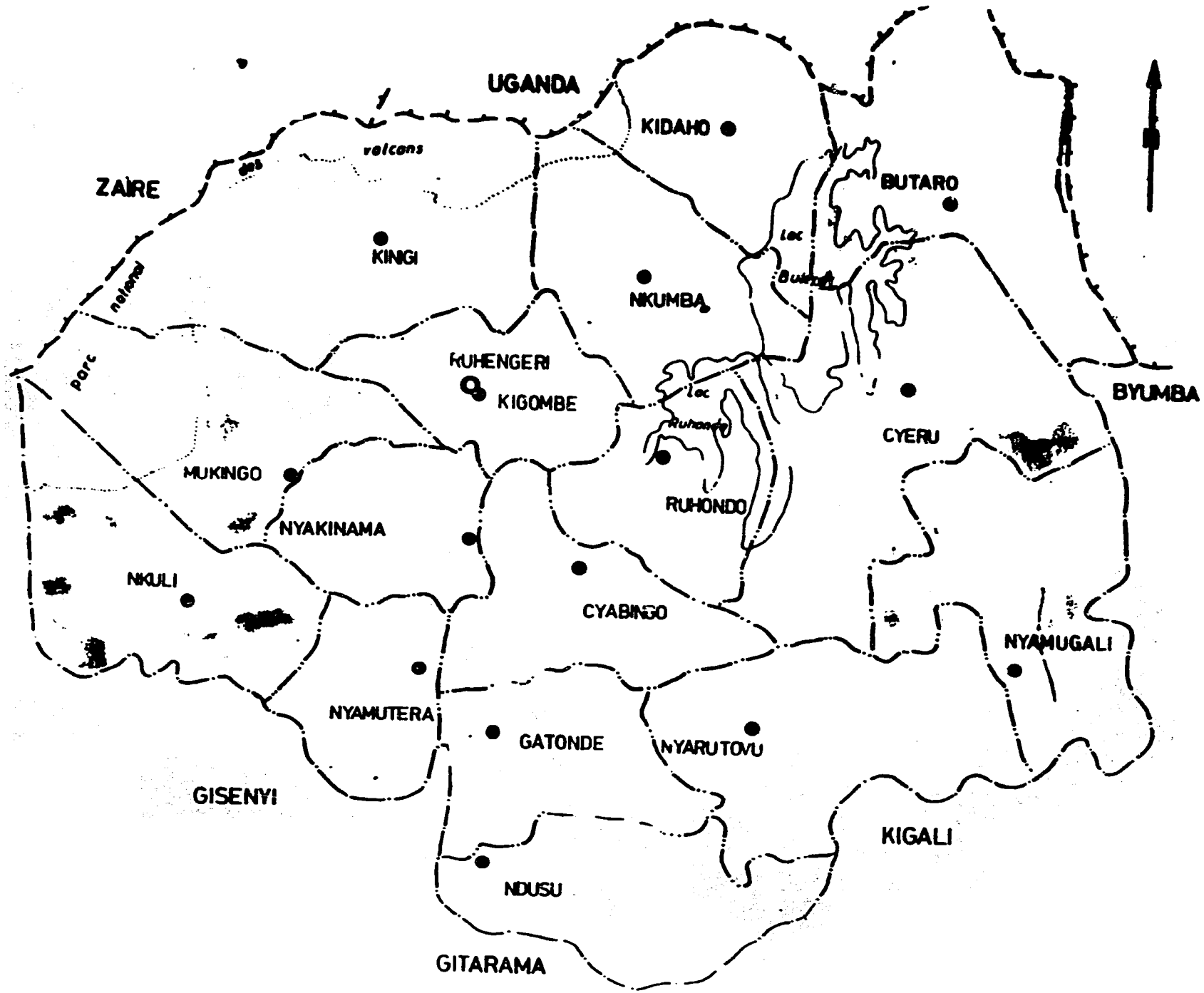
This area is caracterized by high altitude varying between 1600 and 2000 m, with rainfall lying between 1300 mm and 2000 mm. The landscape is mountainous, with slopes of more than 60 percent. Due to the population pressure and to shortage of fuel wood, the whole area (as it is in the whole country) has been deforested and cultivated. Consequently the soils are overused and remain unprotected, and soil loss become the most important constraint for the farmers in that area during the last 20 years. The traditional agricultural practices in the area consist of growing beans, peas, potatos, wheat, sorghum and sweet potatoes without measures to restore the soil fertility. This has contributed to the soil losses ranging from 12.3 and 21.7 MT/ha/year.

MAP 1: AGROECOLOGICAL REGIONS OF RWANDA



Source: MINAGRI.

MAP 2: RUHENGERI COMMUNES INVOVLED IN THE NRM PROJECT



During the last 15 years, the GOR has focused on soil erosion control and reforestation and has sensitized the population to soil protection and tree planting. The efforts undertaken have been remarkable. However, the techniques used, such as infiltration ditches and eucalyptus plantings, have been modified since the colonial period. Those techniques have not been sufficient to adequately control soil erosion or to improve soil fertility. Moreover, mass-movement of soils landslides, gully and channel erosion of the steep creeks and draws that drain into the valley bottoms is becoming the major problem. The surface horizons of the soils are getting shallower and less fertile. Large areas are being degraded and becoming inappropriate for agriculture. The agriculture in Rwanda, and particularly in that north-west region, depends upon the exploitation of a precarious environment. The NRMP will therefore focus on extending appropriate existing techniques and developing new techniques, which are sustainable and environmental sound.

2. The Utilization of Forest Resources

As stated above, population pressure has led to the destruction of the natural vegetation in the country, particularly of the natural forests. As a result only a small portion of Rwanda's natural forest cover remains. The remaining forests include the Nyungwe Natural forest, Gishwati and several smaller patches of forest located along the Zaire-Nile Divide, the forest of the Parc National des Volcans, and the savannah Woodlands in the Parc National de l'Akagera and in Bugesera region. In addition, there are a few remnants of gallery forest in Kibungo prefecture.

These natural forest are seriously threatened by the human pressure. In order to protect those forests, the GOR focused on reforestation and has created a "tree planting day" during which many hectares of land are planted. (In 1985, 79,800 hectares of public land and 58,800 hectares of privately owned land were planted).

Despite these efforts, the need of fuelwood and various forest wood products, (such as for construction and the fabrication of furniture, implements, and poles for climbing beans are growing and remain unmet.

The land available for reforestation in Ruhengeri prefecture is also becoming rare. Therefore, the integration of the tree production into agriculture is becoming a high priority. The most commonly used tree species, such as Eucalyptus and various pine species are poorly suited to be integrated into agriculture and to the erosion control.

The Ruhengeri Resources Analysis and Management Project and the Farming Systems Research Project have been looked for alternatives. The Natural Resources Management Project will build on the new agroforestry and soil conservation techniques developed by these projects, in order to address the described problems discussed above, and will apply them in such a way that the environment in these five communes becomes less precarious. Those techniques should also contribute to increased and sustained agricultural productivity on long term.

3. Natural Resource Management Issues

Assistance from AID and other international donors to promote a more sustainable utilization of Rwanda's natural resources in upland areas have generally addressed, and should continue to address, one or more of the following needs:

a. The identification of soil erosion control methods which allow farmers to cultivate on hillsides, while maintaining or increasing agricultural productivity levels, and which will provide immediate, as well as long-term, economic benefits.

As is readily apparent in Rwanda, one of the problems with many soil conservation measures introduced to date is that they are labor-intensive but often provide no immediate economic compensation for the labor investment required. In addition, some measures take up farmland without producing an increase in crop yields sufficient to compensate for the reduction in cultivable land area.

b. The maintenance or enhancement of soil fertility levels and overall soil quality

Due to extreme population pressures, very few farmers have the option of allowing land to lie fallow to regain soil structure and soil fertility. In order to increase, or even sustain, present production rates, it is essential that appropriate techniques be identified and disseminated which allow farmers to improve soil fertility by other means. These techniques should be simple enough that, once given appropriate training, farmers and communities could implement them without further outside assistance.

c. The Provision and improvement of fodder resources

The land available for pasture is decreasing, as more and more land is being brought into cultivation. In order to maintain livestock production levels, methods must be found which will allow a more intensive production of fodder and a more efficient use of agricultural residues for this purpose. Additionally, appropriate combinations of graminoids and legumes must be identified to ensure that fodder contains the maximum nutritional value possible.

d. Increased supply and more efficient use of forestry resources

As the supply of forest products in Rwanda is still outpaced by demand and the land available for reforestation is decreasing, efforts should be provided to promote agroforestry as a means of increasing the supply of forest product as well as to control erosion.

C. Alternative Agroforestry and Soil Conservation Techniques

This section of the report discusses in detail a number of Agroforestry and soil conservation techniques that could be employed by the Natural Resources Management Project (1) to control soil erosion; (2) improve and increase soil fertility; and (3) improve forest management techniques.

1. Agroforestry as Erosion Control and Soil Fertility Improvement

Tree planting in Rwanda and elsewhere has traditionally focused on forestry species which planted in woodlots with little effort to integrate the trees into agriculture. The shortage of land and need to improve erosion control and soil fertility argue for the introduction of new forestry species which could be associated with agriculture, (i.e. Agroforestry". Agroforestry can be used in combination with other techniques to a) reinforce biological contours and infiltration ditches, b) stabilize raodsides, c) improve fallows and produce organic matter to enhance soil fertility , d) produce fodder for livestock and wood for fuel and poles, and e) demarcate farm boundaries.

Unfortunately much of the research being conducted in Rwanda to verify the potential advantages and/or identify the possible disadvantages of various agroforestry species has only begun within the past three to five years. This time span is too short to provide conclusive results. At the same time, much of the agroforestry work to date has concentrated on the use of exotic tree species. Very little attention has been given to the use of indigenous species, despite their potential advantages, which include: greater resistance to disease, grater site adaptability, and easier utilization by local people, who are often familiar with these species.

The NRM Project will therefore to disseminate the agroforestry species selected by RRAM and FSRP projects and conduct additional research and pre-extension trials. These trials will focus, in particular, on the incorporation of improved agroforestry techniques into available soil conservation packages.

2. Techniques for Erosion Control

As indicated above, Rwanda comprises 12 agroecological zones, which are different in climate, vegetation, topography and, in particular, soils. Nevertheless, these differences, soil erosion control techniques have traditionally been applied in the same way in Rwanda regardless of soil type and climate. This section will describe the various soil conservation techniques commonly employed, identifying weaknesses and potential.

a. Infiltration Ditches

The practice of constructing infiltration ditches to reduce runoff and soil loss was introduced into Rwanda in the 1940s. Today, they are found throughout the country. However, many of these are not adequatelymaintained, possibly due to a lack of farmers incentive to invest valuable labor in an activity which yields little or no immediate tangible benefit. In addition, the establishment of infiltration ditches in inappropriate areas appears to be a problem. In the Ruhengeri area, particularly in and the Zaire-Nile Crest where, the slope reaches more than 60 percent, infiltration ditches used alone can cause landslides and land slippage.

Potential AID Intervention: AID intervention in this area could include:

(1) Support for research to determine the suitability of ditches under various agro-ecological conditions (e.g. slope steepness, soil type, rainfall, and cropping practices). In addition, new techniques, such as protection and diversion ditches should be tried out in order to control excess water accumulation, which causes landslides and land slippage.

(2) Support for local land use planning efforts to identify areas within target communes which would be more suitable for another form of erosion control;

(3) The use of combined techniques such as agroforestry species to strengthen ditches and to provide additional benefits (e.g. wood for poles, green manure). In this case, AID should build upon the experience of on-going projects and programs, which are already experimenting with and/or disseminating this methods.

b. Biological Contours/Hedgerows

Biological contours entail the establishment of grasses, shrubs, and/or trees along slope contours and infiltration ditches, in order to stabilize soils and to encourage the collection/build-up of runoff material and the gradual formation of a terrace. In RRAM field runoff trials (on land with an average slope of 55 percent) soil loss on fields planted with biological contours was significantly less (75 percent lower) than on plots containing no biological contours. In addition to controlling erosion, biological contours can provide fodder for livestock. Graminoid species (e.g. Tripsacum, Pennisteum, and Setaria) for example, are used by some farmers in Ruhengeri as fodder. Planting agroforestry species in association with graminoids can strengthen contours, as well as provide additional fodder sources.

Although biological contours appear to be relatively efficient in terms of erosion control, there are still a number of problems/issues which need to be addressed. First, the farmers in Ruhengeri area are planting graminoid species on the contours without combining them with agroforestry species. This practice reduces the efficiency of biological contours in controlling soil erosion. Moreover, there are only few species of graminoids and agroforestry trees which are adapted to the Ruhengeri area, where the low temperature (between 12°C and 18°C) slows down the growth of those species. Finally, as with infiltration ditches, many biological contours fall into disrepair due to a lack of maintenance.

Potential AID interventions: AID assistance in this area could include:

(1) Dissemination of new agroforestry technologies developed by RRAM and FSRP projects, which combine graminoid and shrubs and trees in the same biological contours to better control erosion and to provide, at the same time, fodder for livestock and poles for climbing beans.

(2) Support or expansion of present research efforts to identify suitable agroforestry species and grasses, optimal spacing patterns, and appropriate combinations of grasses and tree species for specific sites and farmer needs.

(3) Sensitization of farmers to better maintenance of planted biological contours.

c. Road Side Stabilization

If appropriate precautions are not taken, roads located on steep hills can channel water down a slope and can be a primary cause of land slippage and/or ravine formation. This can be prejudicial to the interests of the farmers living on hillsides and to the environment as whole. This problem can be somewhat controlled if roadsides are stabilized by the planting of trees alongside, upslope and downslope from the roads. Examples of this can be seen along many Rwandan roads, and particularly the country's main roads. However, examples can also be seen of roads that, due to improper placement and a lack of stabilization measures, have caused severe hillside degradation.

Potential AID intervention The NRM Project could assist local population in target communities to identify needed measures to manage the targeted watersheds as a whole, including roads stabilization in the rural area. The NRMP should provide the local population with technical assistance in the planting and maintenance of suitable tree species and with needed seedling.

d. Mulching

Even though mulching with crop debris or cuttings from biological contours is widely practiced in coffee plantations in Rwanda, it has not yet been adopted by farmers as a soil erosion control or soil fertility improvement technique. This is due to the lack of sufficient mulch material. The RRAM project has demonstrated that fields mulched with grasses harvested from biological contours can decrease soil erosion and increase food crop yields.

AID intervention. AID intervention in this area should focus on:

(1) Dissemination of technologies developed by previous or on-going research projects

(2) Sensitization of targeted communities and populations to the use of mulching

(3) Support and/or expansion of research efforts to determine additional appropriate species and materials for mulching, as well as the agro-ecological zones in which mulching is appropriate and desirable.

e. Cover crops/Green manure

It has been demonstrated that leguminous cover crops such as mucuna, vetch, lupin, desmodium, crotalaria, canavalia, alfalfa, cajanus cajan, etc. can improve fallows, protect soils from heavy rains and erosion and increase soil fertility, once they are incorporated into the soil. Unfortunately, this technique has not yet been adopted by the farmers because of shortage of land for fallow and lack of appropriate varieties, which could be extended to them.

Potential AID intervention: AID activities in this area will consist of:

(1) Extension activities to sensitize farmers to the benefits of cultivating cover crops which would contribute to soil erosion control and provide green manure for soil fertility improvement.

(2) The continuation and expansion of research on cover crops/green manure building upon the work of FSRP, which is testing various cover crops/green manure for suitability in the Buberuka agroecological zone.

f. Improved Cropping Patterns

Traditional cultivation techniques may exacerbate soil erosion and, therefore, be inappropriate for sloped areas. The notable example is the practice of planting crop rows perpendicular to slope contours, which can result in the channeling of rain waters downslope and the formation of ravines.

Potential AID Intervention AID can address this problem by identifying inappropriate cultivation techniques and informing farmers of their disadvantages, as well as by ensuring that any agricultural extension ac vities carried out under the Natural Resources Management Project encourage the planting of all crops along slope contours.

g. Diversification of Perennial cash crops

Perennial cash crops in Rwanda include coffee and tea. However coffee is not adapted to these targeted agroecological zone and tea competes badly with irish potato in this area. On the other hand, fruit production in this area practically nonexistent, with the exception of the mountain papaya and "prune du Japon". Fruit orchards show potential for the region and, can be used as agroforestry species and as such, help control soil erosion and provide organic matter for soil fertility improvement.

Potential AID intervention The NRM Project will support efforts to identify fruit species suitable to highlands areas, as well as to train local farmers in the production and maintenance of these species. In addition to encouraging the more appropriate use of steep slopes, such an intervention would be quite useful in terms of providing alternative sources of income generation and nutrition.

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h. Buffer Zones

Ruhengeri prefecture includes areas which show a high propensity for soil erosion, land slippage and mass movement, particularly when cultivated. These zones belong to the most precarious environment of Rwanda, which includes ravines and highly degraded land. These areas should not be taken into agriculture, but rather, should be planted with trees and constitute "buffer zone" against erosion and land mass movement.

Potential AID intervention The NRM Project will provide technical assistance, seedlings and training to local community groups or private individuals to establish buffer zones where needed.

3. Techniques to Increase Soil Fertility

Most of techniques described above have the advantage of increasing soil fertility and crop production, in addition to controlling soil erosion. Three additional techniques for increasing crop as well as livestock production will be described below. These are improved fallows, composting, and improved fodder production.

a. Improved fallows

In areas of lower population density, some farmers leave land in fallow for up to one year. In such cases, improving the fallow by planting leguminous tree species or cover crops could lead to increases in soil fertility and, where tree species are planted, could provide other benefits (e.g. fuelwood or fodder production). Research in this area has been carried out by ISAR, as well as by several agricultural development projects (PAP, PAK, and PIASP). The PAP project began extending fallow improvement techniques on a small scale to farmers in the Nyabisindu area two years ago. Preliminary on-farm research results indicate that crop yields after a one-year fallow can be three times greater than those previous to the fallow. According to the PAP forester, farmers were originally skeptical and hesitant to allow land to lie fallow for that length of time. After experiencing significant crop yields, however, they have decided to continue this practice. Nevertheless, it appears that, nation-wide, the rate of adoption of these techniques by local farmers is still very low.

Potential AID Intervention The proposed NRM Project should: (1) attempt to identify constraints to the practice of improved fallows in each of the target communities chosen, and to alleviate these constraints through the support of additional research; (2) Provide appropriate seed supplies; and (3) identify methods for improved fallow systems which do provide adequate economic benefits.

b. Composting

The Rwandan Government requires that compost pits be established on all farms. The compost generally consists of crops debris, manure, and household waste. Adoption rates by farmers have been highest in areas where cropland is the most scarce (e.g. in the northern and western regions of the country).

Potential AID intervention The proposed project will include training in the establishment and proper management of compost pits.

c. Fodder Production

As the area of land available for fodder has decreased, more attention has been paid to research on, and extension of, methods which intensify fodder production and which allow for an appropriate/nutritious mix of plant species. The GOR has, in the past, encouraged farmers to plant graminoids suitable for fodder (pennisetum, Tripsacum, and Setaria) as biological contours. These species alone, however, do not contain an optimal nutritive value. For this reason, several research projects, including ISAR, PAP, and the Ferme de Rubilizi (a parastatal farm located on the outskirt of Kigali) are investigating the production of leguminous forage species, many of which have a higher nutritional value than graminoids. Such species would be utilized in association with graminoid species as the consumption of leguminous species alone can have a toxic effect.

ISAR has examined 88 agroforestry species for their forage potential and has selected ten species as the most suitable. It appears that, traditionally, tree planting efforts by local farmers have relied heavily upon species that are unsuitable for forage (e.g. Eucalyptus and Grevillia). Several agroforestry project and research efforts, including those being financed by AID, are attempting to encourage the planting of forage species as well. Several farmers have adopted the practice of feeding their livestock a mixture of grasses and the leaves of leguminous tree species.

Potential AID intervention: The NRM Project will promote the planting of forage species as a source of fodder, and will continue the research underway to identify highly nutritious agroforestry species appropriate for Rwandan highland conditions.

4. Improved Management of Forestry Resources

In an attempt to meet the growing demands of Rwanda's rural and urban populations for fuelwood and wood for construction and other needs, a great deal of emphasis has been given to reforestation. The most successful reforestation programs have generally involved tree-planting by local farmers. There has also been some emphasis place on the establishment of forest plantations, particularly on hillsides, where they can serve the function of erosion control, as well as timber production. Nevertheless, it appears that very little attention has been given to the management of existing woodlots and plantations, many of which are improperly managed and are, therefore, producing far below their potential capacity.

A comprehensive forestry law has recently been passed, which provides the necessary administrative and technical framework for the much needed upgrading of woodlots. In addition, other encouraging evidence exists which shows that changes for the better indeed are possible.

a. Woodlots/Plantations

As mentioned above, few of the national communal plantations in Rwanda are managed to their fullest potential and, therefore, most are not producing the yields of which they are capable. Examples of management problems include: (1) the planting of species which are inappropriate for the functions for which they are intended; (2) planting densities that are too high; (3) the lack of maintenance (e.g. weeding, pruning, selective thinning); (4) improper harvesting schedules and harvesting techniques; and (5) over-cropping.

Due to some of the above problems, many plantations are not adequately protecting hillsides from erosion. Although no data is available, it appears that erosion is high under many of the country's older plantations, most of which are of eucalyptus), as a result the result of alleopathy and/or water competition.

One project designed to address the above problems is the PSTP/HIMO-project, financed by the International Labor Organization and involving the conversion and/or improvement of degraded stands (primarily eucalyptus). Although the exact methods employed for stand conversion are not recommended for an AID intervention, a closer look at the methods used and results achieved may be helpful in the planning of appropriate conversion efforts. The ILO project is also experimenting with the use of leucaena and other fast growing species as understory cover.

Efforts to improve the management of existing plantations and woodlots appear minimal. The Swiss-financed forestry project in the Kibuye is apparently investigating improved management techniques. Therefore, any AID planning for assistance in this sector should be carried out in consultation with the Swiss.

Potential AID intervention AID should provide training and technical assistance to those responsible for managing communal and private plantations/woodlots in each target commune, so that these potentially valuable forest resources can be more effectively utilized.

b. Communal Forestry Plans

The Direction Generale des Forets (DGF) is encouraging each of the country's communes to prepare a Communal Forestry Plan. This will be essentially a work plan, which will allow a better coordination of forestry and set priorities among, other interventions.

Potential AID Intervention AID will assist selected communes in preparing communal forestry plans. According to the DGF, the preparation of these plans would cost between 400,000 and 800,000 FRW each.

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5. Guidelines for the Dissemination of Agroforestry and Soil Conservation Techniques

As mentioned in the beginning of this section, the majority of the above techniques are appropriate for pre-extension trials and research. Few of them are now ready for mass dissemination to Rwandan rural communities. Research and pre-extension trials should, therefore, attempt to evaluate each technique based on the following criteria.

a. Site suitability. Obviously, the technique chosen should be suitable for the specific site for which it is intended.

b. Economic viability. Some of the techniques mentioned above may necessitate increased labor inputs or a decrease of land placed under crop cultivation. In such cases, in order for the technique to be economically viable, it should provide direct economic benefits which justify these additional costs. Such benefits could include increased crop yields or the production of fuelwood, fodder, and so forth.

c. Replicability. The techniques chosen should be simple enough, in terms of the level of skill required and the types of materials used, so that they can be replicated by farmers independently of project assistance. In that way, the chances of the techniques being applied after the end of the project are higher.

d. Participation. Ideally, the techniques chosen for dissemination should be developed in collaboration with the farmers for whom they are intended, to ensure that they are appropriate to their needs.

e. Environmental soundness. As the use of natural resources on a sustained base requires that the overall environment equilibrium be assured, the chosen techniques will aim to enhance the conservation and improvement of the environment.

D. Summary Project Description: Agroforestry and Soil Conservation Component

1. Project Activities

The Agroforestry and Soil Conservation component of the NRM Project will involve the following sets of activities:

a. Creation of an administrative unit within MINAGRI, which will be based in Ruhengeri and will manage the agroforestry and soil conservation activities in Ruhengeri;

b. A state-of-the-art review of past and current agroforestry and soil conservation activities in order to identify specific success/constraints, set up priorities, and implement these priorities;

c. Support for research on agroforestry and soil conservation problems and techniques, particularly through AFRENA;

d. Creation of nurseries and demonstration centers; and

e. Assistance to the communes in preparing and implementing Commune; Forestry Plans.

2. Activity 1: Research

a. State-of-the-Art-Reviews

In both agroforestry and soil conservation, there is a critical need to conduct "state-of-art" reviews of research and field experiences that have already been carried out, in order to identify the most effective and appropriate agroforestry and soil conservation techniques and interventions. The objective would be to clearly distinguish and articulate what is known, what can be surmised, and what is not yet fully understood. Specific recommendations (what to do, what not to do), based upon field experience have to be summed up and presented in a format that is readily accessible to project personnel.

In addition to describing technical packages, it will be necessary to determine how best to reach farmers, commune authorities, and national service personnel. The initial strategy development would entail an informal survey to ascertain farmers' perceptions as to what interventions make sense and what farmers can and will do themselves. This would be necessary in order to determine the best extension-education approaches to be used.

This examination of soil erosion status and problems in targeted area, and the development of plans for addressing these problems, should occur in the first months of the project. Short-term technical assistance will be provided by AFRENA, which will work together with local experts.

These experts will provide two state-of-the-art studies, one on agroforestry and one on soil conservation. These studies, which will be based on literature reviews, site visits, and interviews, will summarize past experiences with agroforestry and soil conservation in Rwanda. The reports will identify lessons learned, research needs, and technologies that could be extended in the near term, The studies will include the preparation of "tech sheets" for technologies that are ready to be extended. They will also discuss how, within the context of the existing institutional structure and agricultural system in Rwanda, to extend these technologies to farmers.

b. Agroforestry and Soil Conservation Research

The relatively limited budget of this project makes prioritizing research needs very important and means that, to the extent possible, the research should build upon that which has already been done. Moreover, given the limited funding available, the focus of the research should be on answering practical questions quickly and cheaply. The project will undertake relatively little research that is sophisticated and academically rigorous (an exception will be monitoring the Wischmeier runoff plots, discussed below). The NRM Project will, rather, rely on AFRENA to do the formal, statistically valid research that is required, since AFRENA can carry out such research in a much more cost-effective manner.

AFRENA specialists will also assist in analyzing the results of agroforestry and biological soil conservation experiments carried out under the NRM Project. Site visits by network specialists will enable them to assist and guide the design of on-farm agroforestry trials and related research in Ruhengeri Prefecture.

As noted above, the emphasis of the NRM Project will be on field research, rather than academically rigorous research. The one exception will be the observations of Wischmeier runoff plots, three of which were established and monitored under the RRAM II project, and two more of which will be created under the NRM Project. The main function of a Wischneier runoff plot is to produce quantitative information on soil loss and runoff as a function of different protective treatments. Such quantitative information is needed if we are to assess the magnitude and the seriousness of the erosion problem in Ruhengeri Prefecture. Clearly, the results of these runoff plots will have little meaning to local farmers.

Nevertheless, basic quantitative information on the magnitude of soil loss is of scientific and technical importance, not only to specialists in the field, but also to government and donor decision makers faced with a decision as to in what region or in what type of research to invest limited funds.

Observations, analysis, and evaluation of the runoff plots will require the year-round presence of local, trained farmer-observers for the duration of the project. It also requires the participation of a trained technician and soils laboratory. Therefore, it is suggested that responsibility for implementing this task rest with ISAR and UNR, supplemented by short-term-TDYsfrom a U.S. specialist in this area. Under the project, the three Wischmeier plots created under the RRAM Project will be continued, and two others will be created (one in Mukingo and one in Buberuka).

Finally, a study of the hydrology of the Parc des Volcans's watershed will be carried out, aimed at developing a plan to control the torrential runoff from the mountains. This activity may be carried out in conjunction with, and co-financed by, the Karisoke Research Center (see the Natural Forest management Component).

3. Activity 2: Nurseries and Demonstration Centers

Solid, verifiable evidence exists from RRAM, FSRP, and CARE-GITUZA that at least some local people will adopt new techniques and apply them on their land without much, if any active hard-self extension efforts. Farmers must be able, however, to see for themselves now various technologies performed under conditions similar to their own. Thus, with on-farm demonstration sites, farmers can observe, consider, and judge for themselves the value of the new methods, techniques, species, and so forth that are available.

The project will establish one research and demonstration center in each commune. These centers will include nurseries and demonstration fields, where new agroforestry species, grasses and fruit tree species will be tested. Each research and demonstration center will be managed by an agricom (agronome de commune). Under the guidance of the project agroforester, each agricom will

implement species performance observations and pre-extension trials. He will also serve as the liaison between the project and neighboring farmers. The nurseries will serve as the source of agroforesty trees and grasses for the research and demonstration plots as well as for local farmers. Labor for the nurseries will be provided by the project. The project will earmark approximately 360,000 Frw per center per year for the establishment and operation of the research and demonstrated centers,

In addition, on-farm research and demonstration activities will be carried out with the cooperation of farmers living in the same watersheds as the research and demonstration centers. This on-farm research will be conducted within the context of an overall management plan for the watershed. These on-farm research and demonstration activities will be carried out by the farmers themselves on their own fields, with guidance from the agricom and project-trained agronomes (extension agents). The project will provide material support, such as agroforestry plants and grasses, for these activities.

The project will also give support to the existing sector nurseries (there are approximately 10 sectors per commune, and the project will work in 5 communes). The project will furnish support (seed, bags, pesticides, etc.) to the communes for the sector nurseries, which will be managed by the members of the communes themselves, under the supervision of an agricom and monagris. USAID's contribution to the operation to the sector nurseries will be 300,000 FRw per commune per year (a total of $100,000). The beneficiaries will contribute to the project by working on these nurseries (primarily through "umuganda" labor). The estimated value of the labor provided by the beneficiaries will be $6,000. Those individuals who provide labor for the operation of the nurseries will receive priority in receiving the agroforestry species that are already well known and appreciated by the farmers and the new once.

4. <u>Activity 3: Communal Forestry Plans</u>

The communal forestry plan aims to assess the needs of the population for forestry products; to make an inventory of available forestry resources; to identify degraded areas which should be protected against erosion and other areas which should be reforested and to set up action plan for the reforestation and the management of the communal forests. The new forestry law (effective as of Feb. 1989) provides guidelines in this matter to be followed by which each commune. The NRMP project will help the five communes elaborate and implement their forestry plans. The implementation activities may include:

(a) The reforestation of severely degraded sites, including gullies and ravines, extremely steep slopes, and sites threatened with landslides;

(b) the conversion of degraded commune forests, and

(c) soil conservation works identified in the state-of-art review discussed above.

5. Project Sites

Field activities of the proposed NRM Project will be focused in the Ruhengeri Prefecture, which lies in the North-West portion of the country. These activities will be implemented in five communes: Nkuli and Mukingo (lying in Zaire-Nile Divide and in Lava agroecological zones) and Butaro, Cyeru and Nyamugali (covering the Buberuka Highlands agroecological zone). These 5 commumes cover 577.5 square kilometers (not including the area minus area in lakes and the park), with an average population density of 351 persons/km^2. In this area, slopes are steep in some areas more than 60%), the soils are shallow and erosion-prone (with little cohesion and low infiltration rates). Due to the population pressure, agricultural activities have been also expanded into inappropriate zones, with the consequence that land slippage and landslides occur often. This site presents the most appropriate characteristics for interventions of the NRM project.

6. Management Structure

The activities of agroforestry and soil conservation component financed by this project will be implemented by MINAGRI's staff, with technical assistance provided by a US. PVO under a cooperative agreement. MINAGRI's staff and the PVO representative will constitute a team specialized in soil conservation and agroforestry, acting as an independent unit within MINAGRI and will be based in the town of Ruhengeri. This team will be managed by an Ao-level agronome and will work closely with local prefecture and commune authorities.

In terms of extension activities, the project will help to create or consolidate nurseries and agroforestry and soil conservation nurseries and demonstration centers. The nurseries at the sector level will be the responsibility of the commune with technical assistance from the project. The demonstration centers will be the responsibility of the project, with the inputs and contributions from local population.

ANNEX E - NATURAL FOREST MANAGEMENT

I. Introduction

Rwanda shelters a wide variety of plant and animal species due to the combination of a large range of topographic, edaphic and climatic characteristics, which produce a significant diversity of habitat types within a small area. A country of only 26,338 km^2, Rwanda supports mid-altitude afromontane forests, steep hills punctuated by lush valleys, rolling wooded savanna, dry and periodically flooded grassland plains, extensive wetland systems. Included in the rich assemblage of species resident in these different biotopes are a significant number of rare and endangered forms, as well as many species endemic to the Albertine Rift alone.

The afromontane forests of Rwanda represent part of regional zone of exceptionally high endemism, which extends into Burundi, southwest Uganda and adjacent Zaire. This area is second only to Madagascar in species unique to the "old world," according to IUCN's conservation data base.

The remaining ungazetted natural forests, savanna, National Parks and Forest Reserves are equally essential for the well-being of its human population. These areas provide vital ecological services, such as watershed protection, hydrological regulation, and erosion control. Many of these services have an impact throughout the country and internationally. Furthermore, these sites are focal points for international tourism, and thus attract more than $2.5 million of precious foreign exchange annually. Finally, Rwandans are showing more and more interest in recreational aspects of nature and wild areas, as evidenced by their increased visitation rates.

Despite the evident importance of the Afromontane forests, and of the flora and fauna they contain, to the long term welfare of Rwanda, it is clear that their long-term viability is seriously threatened. In fact, there are sobering indications that it will be difficult to do more than slow down erosion of biological diversity given the size of remaining physical assets and associated wild flora and fauna population trends. The cost of reversal of these trends is probably prohibitively expensive and to some extent not technically feasible (1).

Rwanda lacks both financial resources and expertise to plan or implement multiple-use management programs of these areas. Nevertheless, there is increasing evidence of GOR commitment to conserving these forests. This suggests that increased donor support at this time would be effective in generating further commitment from the Government and, ultimately, its gradual absorption of financial and managerial responsibility for the conservation of these resources.

(1) Results from enrichment plantings in Nyungwe forest suggest some key fauna species upon which plant regeneration depends are no longer available in adequate numbers. Similar results from the Kibale Forest in Uganda indicate that very expensive enrichment plantings are required to actually improve biological diversity in Rwanda's forests.

To better manage and protect the two most important afromontane forests in Rwanda, the Park National des Volcans (PNV), and the Nyungwe National Forest (NNF), this project will provide $1.23 million to the GOR, over the next five years to support on-going efforts by the "Office Rwandais du Tourisme et des Parcs Nationaux (ORTPN)" and the Director General des Forêts (DGF) of the Ministry of Agriculture.

Funding of these activities would allow for: (1) the development of a larger information base concerning the forests and their dynamics; (2) a vital increase in Rwandan participation in conservation activities, via education, training, and policy dialogue; and (3) the active encouragement of additional economic benefits to local people surrounding the protected areas as well as to the nation in the form of foreign exchange generated by tourism.

Implementation of this component will be through Cooperative Agreements with the three PVOs which currently have on-going programs in these forests: - The African Wildlife Foundation (AWF), the Digit Fund (DF) and the Wildlife Conservation International (WCI - a division of New york Zoological Society). These PVOs will, in turn work through ORTPN and the Director General des Forêts (the Chief Manager of forest reserves).

The following analysis sets the institutional, technical and analytic framework for the Natural Resources Management Project's interventions, within the domain of biological diversity conservation. The analysis describes the specific interventions as well as reviews of the political and institutional environment within which activities will occur. An implementation structure is suggested and preliminary budgets for various ventures are furnished. Finally, minutes from a USAID-sponsored workshop held for project design purposes are appended.

II. Resource Description and Prioritization of Interventions

This section summarizes the limited quantifiable data available as to the value and production of Rwanda's natural forests and briefly describes the attributes of the major forests targeted for intervention. Finally, this section discusses the biological integrity of each area and the problems facing the limited number of technical staff.

A. Biological Diversity and Rwanda

The conservation of biological diversity means the maintenance of viable populations of all plant and animal species occurring in Rwanda. This includes ex-situ conservation, e.g. propagation of rare animals in zoos, collection of germ plasm for economically important plant species, but more typically it refers to in-situ conservation. The reasons cited for the conservation of biological diversity are varied, but perhaps the most frequent is its potential to yield future benefits, presently unrecognized, such as a source of economically important agricultural or medicinal products.

However, biodiversity is often erroneously linked exclusively with protected areas and endangered flora and fauna. In the context of Rwanda, it should also include the protection of remaining dryland and gallery forests throughout the country, as these areas provide a wide variety of plant and animal materials as well as serve as regulators of local and regional hydrology.

In even more practical terms, biological diversity contributes directly to agricultural productivity throughout the country. By planting different types and varieties of crops and trees, and by raising livestock, the farmer increases his farm level stability and thus uses biological diversity as a commun risk oversion strategy to increase his productivity. Forest commodities such as tutor poles for beans and tool handles are indispensable for farming. In addition large indigenous trees provide anchorage for hanging bee hives and the crucibles for valuable beer brewing and crop storage. Lastly, the use of traditional medicines derived from the forests probably supports agricultural production through reduced employee absenteeism.

B. Afromontane Forests

Montane forests (forests above 2,000 m. in altitude) cover a very small area of the African continent, being represented by, more or less, isolated "islands" of vegetation. Examples include Mt. Nimba (Liberia/Guinea/Cote d'Ivoire) and Mt. Cameroon in the West, the Ethiopian highlands in the north, Mts. Kenya, Elgon and Kilimanjaro in the east, and the mountains of the Southern Cape. The communities of animals and plants that these forests support are sufficiently different from those of the lower areas surrounding them, and are sufficiently similar among themselves, that they form together a distinct bio-geographic region - the Afromontane Zone (White, 1987). Of an estimated 4,000 plant species recognized from this region, about 75% are endemic. The montane forests of the western Rift Valley, of which those of Rwanda are part, are among the richest and most diverse in the Afromontane region.

1. Volcanoes National Park

The Volcanoes National Park and Biosphere Reserve is well known for the success in conserving its population of threatened Mountain Gorillas. Recently, tourism was Rwanda's fourth-largest source of income (estimated at over two million dollars per year). With the decline in prices of coffee, tea and tin, some of Rwanda's main exports in the past, tourism is likely to play an even more important role in foreign exchange generation. Park National des Volcans contains the only land above 3,000 m in Rwanda and thus is host to some unique vegetation communities. Park National des Volcans also represents 25% of the total park area in Rwanda. It has a subalpine zone below 4,000 m characterized by giant heathers, lobelias and groundsels, and a alpine zone above 4,000 m, dominated by mosses and grasses.

2. Gishwati and Mukura

The forests of Gishwati and Mukura are very similar in the types of natural forest they contain. Both are situated at the same altitude, 2,000 - 3,000 m. However, only 5,000 of Gishwati's approximately 27,000 ha remains in primary forest with another 8,000 ha of degraded forest in the northern military zone. Almost 5,000 ha has been converted to either pine plantation or pasture by a World Bank-sponsored silvopastoral project. In terms of biological diversity, Mukura is more impoverished than Gishwati. It should be noted that decreasing forest size causes a reduction in biological diversity above and beyond any decrease in the variety of microhabitats available.

3. Nyungwe Forest Reserve

Nyungwe Forest, with an area of 97,000 ha, contains the greatest variety of forest types of any of Rwanda's forests and it contains the only montane forest below 2,000 m (although this accounts for less than 20% of the area). This diversity of forest types is not just a result of altitudinal variation, but also of differences in local topography, humidity, biological characteristics of various plant species, and especially because of striking geological differences between the eastern and western sectors within Nyungwe. The former derives from a granite bedrock while the latter is of quartz origin. Thus, the eastern sector has poorer soils and poor drainage with swamps forming in the valleys, while the western sector possesses richer soils and consequently a more luxuriant vegetation. The better soil has resulted in a higher human population density on the western edge (augmented by immigrants from the eastern side) putting much more pressure on that part of the forest. Unfortunately this area includes the zone below 2,000 m. containing species unrepresented elsewhere in the country.

C. Eastern Savannas

Rwanda's eastern savannas are contiguous to similar biotopes in Tanzania, southeastern Uganda and parts of Kenya. However they are unique in several aspects.

1. Akagera National Park

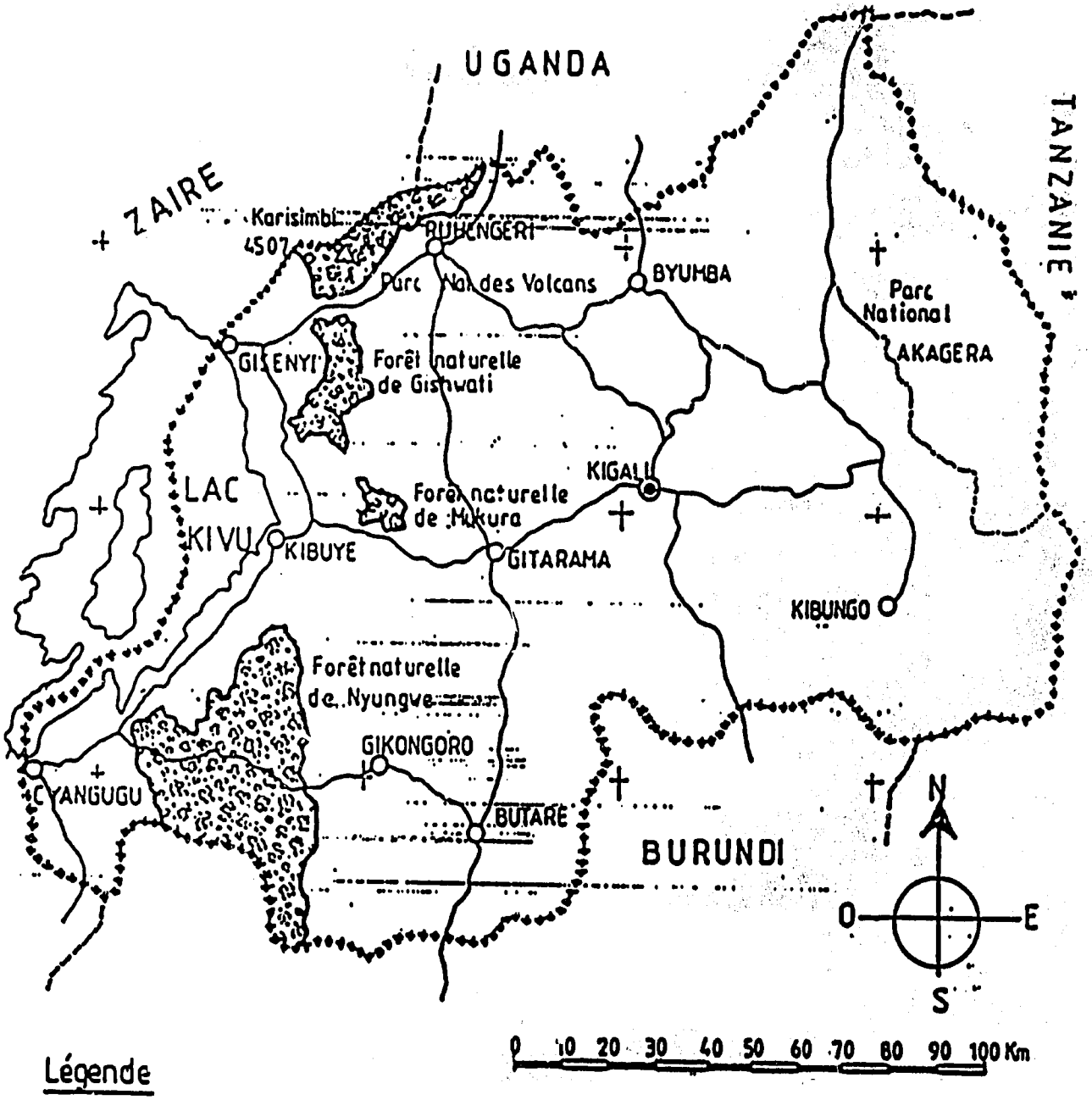
Akagera National Park holds the greatest diversity of plants and animals in the country by virtue of its mix of habitats. On a regional scale, however, Akagera is less important than the montane forests since much of its fauna and flora is widespread throughout the region.

Some species are widespread but sparsely distributed because of their restriction to swamps, e.g., sitatunga and shoebill stork, while others are essentially restricted, primarily in papyrus swamps, to the west Lake Victoria basin. Some of these species occur widely throughout Rwanda but are only protected in the park.

Poor soils and the prevalence of tsetse flies make akagera National Park a less optimal habitat for agriculture, but settlement occurs right up to the edge of the hunting zone and there is increasing pressure for land and firewood. CARE International's Gituza Forestry Project has begun construction of a wooded buffer strip along the park boundary to better define it, as well as keep animals away from crops, and to provide firewood.

Substantial areas of wooded savanna and dry forest existed until recent times, in the Bugesera region, but the resettlement in this area and the subsequent development of the charcoal industry has destroyed all but small remnants of the natural vegetation. ORTPN is currently attempting to carryout an inventory of these vestigial islands of natural vegetation.

Figure 1. Natural Forests of Rwanda.



Légende

———Limites d'Etat

Parcs/Forêts naturelles

———Routes principales

o Chef-lieu de Préfecture.

source: DGF 1984a

2. Gallery Forests

Gallery forests are scattered throughout the country in valley bottoms, surrounding hillside ravines and bordering wetland systems. These forests are generally very small, with very few larger than three hectares in size (Guye pers. commun.). In an unpublished report submitted to USAID (1987), Mr. N. Monfort identifies one remaining relic as being of interest. It contains a rich and rare assemblage of plant species -- including medicinal species -- originating from at least three of the major biogeographic zones which overlap in Rwanda. Although little is known about its faunal residents, some of the rare species include many types of butterflies. This gallery forest is being cut-over and opened up, and may not exist by the time this project begins.

No figures exist as to the total area represented by these forests, nor even their locations. It is clear, however, that cutting of these forests has accelerated tremendously in recent years, and most found on the latest aerial photos (1978-80), no longer exist or are badly degraded. Gallery forests are not specifically mentioned in the recently passed Forest Code as priority areas. Nonetheless it is expected that the agroforestry/soil conservation component will take these important assets into account during the development of the proposed Communal Forest Management Plans.

D. Problems to be Addressed

A review of the major problems and constraints affecting the maintenance of biological diversity, yields a better understanding of remedial and planning actions needed.

Although VNP and NFR have protected status there has been much exploitation and degradation of the areas. Between 1958 and 1979, 17,000 ha. (15% of original total) of Nyungwe disappeared. In Park National des Volcans, there has been a 54% reduction in thirty years (during which time it has always been classed as National Park) including the loss of 17,000 ha. (half the area) between 1969 and 1979 to agricultural colonization and the establishment of pyrethrum plantations in a project financed through ough the European Community Funds.

In addition to this loss of forest, there are several other activities affecting the forests. These include:

1. The illegal extraction of wood

In addition to fuelwood there has been much "skimming" of the most valuable timber trees to satisfy local demand for construction and other needs. This exploitation has covered all of Gishwati and Mukura and the northern and western sectors of Nyungwe, especially around the borders and along paths and water courses.

2. Fire

The cutting of wood for construction is often followed by the burning of branches and dead trunks which are not exploited. In addition occasional agriculture in the forests sometimes results in fires during the dry season. On one occasion, an accidental fire burned hundreds of hectares on Mt. Muhabura, in Park National des Volcans.

3. Mineral Exploitation

Mineral exploitation is being undertaken in all of the forests. In Mukura and Gishwati it has been mainly for cassiterite, and in Nyungwe it has been for gold. Some 4 - 6,000 gold miners work in Nyungwe along practically all the streams of the western sector (Vedder pers. comm.).

4. Livestock

Traditionally, local pastoralists have grazed their livestock in the forests of Virunga and Gishwati. With the advent of intensive cultivation in Rwanda, these animals remained in the forest clearings and bamboo zones. Since 1979 they have been forced out of the Virungas and are now concentrated in Gishwati with some apparently found in the Nyungwe as well. If the forests remain unprotected and unsupervised, an increase of livestock would threaten virgin forests areas.

5. Poaching

Poaching occurs in all of the montane forests. Some is subsistence hunting (for small antelope, wild pigs, etc.), but some is for the larger and more valuable animals as the market for ivory, animal skins and baby primates is easily accessible through traditional channels in Bukavu and Goma (Zaire), Gisenyi and Bujumbura.

6. Roads

The recently-paved road from Butare to Cyangugu inevitably resulted in some deforestation and erosion in Nyungwe, and in dumping excavated soil on steep slopes and in streams. Some rich forest has also been recently lost to a planned road between Pindura and the forest boundary in the northwest.

E. Selection and Prioritization of Geographic Areas

Financial resources available for the conservation of biological diversity within this project; demand that the geographic areas and interventions receiving support be prioritized.

Given the project purpose and goal it is possible to construct a set of objective criteria which can be used to site proposed interventions. These criteria were accepted by the Akagera Working Group (annex A) and led to similar geographic priorities.

1. Criteria for Selection of Geographic Focus

Table 1 presents the ranking of ranking Rwanda's ecological zones in terms of priority for NRM Project intervention.

Table 1: Criteria for Selection of Geographic Focus

AREA RANKING (3)

	CRITERIA FOR SELECTION		
	AMF*	ES	G/M
(1) Importance of the area to Rwanda:			
(a) ecological services provided	3	3	3
(b) economic importance to the nation	3	2	1
(c) local economic/subsistence value	3	3	2
(d) source of plasm for planting	3	2	3
(e) cultural, historical or recreational value.	3	3	1
(2) Biological attributes of the region:			
(a) rare and endangered species resident	3	2	2
(b) long-term viability of those species	3	2	1
(c) degree of endemism in plant/animal communities	3	1	2
(d) richness of the community (number of species)	3	3	1
(e) exclusivity on biologic representation	3	1	1
(3) Likelihood of positive impact of USAID intervention:			
(a) interest and commitment by GOR	3	3	1
(b) future conservation not yet assured	3	2	3
(c) insufficient donor input at present	3	2	3
(d) historical precedent of US PVO involvement	3	1	1
Averages	3.0	2.1	1.8

(3) * AMF=Afromontane Forests ES=Eastern Savannas G/M=Gallery forest/marais

2. Nyungwe Forest Reserve and Volcano National Park

Given the above criteria and ranking the afromontane forests of Rwanda are the most likely sites for USAID-sponsored activities. The importance of these forests to Rwanda cannot be overstated, particularly as upper watershed catchment areas and their consequent impact on controlling downstream water availability, water quality, erosion, siltation, dam life and operation, etc. These ecological services are vital to the country's quality of life as well as to the economy. Local farmers are dependent on products originating from these areas as well as the climatologic benefits accruing from forest cover. Finally, it is the gorillas of the Virunga region which are the drawing card for international tourism.

These forests show a higher degree of biological value than other wildlands of Rwanda in nearly all respects: they harbor rarer and more endangered species, they are centers of high endemism, and forests of this kind are significantly underrepresented in protected areas of the world. They are perhaps more important for the information presently unavailable, thus suggesting that the opportunity costs of continued undermanagement could lead to grave and unforeseeable consequences.

Finally, all criteria for likelihood of success lead one to select the afromontane forests as intervention sites. The national government, and especially the President, have repeatedly declared an interest in protecting the parks and the natural forests of Gishwati and Nyungwe. The Office Rwandais du Tourisme et des Parcs Nationaux (ORTPN) has historically initiated activities only in the national parks, but is now beginning operations in Gishwati and Nyungwe Forests as well. ORTPN has demonstrated a commitment by agreeing to hire additional high-level personnel for both of the national parks and the Nyungwe Forest.

Although the future conservation of the two national parks is close to assured if current efforts continue, that of the forest reserves is not. More than half of Gishwati Forest has already been cleared for a major donor/governmental project, and the management of Nyungwe Forest is yet to be determined. U.S. PVO conservation activities are taking place in both the Parc National des Volcans (PNV) and Nyungwe Forest, but their current or projected funding levels limit their effectiveness. Akagera National Park conservation activities are already being assisted by a major WWF-Belgium project, funded by the Belgian foreign aid program.

Within the context of the proposed NRM project, the two forests (Nyungwe and Park National des Volcans) should be seen as complimentary management units which can support each other through the research, staff and tourism development, and improved management. Efforts to date in the two areas have been parallel, based on the same principles, and would thus tie together very nicely. Collaboration on research, educational activities, training, and encouragement of local economic spinoffs of tourism would be more easily managed together than apart, and would provide coherent arguments and programs for conservation in the country as a whole. Furthermore, coordination between the two areas has the potential for very direct, practical synergistic effects: e.g., development of tourism in Nyungwe must depend on tourists being drawn to Rwanda by the gorillas of the PNV. However, Nyungwe tourism can serve as an escape valve for tourism pressure building in the PNV, which otherwise might inflict damage on the gorillas or the forest.

Finally, the differences in management options between the two areas complement each other. Nature conservation in Rwanda, a country with great needs for human development, cannot be predicated solely on a western-style interest in species' protection or on tourism, the basic philosophy behind national parks. It needs also to be demonstrated that those interested in conservation are interested in, and willing, to allow multiple use of valuable biological resources, as is planned for Nyungwe. On the other hand, true biological conservation in Nyungwe Forest would have little chance of success against the forces of traditional development if there were no high-profile project, such as the protection of gorillas, succeeding at its side.

III. Recommended Actions

Short concept papers were submitted by the the Nyungwe Forest Conservation Project, Mountain Gorilla Project and the Karisoke Research Center for discussion during the December 1-2, 1988 workshop on NRM project design. During the deliberations, the discussion groups identified specific programs required to improve management capability and reduce external pressure on remaining forest through training, applied research, formal and informal education and tourism development. Previous experience, critical need, endemism and endangered species presence, and potential for significant and positive impact focussed the discussion on the Albertine (Zaire-Nile) Rift as the most likely candidates. Discussion further converged on the Nyungwe Forest Reserve and volcano National Park as government and NGO priorities. No objection to the choice of these two areas for USAID-sponsored interventions was raised. Many of the suggested priorities, not surprisingly, afforded considerable overlap.

A. Prescribed Interventions

Four priority areas for intervention have been identified through discussions with GOR counterparts, NGO representatives, and USAID-supported consultants. Required emphasis on each of the four action varies with different geographical areas and the traditional charters of the NGO's and GOR agencies involved:

(1) Technical and Managerial Staff Development

(2) Applied Research Program development

(3) Conservation Education

(4) Operational support and facility construction

Although the Akagera meeting was unable to agree entirely on the prioritization of these possible interventions there was no question as to whether any of the elements could be left out. The activities are all complementary and synergy between actions as well as support from other project components (aquaculture/marais management and agroforestry/soil conservation) is an explicit goal and should be monitored accordingly.

1. Technical and Managerial Staff Development

A lack of qualified and practiced professionals is the primary constraint to the improved and sustainable management of both the Parc National des Volcans and the Nyungwe Forest Reserve. To address this need, the project will support:

(a) The development of a cadre of Rwandan scientists cable of designing and implementing applied research;

(b) Increasing the number and quality of staff charged with park/reserve management, including financial and personnel managers and middle-level technicians responsible for supervisory field functions. Degree training at the Mweka Wildlife College in Tanzania, or the Garoua Wildlife Center in Cameroon, is seen as a cost effective alternative to long-term training in the U.S. (annual costs for these schools is approximately $5,000, as opposed to $25,000 for attending a European or American program).

(c) Training of guards and guides to improve their interpretive and language skills.

(d) Formalized training aimed at community leaders and educators, including Commune and Prefectoral authorities, and primary and secondary school teachers.

Under the project, approximately $224,000 in USAID funds will be set aside for training ($84,000 for Nyungwe Forest Program staff; $90,000 for staff of the Mountain Gorilla Program; and $55,000 for staff of the Karisoke Research Center).

2. Applied Research

In order to better manage and conserve the natural forests of Rwanda, additional research on the physical, biological, and social environment of the two forests is critical. The knowledge base on existing conditions and trends within the forests is incommensurate with development of effective management decisions. Furthermore, the impact of local needs and interests on the forest is poorly understood. To address this need, the NRMP will provide grants to expand and diversify the research by the Karisoke Research Center and the Conservation of Nyungwe Forest Project. This research would be done in collaboration with Rwandan researchers. The highest priority for applied research would be accorded to:

(a) Biological Research. This would include inventories of the flora and fauna within the Parc des Volcans and Nyungwe Forest. These inventories would emphasize not only current status and trends, but also the potential of, and constraints to, increased use of forest products, and the potential and impact of tourism development on the flora and fauna in both areas;

(b) Physical Research. A serious study of the hydrological and climatological impacts of the Parc des Volcans and Nyungwe forest is required, particularly a quantification of the value of these forests as watersheds. In addition, much more work needs to be done on the distribution of soils in the forests, geologic formations, and topography.

(c) Socio-economic Research. The conservation and preservation of these forest areas has an adverse impact on local populations which, in the past, have exploited the forest to meet traditional needs (e.g. hunting, and bamboo and wood harvesting), and also constrains the expansion of agriculture in these heavily populated areas. If the park/reserve is to survive, the needs of the local population must be met, either directly or indirectly. This suggests the need for studies that would examine the interaction between the forests and the local population; estimate the impact, potential for growth, and sustainability of the local use of forest resources; and identify local needs and interests which must be met through alternative sources and projects. Similarly, an analysis of the practicality of a revolving fund to compensate farmers for animal damage to crops and other property, and to support small local development projects, would also be of great value. Other worth while research would include a study on the market potential of tourism, and an analysis of the infrastructure required by, and recurrent cost burdens associated with, tourism development.

With respect to Nyungwe Forest Reserve, in particular, this research should lead to the development of a sustained-yield, multiple-use management plan.

The above studies are indicative. Detailed research plans will be developed within the context of a "Plan Directeur de Recherche". It is suggested that a working group made up of representatives of ISAR, UNR, DGF, ORTPN, USAID, and the involved PVOs be established to prioritize research needs, to coordinate research efforts among the various institutions, and to rapidly disseminate research findings. This working group would review and approve research proposals before they received project funding.

Under the proposed project, a total of $150,000 in USAID funds will be provided to the Karisoke Research Center for research related to the Parc des Volcans, and another $125,000 will go to the Conservation of Nyungwe Forest Program for research related to Nyungwe. Given the limited amount of funding available, research proposals should combine NRMP financing with funding from other sources.

3. Conservation Education

There is evidence that the ten-year old conservation education program of the Mountain Gorilla Project has led, at least in part, to a more favorable perception of the environmental and economic importance of the Parc des Volcans by the surrounding communities. The NRM Project will finance an expansion of this program, and will support efforts already underway, through the AID/W-funded Conservation of Nyungwe Forest Reserve Project, to develop a similar program for Nyungwe Forest.

Under the conservation education program, expatriate and Rwandan experts on the forests will visit local communities and schools to explain the importance of these forests to the local population and to the nation as a whole. In particular, the NRMP will finance:

(a) The costs of preparing audio-visual materials and travelling displays that can be placed at schools and communal headquarters; curriculums and teacher training packages; and interpretive materials (e.g. park brochures and maps) that can be given or sold to visitors to the parks;

(b) The operating costs of a community outreach program directed at farmers, local community leaders, students, teachers, extension service personnel, and government officials. Such a program would involve both community visits by project staff and field trips by members of the local community to the park; and

(c) The operating costs of vocational training seminars and field trips for extension agents, foresters, wildlife managers, and university students, and so forth.

Under the NRM Project, USAID will finance conservation education short courses and materials development (a total of $75,000) for the Mountain Gorilla Project. NRM Project efforts in Nyungwe in terms of conservation education, will be more indirect. However, the construction of an interpretive center, plus vehicle procurement (see below) will complement the efforts already underway under the WCI grant. The GOR contribution to this component of the NRM Project will include two Rwandan technicians for the Nyungwe Forest Project (one in conservation education and the other in forest utilization) and two technicians for the Mountain Gorilla Project (in conservation education).

4. Operational Support and Facility Construction

The project will provide funds to improve the management of the Parc National des Volcans and the Nyungwe National Forest. Apart from increased training, as mentioned above, the project will provide for administrative support, vehicles and operating costs, office supplies and equipment.

The Rwandan contribution to the project will include the salaries of administrative personnel, tourist guides, guards, and equipment (e.g. uniforms), and the local costs incurred by ISAR and UNR researchers. In addition, the GOR contribution to the Nyungwe Forest component of the project will include the construction of project staff housing (three units), with an estimated value of $80,000. These units will house the conservator and two Rwandan technicians.

The project will also finance the development of interpretive centers at both Nyungwe and the Parc des Volcans. These centers will not only play a vital role in the conservation education program, but will provide a focus for tourism at both locations. Approximately, $50,000 will be provided to the Mountain Gorilla Project to construct an interpretive center (the remaining construction costs will be met by the MGP and the GOR). The project will also finance the procurement of audio-visual materials ($30,000), exhibiting materials and equipment ($30,000), and the costs of Rwandan personnel to staff the center in its initial years ($40,000). The GOR will contribute the land needed for this center to the project.

Another $50,000 will be used to construct a second interpretive center in the Nyungwe Forest, together with $20,000 for furnishings and exhibiting materials. Discussions are underway with other donors working in the Nyungwe Forest (particularly the French) in order to combine their financial resources in order to construct this center. The GOR will provide the land needed for this center. As noted above, USAID is already funding, under a bilateral project, the rehabilitation of structures at the Karisoke Research Center.

Implementation by Organization

Initiative	NFCP	MGP	KRC
1. Technical $ Management Staff Development		X	X
2. Applied Research Implementation	X		X
3. Conservation Education	X	X	
4. Operational Support & Facility Construction	X	X	X

B. Implementation Plan

The budgets presented below are subject to changes and ratification by the GOR. They are, however, considered to accurately reflect the needs of the organizations involved. New York Zoological Society (WCI), the African Wildlife Foundation, and World Wildlife Fund-US (sponsors for the MGP) are USAID-registered PVOs. The Mission will need to verify KRC's sponsoring affiliates for appropriate registration prior to grant approval.

1. Institutional Structure

Much of the emphasis on the natural forest management component originates with USAID policy and legislation promulgated by the U.S. Congress. The component was absent from the original Project Identification Document (PID) and was subsequently affixed during USAID/Washington's review (see State '88 160833). While the component indirectly supports the overall project goal and purpose it adds a distinct and third operational direction for project implementation.

Due to the disparate nature of this component, assuring that it is integrated into the other two components and does not become a thematic orphan will oblige the Mission and Technical Coordinator to fold the three sub-project Directors (Clausen, Shalley and Goodall or their designees) into the Technical Committee. This will be accomplished by assuring their attendance at quarterly meetings, periodic monitoring visits, inclusion on all report distribution mailing lists, and use of short-term technical assistance in identifying areas of direct collaboration.

Each NGO will sign a Memorandum of Understanding prior to fund disbursement with the lead technical agency(s). In the case of the Nyungwe project it appears that a tripartite MOU may be required with ORTPN and MINAGRI/DGF as lead institutions. Given ORTPN's more evident responsibilities in VNP, the MPG and KRC may wish to initiate more simplified agreements accordingly. In all cases all research conducted under the component will be affiliated directly with ISAR through the "Plan Directeur de Recherche" as described above.

The MOU's will clearly outline the technical, managerial and financial relationships and completely describe financial, personnel and in-kind support expected from each participant. In addition the MOU's should define the type and membership of Management Committee to be established under the sub-projects including frequency of meetings, chairpersonship, and exact functions. These "Comite de Gestion" will be established between NGOs, MINAGRI and Communal authorities in the other components but will need to take this inter-DGF-ORTPN-NGO form in this component.

2. Work Plans and Budgets

A provisional work Life-of-Project (LOP) workplan will be prepared by each participating organization upon signing of the grant. Annual work plans will be submitted by each NGO/GOR consortia to the Technical Team Leader at MINAGRI for his/her review and submission to the Management Committee and AID/Rwanda. Work plans should be submitted at least one month prior to the beginning of AID's fiscal year. A complete financial plan should be submitted upon the signing of the grant and detailed budgets will be required on an annual basis. The AID/Rwanda Agriculture Development Officer or his designee will be required to review and approve such budgets.

3. Substantial Involvement

As the grant instrument will be a Cooperative Agreement it is expected that the Technical Team Leader and USAID will have substantial involvement during the implementation of work supported through these grants. AID retains the right to review the qualifications and to approve assignment of short-term consultants and staffing changes which may effect project implementation.

4. Counterpart Support

A recurring constraint to effective project hand-over at completion is the inadequate consideration of recurrent cost burdens during design and early implementation. Post-project infrastructure maintenance, personnel and operating costs, and additional training must be contemplated now.

The development of the National Forestry Fund, lodged within the recently passed Forest Code, establishes a precedent for financial autonomy of certain aspects of the DGF's operations. Through collection of stumpage taxes and seedling sales, the Fund provides for a streamlined procedure for allowing reinvestment into certain activities. The revolving fund will be established in a special account at the Banque National du Rwanda with periodic reporting to the Ministry of Finance. Many alternatives for the use of this fund will be available to the NFRP project. Nonetheless WCI will be required to illustrate in its operation plan (below) and its MOU the phasing over of recurrent costs to the GOR.

Although substantial revenues from tourism originate in the PNV, there is evidently a disproportionatly low reinvestment into salaries and infrastructure development and maintenance. ORTPN must understand from the outset that its share of operating and development costs must increase with a proportional decline in financial responsibility on the part of USAID. A financial plan to this effect will be required prior to fund disbursement. Implementing NGOs will be required to provide a minimum of 25% of total costs through personnel salaries, equipment purchases or operating costs. It will be up to the implementing NGO to leverage the maximum participation from its GOR counterpart but at a minimum these agencies should be requested to cover 10% of total costs. Preliminary estimates are included in the budgets below.

IV. Institutional Context for Component Implementation

The diversity of specific legislation concerning management and conservation of Rwanda's natural areas is as varied as is actual the number of agencies responsible for one or more aspects of this component's implementation. As such, the most important aspects are worth noting. A functional overview of pertinent institutions is found within the Institutional Analysis and a listing of laws specific to the biodiversity is included below.

A. Relationship with other projects and U.S. Policy

The USAID Mission in Rwanda has one of the most pro-conservation records within the Africa Bureau. In addition to several projects supporting sustainable agriculture, the Mission has directly fostered natural resource development in forestry, agroforestry, soil conservation and wetland management. Projects on-going or recently completed by USAID in this regard include:

PROJECT TITLE	PACD	LOP FUNDING
Farming Systems Improvement Project	09/92	$13,000,000
Ruhengeri Resource Analysis and Mapping Project	06/88	1,420,837
Gituza Forestry Project	07/89	2,500,000
Communal Afforestation	09/87	500,000
Africare Refugee Resettlement Project	09/87	4,409,670

This impressive track record has earned USAID/Rwanda status as a Group I country under the Agencies natural resources strategy embodied in the "Plan for Supporting Natural Resources in Sub-Saharan Africa" and as supported financially through Mission resources and the "Natural Resources Management Support Project" (NRMS, no. 698-0467).

The conservation of biological diversity through improved natural forest management responds directly to USAID and American Congress mandates for sustained development founded on a renewable resources base. Sections 118 and 119 of the Foreign Assistance Act (revised) require that USAID take into account the tropical forest management and the maintenance of biological diversity through all means at the agency's disposition. Life of project funding ($7.7 million) contributes directly to the congressional earmark of 10% of the Agencies development Assistance earmark for natural resources.

B. Present and Future Legislation

Natural resources legislation in Rwanda is presently undergoing a series of dynamic changes. Only recent legislation which immediately affects the management of natural forests and protected areas is discussed below. The reader is referred to the Institutional Analysis for a comprehensive review of comprehensive natural resource legislation. A listing of all legislation germain to natural forest management follows.

1. New Legislation - Forestry Code

A long-awaited, major revision of the Forestry Code was passed in late November and is expected to be shortly passed through the judiciary and immediately promulgated through Presidential decree. Important changes which affect natural forest management include:

(a) Article 6. Protection of flora and fauna in all "domain forestier de l'etat" (state-held forest land) now falls within MINAGRI's Direction General des Forets (DGF). The status of management of flora and fauna in Forest Reserves presumably is included while it is assumed the Office of Tourism and National Parks maintains authority over VNP;

(b) Article 31. Recognition of prescribed consumptive use of State-held Forests and Forest Reserves (Nyungwe) including fruits, medicinal plants, vines, flowers, bamboo, honey collection, hunting and other recreation;

(c) Article 32. Recognition of "Reserve Forestier Integral" which are areas under strict non-consumptive protection where no harvesting or human disturbance is sanctioned. This would seem to include the 40% of Nyungwe which will remain strict Forest Reserve although a Ministerial Decree will be required to firmly establish acceptable uses of the different zones under control of four projects supported by different donors;

(d) Article 34. Prescribes that areas preserved as mentioned above can only be revegetated using indigenous species of plants and animals;

1.5/6

(e) Articles 80-82. Creates the necessity for wood cutters and transporters to purchase and be in possession of cutting and transport permits respectively. If enforcement capability is provided this could have a significant impact on fraudulent forest cutting and illegal wood sales;

(f) Article 97. Establishes penalties for illegal grazing in State-held forests and permits confiscation and sale of offending livestock. This could positively impact upon the situation in Nyungwe if enforced.

Past and Present Legislation

Many laws impinge on the planning and management of natural forests and protected areas in Rwanda. With few exceptions, mentioned above, the laws are quite old but most often still functional. The primary statutes affecting proposed project activities include:

Legislation Relative to the Conservation of Biological Diversity

1915 Conservation and preservation of forest species

1930 Regulation of cutting and selling wood

1933 Establishment of the forest reserves of Nyungwe and Birunga (Volcanos)

1935 Establishment of a forest reserve on Wahu island

1951 Establishment of the forest reserves of Gishwati and Mukura

1953 Legislation on brush fires

1926 Ban on the destruction of palm trees

1934 Creation of Akagera National Park

1934 Establishment of limits of Albert (Volcanos) National Park

1938 Ban on hunting in Albert N.P.

1952 Establishment of hunting reserves in Kibungo

1974 Creation of the National Office of Tourism and National Parks (ORTPN)

1980 Creation of the National Office for the Development of the Mutara (OVAPAM)

1914 Pollution and contamination of water sources, lakes and water courses

1952 Protection of water sources, water tables, lakes and water courses

1978 Protection, conservation and improvement of pasture lands

2. Environmental Action Plan

Rwanda is in the process of developing a National Strategy for the Environment which will, theoretically, furnish a policy and institutional framework for the integration of environment and natural resources management. The strategy being used to derive the Action Plan prescribes several studies which are now beginning and are expected to culminate in a draft Plan sometime in 1989. To further strenghten the environmental oversight and planning, responsibility for the coordination of all environmental activities in Rwanda, has recently transferred to the Ministry of Plan. (This coordination was formerly vested in the Ministry of Health and Social Affairs). The NRM Project will finance one technical assistant adviser to set up and run the environmental coordination office in the Ministry of Plan. This adviser will not only serve as a focal point for national environmental coordination, but will have major input into the creation of environmental polify for Rwanda.

C. Policy and Planning Context

There is strong presidential support for maintaining the National Parks. The Mountain Gorilla Project and ORTPN formulated a detailed management plan in Sept. 1985 for the Volcanoes N.P. and put forward many recommendations including expanding the role of Karisoke research station and controlling animal damage outside the park. Animal damage is also a problem around Akagera National Park. ORTPN needs to work closely with the communes bordering the parks so that local people can benefit from them. Increased employment possibilities and indirect revenues from tourism have led to the development of a favored attitude locally, towards VNP, by, for example, compensation for animal damage, provision of firewood or even a direct revenue-sharing scheme. Although game ranching has been frequently discussed, ORTPN has not been supportive.

The Action Plan for the conservation and management of the montane forests (DGF 1984) recognizes the importance of these forests in watershed protection of streamflow, increasing the infiltration capacity of the soils and protection of the surrounding lands from aggravated soil erosion. It therefore advocates maintaining the forest cover, designating some areas as reserves (34% in total - 40,600 ha. in Nyungwe) and putting the rest (85,000 ha) under some form of sustainable production (figure 3). By 1990 the DGF expects to have completed a forest inventory, elaborated management plans and to have begun executing these plans in 14,000 ha. of forest.

Within the setting of the proposed management plan for Nyungwe priority activities include, an applied research program (including research on native species suitable for reforestation purposes and an inventory of medicinal plants), a forest inventory, buffer zone establishment and maintenance (9,000 ha. in total), silvicultural trials and infrastructure establishment (forest trials, building for forest guards and monitors).

The Action Plan calls for the forests to be divided up into management blocs. For Nyungwe four zones will be managed by the Swiss, FED, the FAC (France) and the World Bank. The latter has already commissioned an ecological survey and includes a natural resource monitoring and evaluation component as a critical feature. The World Bank also plans to provide a full-time Wildlife Ecologist to help in monitoring activities. The French plan to build a forest center in Nyungwe, to be used at least partly as a base for research. It is anticipated that this station will also serve as the interpretive center and a base for NRMP staff. Funds for additional buildings are incorporated in the present budgets.

D. Supporting Institutions

The major players in the management of NFR and VNP are:

1. Ministry of Agriculture - Directorate of Forestry (DGF)

The Directorate of Forests (DGF) has overall responsibility for the management of all State-held forest land and the protection of all wild flora and fauna. These lands are distinguished from National Parks and hunting areas operated by ORTPN (below) although the relationship between these to agencies becomes less clear within the Nyungwe where both have roles. The "Plan d'Action Pour la Conservation et l'Amenagement des Forets Naturelles de la Crete Zaire-Nil" (DGF 1984b) lays the framework for the development of a comprehensive management plan for all the three natural forests along the Albertine Rift. Nyungwe figures prominently in this Action Plan and even more so today as the other two forests (Mukura and Gishwati) have been greatly reduced since the Plans' publication.

The DGF is responsible for development of Nyungwe's Management Plan and coordinating all aspects of consumptive use and research. ORTPN's role is limited to tourism development, although the agency will evidently be involved in research planning and implementation.

2. National Office for Tourism and National Parks (ORTPN)

ORTPN, lodged within the office of the President, manages the parks and is responsible for the protection of the flora and fauna within Rwanda's two National Parks and the Mutara Hunting Reserve. It is also responsible for the development and promotion of tourism in Rwanda and owns hotels, guest houses, and economy accommodations in many locations. ORTPN also organizes tourist visits to these parks and to see the gorillas.

Tourism responsibilities accounts for the vast majority of ORTPN's human and financial resources. Forty-six people are employed in park protection in the VNP for poaching patrols, boundary and trail clearing, and general surveillance. Another 25 guards act as natural interpreters and guides for tourists. An undetermined number of porters and support staff are also on call in the VNP.

The Mountain Gorilla Project, financed by a consortium of international wildlife groups, is concerned with the protection, promotion and habituation of the gorillas and has funded a sensitization campaign in the region around the park. The tourism and National park Service of the Belgian cooperation provides technical advice to ORTPN. It has also constructed an administrative center, a guest house and other accommodation at the edge of the park and provides logistic support and study grants.

3. Institute for Agriculture Research (ISAR)

The forestry division of ISAR has set up trials using native and exotic tree species in Nyungwe and at the Arboretum in Butare, and will play a critical role in the development of the montane forests. MINIMART is pursuing the rights to mineral concessions in the forests to organize the research and exploitation of minerals such as gold, cassiterite, wolfram and semi-precious stones.

4. National Institute for Scientific Research (INRS)

INRS supports the National Herbarium, containing 17,000 plant specimens. Other expatriates have contributed to an impressive body of knowledge on the flora and fauna of the country by assisting this organization. The extent of ecological research in Rwanda is very limited and INRS has not been greatly involved historically due to the small number of qualified researchers.

5. National University of Rwanda (UNR)

The Faculty of Sciences at UNR opened a zoology section in 1984 but the program is evidently academically oriented. However, ecology courses have recently been taught and this, together with study grants from ORTPN and various donor projects to work in the field, has encouraged some students to pursue more field-based studies. A curriculum leading to a B.Sc in Forestry is presently under design.

One student has been hired by ORTPN to direct the campaign promoting public awareness around VNP. Generally, these students are trained to teach in secondary schools. As such, field research is not always encouraged. In the case of graduates studying overseas, they may find themselves seconded to a ministry rather than being able to carry on further work in the field in which they were trained.

E. Present Management- Programs and Projects

Natural forest management is a very complex and still evolving field in Rwanda. Institutional responsibilities vary from one area to another due to personnel limitations and logical overlapping of administrative, managerial and enforcement accountability. In addition to critical personnel limitations, the present state of basic knowledge of the resource base and management options further reduces effectiveness. Clearly a vast amount of staff development and research will be required.

1. Adequacy of Information Base

Traditional forestry techniques will not suffice. Basic information on the ecology of native forest species (growth and regeneration rates, shade tolerance, seed production and germination etc.) is lacking. Baseline information needs to be collected on critical parameters such as streamflow rates and sediment load, the status of indicator and "keystone" species which characterize the health of the forest and perform key roles such as pollination and seed dispersal. Management techniques are going to have to be correspondingly varied. This research and training will take some time so increased emphasis also needs to be put on increasing the production of fast-growing tree species around the forest and perhaps in places, inside the forest (along for example).

2. Popular Participation of Local People

Many people living around the forests obtain multiple benefits from them, both direct, such as wood, forage for livestock and gold, and indirect, such as regular and clean water. Every effort must be made to include these people in the planning process, e.g. socioeconomic surveys must be undertaken to determine their needs and desires. For example, gold mining provides essential revenue for thousands of families around the forests. It is impossible to prohibit it (even in the reserves), even if this was desirable. However, the economy which has grown up around this industry clearing of the forest for short-term crops.

These activities can be, and need to be, regulated to minimize negative impacts on the forest. Similarly the cutting of wood, hunting, beekeeping and the collection of edible and medicinal plants are important activities for up to 20% of the population in certain areas. It is important to know the role of these activities in the local economy as well as their effect on the fauna and flora of the forests.

3. On-Going Projects In Biodiversity Conservation

The following list of on-going projects are actively encouraging the conservation of biological diversity through enhanced forest management. Several other projects are under consideration but their probable locations will either support or not interfere with the implementation of efforts described here.

LIST OF PROJECTS RELATING TO BIODIVERSITY IN NATURAL AREAS

Management Unit - Zone 1 of Nyungwe Forest
Description: Natural forest management and exploitation
Donor: Switzerland

Management Unit - Zone 2 of Nyungwe Forest
Description: Natural Forest management and exploitation
Donor: France (CCCE)

Projet Crete Zaire-Nil
Description: Natural forest management (Zone 3 of Nyungwe Forest). Communal forestry around natural forest
Donor: FED

Second Agro-sylvo-pastoral Project
Description: Natural forest management (Zone 4 of Nyungwe Forest and part of Gishwati Forest). Forestry-livestock development and applied agroforestry research and extension activites in Gishwati Forest.
Donor: World Bank

Mudosomwa Reforestation Project
Description: Reforestation (Buffer zone) in commune around Nyungwe Forest
Donor: Belgium

Nyungwe Forest Conservation Project
Description: Conservation of biological diversity in Nyungwe Forest. Includes research, conservation education and tourism development activities
Donor: New York Zoo. Society/USAID

Mountain Gorilla Project
Description: Protection of the Mountain Gorilla in Volcanoes National Park. Includes monitoring of the gorilla population, anti-poaching activities and a conservation education component around the park and elsewhere.
Donor: MGP Consortium headed by African Wildlife Foundation

Karisoke Research Center
Description: Research and training on the physical and biological aspects of Volcanoes N.P. (including the Mountain Gorilla)
Donor: Digit Fund (U.S.)

Ruhengeri Research Analysis and Management Project (RRAM)
Description: Live hedge around part of Volcanoes N.P. Watershed research and monitoring around Volcanoes N.P.
Donor: USAID (funding ended Oct. 1988)

Conservation and Management Project for Akagera N.P.
Description: Conservation of the flora and fauna of Akagera N.P. Includes monitoring of the fauna, anti-poaching activities and habitat management.
Donor: WWF (Belgium)

CARE-Gituza Forestry Project
Description: Buffer zone around part of Akagera N.P.
Donor: CARE/Rwanda (USAID/Holland)

In addition the component will benefit from similar work occuring elsewhere in the region. USAID-sponsored activities in Kibera National Park and Bururi Forest in Burundi can provide valuable insight to natural forest management techniques. Another USAID-sponsored project in the Impenetrable Forest in southwestern Uganda is also breaking new ground in conservation through development in many ways similar to the NRMP project. Finally a USAID/Washington effort to bring all these potential partners together for a workshop may lead to a much needed regional "Afromontane Conservation Network" project for more effective and efficient collaboration in information transmission, training and policy (national and inter-regional) development. As all these projects are proximate to one another some coordination would be very desireable if not essential.

ANNEX F: INSTITUTIONAL ANALYSIS

A. Introduction

This annex reviews the institutional context of the Natural Resources Management Project. It includes a brief description of the central and communal government structures, and research and training institutions, and outlines the ways they work together. This annex also outlines how the project will be structured so as to ensure adequate coordination.

More detailed discussions of these institutions are included elsewhere in this Project Paper. In particular, discussions of the Programme Pisciculture National, which will implement the fish culture component of the project is included in the Fish Culture Annex. A discussion of the Division Amenagement Hydro-agricole is contained in the Annex on Marais Research and Training. The Environmental Planning Annex contains more information on MINIPLAN and its environmental office. The implementation plan provides additional information on the project coordination structure.

B. Central Government Institutions

There are a number of ministries and other entities involved, either directly or indirectly, in the natural resources sector. Principal among them at the national level are MINIPLAN, MINAGRI, and ORTPN, the planned counterpart agencies for the NRM Project. In addition, both ISAR and UNR will be involved in the proposed project, through their research functions. Finally, the local communes play an important role in natural resources management, generally in collaboration with central ministries (e.g. by providing an extension function for new technologies). Each of these institutions will be discussed below.

The Ministère du Plan (MINIPLAN)

MINIPLAN is responsible for coordinating planning activities at the national level, the identification of pressing economic and financial problems, and the preparation of the "grandes orientations" for the National Plan. In theory, MINIPLAN is supposed to establish the conceptual underpinnings and broad outlines of the national plan, leaving it to the individual ministries to adapt them to their own sectoral needs. More important, MINIPLAN is responsible for preparing Rwanda's development or investment budget. In the past, MINIPLAN has not had a strong reputation or political clout. It was considered to be badly organized and to suffer from lack of both human and physical resources. This situation appears to be improving dramatically, due to changes in the leadership and mandate of MINIPLAN which were instituted during the February 1989 reorganization of the government.

As part of this reorganization, MINIPLAN was named the principal GOR institution responsible for environmental planning and policy. Prior to February 1989, no entity had a true mandate to coordinate national level environmental activities. The only agency with any kind of environmental mandate was the relatively low-level 'Office of the Environment' within MINISAPASO, the Ministry of Public Health and Social Affairs. Given its

institutional home, however, MINISAPASO's Office of Environment focused on health-related environmental issues. The broader issues of resource conservation were largely ignored. Nevertheless, since this office was the only one in the government with any kind of environmental mandate, it was selected to organize and sponsor the First National Seminar in the Environment in September 1985. Subsequently, it coordinated the World Bank-funded efforts to prepare a National Environmental Strategy and Environmental Action Plan.

With the ministerial reshuffle in February 1989, Social Affairs was split off from MINISAPASO (which became MINISANTE). At the same time, the responsibility for environmental coordination was transferred to the Ministry of Plan, as noted above. Responsibility for managing the National Environmental Strategy and Environmental Action Plan was also passed to MINIPLAN. It is generally felt that this move underscores the GOR's seriousness about broadly addressing the needs of the environmental sector.

At present, there is a temporary "environmental unit" within MINIPLAN which reports directly to the Minister of Plan. A more permanent institutional arrangement within MINIPLAN for the coordination and management of matters pertaining to the environment will be established after the completion of the National Environmental Strategy and the Environmental Action Plan later this year. Long-term technical assistance funded by the NRM Project would be located in this temporary unit and, ultimately, in the permanent environmental unit that replaces it.

The Ministère de l'Agriculture, de l'Elevage, et des Fôrets (MINAGRI)

MINAGRI is the ministry who's program affects, most broadly, the environment. The Natural Resources Management project will be directly involved with three of MINAGRI's four Directions-Générals.

The first is the Direction Général du Genie Rural et de la Conservation des Sols (Rural Engineering and Soil Conservation). The DGGR is composed of two Directions:

- The Direction of Soil Conservation, which is responsible for all aspects of erosion control, and will therefore be involved in the soil conservation and agroforestry activities of the NRM Project; and

- The Direction du Genie Rural, which is the institutional home to the Division d'Amenagement Hydro-agricole. This division is charged with monitoring marais development activities in the country. As such, it will be the counterpart agency for the marais research and training component of the NRM Project.

The NRM Project will also be directly involved with the Direction-Général of Forests (DGF). The DGF is responsible for forestry activities in the country, from strategic planning to the identification of appropriate species and techniques. The DGF is noteworthy for its relative depth in qualified personnel, including hundreds of foresters now working with projects in the field. Extensive international assistance has helped support the training of these cadres. The DGF will be involved in the soil conservation and agroforestry activities of the proposed project.

The third Direction Général involved in the project will be that of Livestock (l'Elevage), contains the Division de Peche et Pisciculture, the institutional home of the Programme Pisciculture Nationale (PPN). The NRM Project's fish culture activities will be implemented as part of that Programme.

The Institut des Sciences Agronomiques du Rwanda (ISAR)

ISAR is charged with carrying out agricultural research in Rwanda. ISAR's research activities are administratively organized into five departments: crop production, forestry and agro-forestry, rural studies and farming systems, animal production, and the laboratory. Crop production is the largest department and contains well over one-half the Institute's scientific capacity. The World Bank has assisted ISAR in upgrading its research facilities.

The overall research program of ISAR is very ambitious, given the relatively small staff available. In fact, ISAR's main problem at the moment is a serious lack of human resources. A mission from the World Bank and ISNAR estimated, in 1983, that ISAR needed 52 additional researchers at the A0 and A1 levels and 68 technicians at the A2 level in order to carry out its research goals. As a result of this manpower constraint, little research activity is currently underway in several key areas. Until recently, for instance, ISAR has no research program of selected forestry topics, such as harvesting and use of indigenous wood. Similarly, no Rwandan scientists are currently working specifically on wetland development.

Recently, however, the Institute has increased its commitment to applied research on agroforestry and erosion and seems intent on making a greater contribution in these areas. ISAR is the counterpart institution for the USAID-funded Farming Systems Research Project. As such, it is the directly responsible for the agroforestry and soil conservation work being undertaken by that project. Under the NRM Project, ISAR will continue its involvement in this area. AFRENA activities in Rwanda are also under the sponsorship of ISAR. Finally, ISAR could also become involved in wetland research envisioned in the NRM Project.

The UNR Faculty of Agriculture

The Université Nationale du Rwanda (UNR), established shortly after independence in 1963, is the only public institution of higher education in Rwanda. UNR is modeled after the European university system and has now nine faculties (schools), three research centers and several libraries spread over three campuses (Butare, Ruhengeri and Kigali).

The Faculty of Agriculture (created in 1974), has three major responsibilities: (1) to train high-level agricultural specialists, (2) to conduct agricultural research and (3) provide information to the extension service. Historically, UNR has faced a number of problems in meeting these responsibilities. The Rwandan educational system, including UNR, was recently the subject of a general reform program aimed at addressing these, and other problems. The principal concerns have included:

- UNR has produced only a limited number of graduates (ingénieur agronome') each year. Until recently, UNR has been turning out barely 15 graduates annually, nowhere near what the country needs, particulary if its basic extension and research requirements are to be met;
- UNR has emphasized generalist training, which is probably no longer the the most appropriate preparation for its graduates, given the highly specialized challenges of modern agriculture. To address this, the reform program is introducing the following specializations: crop production, animal production, agricultural economics and rural sociology, and soil science and agricultural engineering. In a later phase food technology and nutrition and forestry are to be added.

- UNR has a very severe shortage of laboratories, research facilities and equipment (particularly microcomputers). Collaborative projects with foreign universities will, to a significant extent, alleviate this problem. For example, Canadian aid is building a new faculty building, while the Universities of Laval, Minnesota, Oregon State, and Mayence are equipping laboratories and research facilities.

- UNR's Faculty of Agriculture has not been sufficiently involved in trying to resolve the agricultural problems actually facing the country. The Faculty of Agriculture has often been criticized for remaining in an 'ivory tower'. This appears to be primarily a result of lack of manpower and resources. The AID-funded SAARFA project with the University of Minnesota (UM) is specifically designed to involve faculty members in adaptiv research activities through strengthening linkages with other research institutions throughout the country.

The UNR-UM project concentrates its activities in three specialty areas: crop production, animal production and soil science. This last includes a program in soil conservation and soil fertility. Another faculty, the Faculty of Geography (Ruhengeri campus), provides training in the natural resources area.

UNR's involvement in agricultural research, while limited, covers a number of areas relevant to the proposed NRM Project. For example, UNR is the counterpart agency for the AID-sponsored Pond Dynamics Collaborative Research Support Project (the Pond Dynamics CRSP). Under this project, UNR researchers are collaborating with those from Oregon State University and other U.S. universities to gather data on the environmental and eco-climatic aspects of fish pond dynamics, as well as on the growth and feeding of Tilapia nilotica. This research is being conducted at the Rwasave Research Station at UNR, a center with 66 fish ponds, occupying over 10 hectares. UNR may also be involved in research financed by the project in areas such as wetland management and natural forest management.

The Office Rwandais du Tourism et des parcs Nationaux (ORTPN)

ORTPN has a status comparable to that of a ministry in that it is directly attached to the Presidency of the Republic. Created in 1974, ORTPN is responsible for the management and protection of Rwanda's two national

parks. It is also legally responsible for the conservation of all natural flora and fauna outside of the parks. The application of this more general mandate, however, thus far has proven to be quite complicated, due to overlapping responsibilities and interests of other ministries.

C. THE COMMUNES

The national territory of Rwanda is divided into ten prefectures encompassing 143 communes with legal personality and financial autonomy. The commune represents the lowest administrative echelon in the Rwandan Republic. Twenty-two subprefectures have been set up to serve the communes farther away from the prefectural capital. The commune is divided into about ten 'Secteurs', each headed by a 'Conseiller Communal'. Each 'secteur' is, in turn, divided into 'Cellules', representing groups of 'collines' or hilltop communities headed by a 'Responsable'.

The 'Mouvement Révolutionnaire National pour le Développement' (MRND), the political organization grouping all Rwandan citizens, is represented at every level in the commune by its own institutions: commune congress and committee; 'secteur' assembly and committee; and 'cellule' assembly and committee. Communal action is the responsibility of the MRND, which formulates the philosophy, and MININTER, which has responsibility for its implementation.

The 'Bourgmestre' heads the communal institutions. He is appointed by the President, on the recommendation of the Minister of the Interior. As the representative of the central authority and the official responsible for application and implementation of national laws, decrees, ordinances and recommendations (including those of the technical ministries), he exerts great authority. Statements such as 'All depends on who the burgomaster is', are commonly heard in Rwanda.

The burgomaster's main concern is to collect revenues for the communal budget, not only to pay its employees, but also to carry out the vast array of tasks assigned to its administration. Since the direct taxes assigned to the commune by the Central Government have limited yields, the commune is led to impose and collect many different levies and other charges. The burgomaster is responsible for ensuring local community participation in Umuganda (community labor). Of particular importance is also the organization of political activities, to which the population is expected to devote as much time as to Umuganda. Lastly, the burgomaster also plays a conciliatory role in local disputes (mostly about land). This last role is particularly important, as it determines his reputation among the people he governs.

The commune, as an institution, is currently in the middle of an important transition. It has been in existence for more than 25 years and still is, in many respects, an administrative unit and an extension of the Central Government. At the same time, however, it is evolving into a decentralized community with growing responsibilities and autonomy. It is becoming more and more a socioeconomic reality and a frame of reference for both public and private sector activities. In order for the communes to play an active role in local development, however, a great deal of work needs to be undertaken to strengthen its personnel and materiel resources. A case in

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point is that of marais development. It is the policy of the GOR that communes shoulder an increasing share of the responsibility for marais development. To date, however, their efforts have been limited by a lack of trained manpower to do so. For this reason, the focus of the training aspects of the marais management component of the NRM Project will be to address this problem, specifically to train rural engineering and water management technicians that will, ultimately, be assigned to the communes to manage marais development activities.

D. The Role of the Communes in Extension

In the NRM Project, the most important role for the communes will revolve around implementation of extension activities. Extension services in Rwanda generally lack a single, direct line of technical support and administrative control. MINAGRI has no extension department, per se. Rather, extension agents are assigned to the local communes, even though they may be paid for by the central government. The local extension agents find themselves integrated into the local civil administrative structure, under the supervision of the burgomaster, while receiving instructions from MINAGRI via the 'agronome de préfecture' and the 'agronome de commue'. The extension agents may also receive instructions from other institutions (OCIR-café, OCIR-tné) or donor projects.

Each commune has an agronomist and a veterinarian, who supervise the extension agents assigned to 'secteurs' and ensure their liaison with prefectoral staff. In some communes, there may also be a forester. The commune agronomist and veterinarian are usually civil servants on the Central Government payroll. Each secteur usually has an extension agent (monagri) and a veterinary assistant (AIV), both paid by the commune. There are also a number of specialists attached to each commune to provide extension services in coffee-growing, bee-keeping, fish-farming and forestry activities. In practice, the number of staff varies considerably from one commune to another, depending on the financial resources of the commune, the presence of 'projects', the secondment of specialist personnel by other public institutions (e.g. OCIR-café).

It is generally recognized that the extension system is outdated and in bad need of reform. The problems with the current extension system include the following:

- The lack of a lack a single, direct line of technical support and administrative control, means that extension service personnel are often assigned multiple roles including non-agricultural rural development tasks and regulatory work. This, of course, undermines their effectiveness in extension.

- Monagris are poorly paid and, in the case of commune employees, often irregularly paid. Most have no means of transport and very little material to use in working with the farmers. There does appear to be, however, an adequate number of extension staff in the field.

- Many agents have little or no training when they begin their work and they often receive very little in-service or on-the-job training. There are very few appropriate extension or agricultural reference materials available for their use.

- Ties with research activities are weak or nonexistent, so extension agent often have not a very updated message to extend.

- Local monagris generally have low status, low morale and low pay, all of which are reasons for their low productivity.

The explicit reform of the extension system at the commune level is beyond the scope of the proposed NRM Project. As noted above, the problems inherent to the current extension system are recognized by MINAGRI, and a new national extension structure, under discussion for some time, is being considered. The NRM Project cannot depend upon this reform, however.

Nevertheless, the NRM project will attempt to improve extension activities in those communes in which the project will work. This will be done through improved training, materiel support, and the development of discrete, easy to disseminate technological packages. In the agroforestry and soil conservation component of the project, substantial reliance will be put on commune-level agents. In this case, some caution will be necessary to ensure that conflicting demands upon these individual's time do not undermine the success of the project. In the case of fish culture, on the other hand, a highly motivated and effective cadre of commune-level extension agents has already been trained, and is using a variant of the 'training and visit' system approach. This program could serve as a model for other activities.

D. Coordination of the NRM Project

The overall administrative coordination and management of the project will be the responsibility of a Project Coordinating Committee (Comite de Coordination), which will include representatives of MINAGRI, ORTPN, MINIPLAN, USAID, ISAR, and MININTER and MINAFFET. MINAGRI will be responsible for the marais, fish culture, and agroforestry and soil conservation components. ORTPN will have primary responsibility for the natural forest management component. MINIPLAN will be responsible for the environmental planning component.

Day-to-day coordination and management of the project will be the responsbility of a Coordination Unit (cellule de coordination) composed of a Rwandan national coordinator for the project, and an expatriate advisor. The national coordinator will be designated by Project Coordinating Committee. This unit will work closely with MINAGRI, ORTPN, MINIPLAN, and the other institutions in coordinating field activities, and will report to the Coordinating Committee.

Actual implementation of the subcomponents will be carried out in the field by representatives of the three GOR agencies, with assistance from Private Voluntary Organizations (PVOs). Representatives of these agencies and organizations will constitute a Comite Technique which will meet quarterly, together with the National Director and Resident Advisor, to discuss project implementation, prepare work plans, and to address issues that arise.

ANNEX G - SOCIAL SOUNDNESS ANALYSIS

The value of natural resources to people is only partly measured in monetary terms. Lands which retain their economic value through protection and improvement give vitality to rural economies and promote social stability. Watersheds which are well-managed improve the level of health in a community and prevent catastrophic seasonal flooding. Forests yield numerous products and benefits in addition to wood, including medicines, food, fodder, and recreation. The degradation of the natural resource base, by contrast, may lead to the breakdown of precariously balanced economies, the disruption of social systems through migration and increased mortality, greater instability of government, and increased dependency of individuals, families, and nations upon the uncertain intentions of others. This has been clearly demonstrated throughout the African Sahel.

While Rwanda is blessed with a rich natural resource base, signs of resource deterioration are already becoming apparent. The long-run welfare of Rwanda demands that greater attention be given to conserving the natural resources of the country.

The Social Soundness Analysis will discuss (1) natural resource management as traditionally practices by Rwandan farmers; (2) which individuals can be expected to benefit from improved natural resource management techniques and technologies; and (3) the impact on society overall of a sustainable natural resource base.

The widespread use of improved resource management techniques and technologies is crucial for combatting resource degradation in Rwanda. This translates into popular participation in programs for, inter alia, forest management, erosion control, soil fertility enhancement, and small marais development. Rwandans must be convinced that conservation is in their own best interests. If not, they will not allocate financial, material, and human resources so as to maximize the production potential of their farms and families. The Social Soundness Analysis will recommend means of increasing popular participation in natural resource management, so that the tradeoffs between possible short-term production losses and long-term sustainability are made more favorable to families for whom risk-minimization is a fundamental survival strategy.

Socio-Cultural Feasibility

The 6th National Congress of the Movement Revolutionaire National pour le Developpement (MRND), Rwanda's sole political "party", was held in June, 1988. Led by President Habyarimana and some 200 of Rwanda's central, regional, and local leaders, the Congress discussed the importance of the agro-economic base of the economy and the nation's dependency on agriculture. The Congress also discussed the need to decentralize administration and development by encouraging initiatives at local (commune) levels.

In particular, the Congress passed resolutions calling for:

a. Improved management and use of the small marais, and the publication of laws defining marais use rights;

b. Greater numbers of agro-pastoral projects focused on increased production;

c. Greater collaboration between agricultural production activities and research;

d. Continued anti-erosion campaigns, especially in the risk-prone zones of the Zaire-Nile Divide (ZND);

e. Continued promotion of fish culture;

f. Expansion of agro-industry, especially in the rural milieu;

g. Increased assistance to communes for local natural resource assessments for improving the profitibility of the natural resource base;

h. Greater local involvement in the design and execution of development activities; and

i. Increased communal capability to play the fundamental growth role in the nation's development.

These priorities are laudable for revealing the awareness the country's leaders have of the constraints limiting the continuous use of the resource base and the socio-economic concomitants of resource degradation. Yet how close are national priorities to locally perceived needs of what must be done to sustain individuals and families?

While survey data are scant, some historical trends are nonetheless apparent. Rwandas have practiced a number of sound land use techniques: crop rotation; intercropping of nitrogen fixing species; fallow; rotational use of bottoms lands for pasture and crops; and planting trees in crop fields, on field boundaries, in woodlots, and near houses.

Are these practices still employed, or were they the "luxuries" of a population less densely packed onto a small land base? This is a key question, for the rapid rate of population growth is resulting in (1) the use of marginal land for crop production, hastening erosion; (2) over-exploitation of hill and valley land, with consequent depletion of soil fertility; (3) incursions into the natural forest, a dangerous phenomenon for a nation so dependent upon the health of its watersheds for ecological well-being; and (4) "parcelization" of agricultural land through customary inheritance practices, increasing the importance of organizing farmers for soil protection and enhancement.

GOR awareness of the precarious condition of the environment has prompted programs and policies which are well-intentioned and meant to counter the trends engendered by population growth and more intensive land use practices.

Following the severe degradation of the Gishwati Forest following donor-financed development activities, the GOR has placed much more attention on natural forest management, particularly through current activities in the Nyungwe Forest Reserve and the Parc National des Volcans. Combatting erosion is a national extension theme, as are soil fertility and reforestation. composting, agroforestry, and cover crops are being promoted as substitutes for unavailable manures and costly chemical fertilizers. Finally, improving the use of small marais is being investigated, including the question of tenure security for marais producers.

Despite this, there is still a question of farmer commitment to adoption of technologies of uncertain payoff. Perhaps three-fourths of the country has been treated with ditches and fixed grass hedges to control erosion. Yet farmers do not undertake this difficult work of their own volition. Moreover, there is evidence that this technology can actually increase landslide on the shallower soils of the Zaire-Nile Divide, while common sense dictates that it is unnecessary on the gentler sloping lands in eastern Rwanda.

On the other hand, CARE-Gituza reports that 73 percent of the farmers that they surveyed were rotating crops, increasing fallow, clearing new land, and composting, in order to counter declining crop yields on soils weakened by loss of fertility and topsoil. Tree planting is common where farmers (83 percent) have title to the land and tenure security. Overall, 95 percent of the respondents in that survey reported planting trees on their land. A second survey, in the Kirambo sub-prefecture of Ruhengeri, likewise demonstrates high levels of farmer experience with tree planting and appropriate tree placement (i.e., Eucalyptus in woodlots and Grevillea in and around crop fields).

In the marais, water technologies employed by farmers untouched by development projects are demonstrably sound, given prevailing levels of technology and limited objectives. Low value crops are grown by most marais cultivators, reflecting their unwillingness to invest in the marais, as tenure is insecure, crop protection is difficult, and marketing is poorly developed. The improved use of the marais interests farmers, but they have been disappointed by development projects which have begun from the "top" in telling farmers what they should do. Research undertaken under the WMS II project concludes that marais interventions must begin with asessments of farmer interests, in order to solicit their willing participation in attempts at improved land use.

While it is evident that both private citizens and the Government are concerned about, and active in, natural resource management, technologies applied have not always been appropriate nor effective. To ensure the appropirateness of the technology to be promoted, we must:

a. Identify suitable site-specific technologies, through greater farmer-researcher-planner collaboration;

b. Increase our understanding of labor constraints which require that the payoffs of labor intensive technologies be apparent and forthcoming;

c. Optimizing the tradeoffs between the benefits of erosion control and soil fertility improvement technologies, on the one hand, and the costs to the farmer in terms of land, labor, and materials;

d. Increase the security of tenure in the small marais, as a lack of tenure discourages farmers from investing in land improvement;

e. Develop new markets and marketing techniques in order to make the production of high value crops in the marais more interesting. This will require improved market analysis and marketing methods;

f. Encourage the formation of farmer associations and other groupings, in order to support the production of high value marais crops (fish, food and livestock);

g. Improve our understanding of forest ecology and encourage the public's sense of "ownership" of national park and forest land through widespread public education campaigns and increased sharing of economic spin-offs from forest-based remunerative activities.

Beneficiaries and Equity

Poorer families, as a rule, have fewer management options than do relatively wealthier ones. Their farms (surface area/person) are smaller; their resource base is of lower quality; their labor is less skilled and diverse; and their support systems are weaker (especially in the case of female-headed households). These families will benefit from natural resource conservation technologies, such as low cost soil enhancement technologies, greater availability of fuelwood, and alternative income generating uses of poor crop land.

Female-headed households (21 percent) are a special case of this group. Their farms are 30 percent smaller on the average, their laborers fewer, their patrons weaker. Women, in particular, are often untouched by extension agents, left-out of training programs, only occasionally organized into permanent groups, and are in a worse position in terms of access to marais parcels. The overall potential benefits of sustainable resource management are likely to reach women only if they are intentionally identified as clients of development program activities.

The development record is unambiguous about the often differential impacts of economic growth upon men and women within the same family, regardless of their socio-economic standing, as a result of their respective differences in interests, rights, and responsibilities. The selection of tree species for planting on family land is a classic case in point. Men often

want trees which can be commercialized for construction, tools, and carpentry. Women, the collectors of firewood, are more interested in species which can be grown near the house, and provide fuelwood and materials for other household uses (food, medicines). Survey data in Rwanda support the sometimes different interests of men and women, and suggest that the views of both need to be solicited and that interventions need to address both their interests.

In Gituza, 97.5 percent of the families use wood for cooking. Seventy-two percent of the respondents indicate, however, that obtaining fuelwood is not a problem. Much dead wood is collected on the uninhabited lands in the Gituza region. In families where this is the case, men are uninterested in planting fuelwood species on the farm. By contrast, where men are involved in fuelwood production, that is, where women have access only to fuelwood cut by men from trees on the farm, men recognize a "fuelwood problem" and are more interested in planting fuelwood species.

The gender issue is expressed differently in Kirambo, where men and women equally perceive the gravity of the fuelwood problem. Women have rights to wood use only for fuelwood species, i.e., Eucalyptus and Black Wattle. The desire to plant these species predominate in women's responses. Agroforestry interventions, however, may not include these species (which are inappropriate for placing in crop fields), but women -- who manage and maintain the crop fields -- may nonetheless be responsible also for employing and managing agroforestry technologies. Their interest in so doing, if they are not also permitted discretion as to the uses to which the wood is put or access to the revenue the wood brings, clearly is questionable. The individual man or woman's interest in trying improved management is crucial to technology adoption and consistent with the record of development success based on widespread local participation. Further investigation and monitoring will be needed to gauge women's interest in agroforestry.

Gender issues aside, the need to involve men and women in coordinated activities for hillside soil conservation and marais development is fundamental. Erosion involves all farmers, since their disbursed parcels must be treated in a coordinated fashion in order to obtain maximum benefit from soil protection technologies. A similar situation exists with marais production. What a farmer does in one part of the marais (e.g. level of water use, type of crops grown, use of inputs such as pesticides), will affect the choice set available for farmers downstream. Better organized groups also are more willing to invest in land improvement and protect those investments. This is especially true in the marais where, by increasing the stake of the "community" in the management and development of the land, greater care and protection of the resource will result. Resources such as trees, fish, and livestock are seen as security and savings by the rural poor, and willingness to sustain them can be promoted under conditions where the poor are guaranteed greater tenure security.

Farmer initiative and motivation for adopting/adapting improved technologies is an important determinant of successful intervention. Mechanisms for receiving assistance must be made available to farmers so that those who seek assistance can obtain it. NGOs, for example, if engaged by the NRM Project, should help to identify interested farmers/farmer groups. Moreover, the focus on local development will require that NGOs and other associations of Rwandans draw as heavily as possible from local populations for their technical and outreach personnel.

CARE has been successful in Gituza in stimulating widespread farmer interest in new technologies by, among other things, discounting the cost of seedlings to farmers who have participated in courses on agroforestry and tree management offered by the project. Recent survey data indicate that trees are now being managed by these farmers for multiple uses. Indicators of increased farmer interest stemming from initial participation include farmer specification of desired agroforestry species, farmer modification of agroforestry configurations on farms, and farmer suggestions for new research subjects and course content. The CARE model may be applicable elsewhere in Rwanda.

Popular participation not only increases the likelihood that improved techniques will be given a fair trial, it helps planners and researchers to learn what farmers already know about the resources in their area (or what they would like to know in those cases where they are experimenting themselves). Both for applied research activities and ordinary implementation follow-up, popular participation increases the likelihood of progress.

The other side of widespread citizen participation is technology abandonment. For example, many of the terraces introduced into Rwanda in an earlier period have fallen into disrepair. Thus, it is equally as important to identify why a technology is no longer used as it is to promote its use in the first place. Tracking the impact of interventions by monitoring when, where, how, and why users reject, accept, continue, and/or abandon technology will help to reveal farmer priorities and, if acted upon correctly, make the NRM Project more responsive to farmer needs and, in the end, more sound.

Widespread popular participation can promote technology spread or benefit incidence, perhaps in surprisingly rapid fashion, according to the experiences of other projects currently active in the natural resource sector. The Farming Systems Research Project has found participant farmers eager to try agroforestry configurations, and the Fish Culture Project has not been able to meet the demand for technical assistance in marais throughout the zones where they have been active. However, it is the RRAM Project which best demonstrates the potential of replicating improved technologies. Hillside configurations of contour plantings of trees and grasses have been copied by farmers neighboring project demonstration sites. Recent RRAM data indicate that these hillsides are losing soil at one-fourth the rate or greater than untreated hillsides. Dramatic demonstrations of this during the May 1988 torrential downpours and subsequent landslides did not go unnoticed by area farmers. More widespread demonstrations could stimulate a rush to adopt appropriate site-specific interventions.

A special case for potential beneficiary participation is made for the "Batwa" or pygmy population of Rwanda's natural forests. These hunter/gatherers have been implicated in poaching and other activities harmful to forest flora and fauna when employing a "traditional" adaptive strategy. The GOR is concerned about the future of these peoples and is likely to try and relocate them elsewhere. There is an urgent need for research on these forest dwellers already know about the forest and its inhabitants -- to obtain some of the vast benefits which forest resources provide for humans in the way of medicines and other forest products, and to assist the GOR (and the Twa) in finding a viable solution to sustaining their livelihood, possibly outside of the forest.

In sum, the equity of NRMP activities and widespread beneficiary incidence can be best promoted by:

a. Promoting tenure security, especially in the marais, to increase farmer willingness to invest in land improvement;

b. Organizing hillside and marais families for improved technology adoption and marketing;

c. Involving farmers from the start in technology demonstrations and applied research trials;

d. Working with private groups (e.g. associations, cooperatives, NGOs) to reduce the burden on the Government of development activities and to profit from private interests in the promotion of family welfare;

e. Making sure that women and women's groups are identified for training and outreach;

f. Disaggregating all analyses by gender; and

g. Focusing on the Batwa and other unique forest resources, in research and implementation, to satisfy both biodiversity and development objectives.

Impact

While the potential impacts of improved technologies for Rwandan farm families are apparent (i.e., improved land use potential and concomitant production increases), greater impacts will be the benefits of society at large.

a. Conservation of natural forests provides protection against drought and famine. These water catchment areas are crucial to maintaining rainfall and water availability on the hillsides and in the marais, and thus a sustainable rural economy and social system.

b. Clean groundwater for drinking, cooking, and bathing makes for a healthier and more productive population.

c. Resource sustainability promotes socio-political stability. Rural economies which are stable help to minimize rural-urban migration and the potential deterioration of urban life resulting overtaxes services, increased unemployment, crime, and so forth.

d. Sustainable production and the introduction of improved protein sources (i.e. fish) will improve nutrition levels and reduce mortality.

e. Increased labor requirements of most "low-cost" improved technologies, when accompanied by a corresponding increase in productivity, increase the absorptive capacity of the rural economy, enabling more individuals to find productive employment.

f. Resource sustainability promotes the build-up of enterprises across generations, not only promoting enterprise growth but also the long-term sustainability of the socio-economic system.

These impacts will be conditioned by on-going trends which call forth caveats for implementation. Current evidence from the ENBC indicates that more intensive land use practices, usually associated with smaller farms, are positively correlated with higher nutritional levels (an indicator of general well-being). While on the rich soils of the densely populated northwest this appears to be a function of good soil fertility, it would be a mistake to "forget" that the renewable character of the soil for sustainable use will need to be supported by efforts to control of soil loss and diminishing fertility. Labor intensive technologies may or may not be adopted by local populations, depending upon farmer perceptions of their pay-offs. Interventions will need to focus on immediate or short-term returns at the start (e.g., preventing landslides and improving market incentives).

In the marais, more intensive use of small parcels has increased their yields, an apparent consequence of higher inputs of labor/unit land. The implication for the development of larger parcels is to increase labor inputs there also. This means grouping farmers into associations and cooperatives for maximum output/unit labor input.

For these impacts to be realised, the NRMP will need to:

a. Determine the optimal trade-off between production and resource improvement by monitoring the impact of interventions and participant resource allocations;

b. Educate/train individuals in forest ecology and improved resource managememt;

c. Encourage widespread participation in technologies through the formation of groups;

d. Assure the sociological appropriateness of potential techniques through farmer surveys and monitoring;

e. Promote applied research and links between researchers and farmers; and

f. Undertake extensive public education campaigns to sensitize the population to the desirability of employing improved natural resource management techniques for the short, medium, and long term through workshops, seminars, publications, policy dialogue, collaborative endeavors, applied research, and demonstrations of technology effectiveness.

ANNEX H - ECONOMIC ANALYSIS

A. Introduction

The economic analysis presented below addresses the question of whether the technical approaches and interventions proposed for the Natural Resources Management Project are financially feasible from the perspective of farmers and to Rwandan society as a whole. Section A discusses the importance of the natural resource base to the Rwandan economy. Section B analyzes the proposed agroforestry/soil conservation and forestry interventions. Section C discusses the economics of fish culture in Rwanda. An economic and financial analysis of the biodiversity component is considered briefly in Section D. The report concludes (Section E) with a proposed analytical framework for economic and financial evaluation during project implementation.

1. Importance of Natural Resources to the Rwandan Economy in Context of Economic and Financial Analyses

The importance of the natural resource base to the Rwandan economy is well-documented in the several technical background documents prepared for the PID, as well as in other documents available to the Mission. Given a population growth rate of 3.7 percent, the observed degradation of the natural resource base, and the general absence of wide-scale, replicable technologies to apply to increasing productivity, it will become increasingly costly for the GOR to delay action on environmental issues. The more severe the degradation of the resource base, the more costly it will be to restore it.

As will be shown in the analyses below, the GOR is faced with some hard economic decisions. If the degradation of the natural resource base is to be completely stopped, the GOR must be prepared to spend large sums of money. If the objective is to only slow the rate of degradation, lower levels of investment will be needed in the short run (but the long run problems will still persist). There are economic tradeoffs between the two extremes -- what it takes to stop the resource degradation entirely, and no action at all. The purpose of economic analysis is to provide decision makers with the best information possible to measure these tradeoffs. It should not be the sole decision-making criterion.

2. The Approach

The analytical approaches used in this report were first developed for the Sub-Sahelian Regional Assessments (SSRA) (Shaikh, et. al., 1988) and modified for Rwandan conditions. Several lessons learned from the SSRA are also applicable in Rwanda and are included the report.

For the soil conservation and agroforestry interventions, the focus is on the farmer -- what are his concerns and what does he need to know in order to make the time and financial investments required to carry out a particular intervention? Typically, a farmer at a subsistence level is a risk averter, rather than a risk taker. He is concerned about food security -- that his harvest will provide enough to last until the next harvest. He knows, from his farming experience, that with his traditional methods he can produce what he needs, as well as perhaps a small surplus to sell in local markets. If he is asked to take the risk of changing methods which he knows works, even if

they only provide a subsistence level of production, he is likely to be reluctant, unless there is promise of higher food security in the future.

The introduction of contour vegetation strips can be used as an example. The planting of trees and grasses as contour vegetation leaves the farmer with less area to cultivate. Moreover, the area remaining for cultivation decreases as the slope of the land increases. Given that the introduction of contour vegetation strips entails an investment of time and money by the farmer, it is not sufficient that the vegetation strips increase yields to recover the loss of the cultivable area. Rather, such strips must increase yields beyond this initial levels. Any soil conservation and agroforestry intervention is hard work, particulary on steep slopes. While a farmer may intuitively know that his land will typically produce only at a subsistence level, he also values his time. If he has just enough food to last until the next harvest, he may not want to give up his time to get more. The key question is: how much of an increase in crop yield would a farmer have to have in order to be enticed increase his investment in his crop?

3. Context of the Analyses

The agroforestry and soil conservation analyses presented in this report are only illustrative and should be interpreted with extreme caution. They use assumptions collected in the field that cannot be readily verified by any documented field research. The numerical results, therefore, are less important than the relative differences between them. Our aim is to be able to predict, with reasonable assurance, which intervention is likely to be more attractive to farmers and the conditions under which farmers would be likely to undertake it.

Until reliable information is available, the analyses should be considered only preliminary and indicative at best. The project should collect data at a sufficient level of detail to carry out accurate economic and financial analyses. For example, there is currently little information available, except for in site specific and isolated cases, on:

a. Farm gate prices for different crops;

b. Agricultural production costs;

c. Actual time (person days) invested, between planting and harvest, for various agricultural crops;

d. Time (person days) spent on soil conservation and agroforestry activities;

e. Soil conservation and agroforestry technical packages that are extendable on a large scale to farmers (that they will readily adopt) and accompanying increases in crop yields;

f. Growth and yields of different tree species in response to a range of different management alternatives.

This kind of information will have to be collected before confidence in the analytical results can be expressed. Although there are several technical

packages developed through the RRAM, CARE/Gituza and FSRP projects and by other donors, few have yet to be applied in the field by farmers on a large scale. They may ultimately prove to be either too costly or too time consuming. To use the researched and documented crop yield increases in the economic and financial analyses from these technical packages, therefore, would be incorrect.

B. Soil Conservation, Agroforestry and Forestry Interventions

The first analysis compares three alternative soil conservation and agroforestry interventions. The interventions consist of different variants of contour vegetation strips planted with bands of trees along the contours supplemented with naturally occurring vegetation (grasses and brush). Also presented in this section is a discussion of the forestry interventions.

1. Base Case Assumptions

The assumptions for the soil conservation and agroforestry interventions, summarized in Tables 1 - 3, are briefly discussed below.

Discount Rate, Crop Prices and Labor Costs

A 20-percent real discount rate is the assumed opportunity cost of capital for the farmer. The rate is high to reflect his (assumed) aversion to risk. His (intuitive) discount rate would typically be much higher than bank lending rates, or other benchmark statistics used to determine discount rates. In the soil conservation and agroforestry analyses contained here, a 20-percent rate is assumed to represent the farmer's "profit margin" requirement. To this effect, the breakeven crop yield increases (see results of the analyses below) are further increased by 20 percent to provide the incentive he would have to have to attract his participation. If agronomists (who are familiar with the site) are confident that crop yields with the intervention will exceed the breakeven yield requirement, then the investment can be judged feasible.

Farm gate crop prices are assumed -- the prices a farmer could reasonably expect to receive if he were to sell his crops at harvest time. This information was obtained directly from farmers in the field. Published statistics are not available. Seedling prices are assumed to be three FRw each (a subsidized price in the central nurseries). For the sake of analytical simplicity, labor cost is assumed to be 100 FRw per day for the financial analysis.

In addition to the direct cost outlay for the tree seedlings, the farmer must also pay for the transportation of the seedlings from the central nursery to the planting site. The assumption is that one person can carry up to 40 seedlings (approximately 22 kg) for up to three round trips per day depending upon the distance from the nursery and the slope of the farm. Also assumed in the table are the person days required for planting the seedlings, including site preparation, by slope.

TABLE 1: BASE CASE ASSUMPTIONS: DISCOUNT RATE, PRICES, LABOR AND SEEDLING COSTS, SOIL CONSERVATION/AGROFORESTRY

Assumptions	Values
Discount rate (or required return on investment)	20 %
Labor cost, FRW/person day	100
Seedling cost, FRW/each (at nursery)	3
Crop prices/kg at harvest (farm gate)	
Maize	18.00
Beans	30.00
Bananas	12.00
Sorghum	19.00
Sweet Potatoes	6.00
Tree spacing:	0.5 meters
Labor and Misc.	
No. seedlings carried from nursery to planting site per round trip (RT)and per day (PD):	40

Slope (%):	10-20	30-50	_50
RTs to nursery/PD:	3	2	1
Trees planted/PD:	10	8	6
PD maint./year:	5	8	12

TABLE 2: BASE CASE ASSUMPTIONS: CROP YIELDS, LABOR REQUIREMENTS

Assumptions	Values
Crop yields, kg/ha, 1st year	
Maize	1,130
Beans	700
Bananas	9,600
Sorghum	1,070
Sweet Potatoes	5,500
Crop yield reduction over time without interventions	10%

Crop Yields, Labor Requirements

When land is brought back into production after fallow, it is assumed to be at its maximum productive capacity. 1/ As the land is farmed in the traditional way, without the benefit of additional land improvement interventions, yields will gradually decline. The land will eventually have to return to fallow and new land will have to be cleared to replace it. The rate of annual decline in crop yields is assumed at 10 percent under the "no-intervention" scenario (based on undocumented estimates obtained in the field).

No assumption was made concerning the extent to which crop yields will increase over time as the interventions are applied. First, the interventions for which reliable data may exist are not easily extendable on a large scale. Second, the interventions analyzed in this report have not been tested extensively in Rwanda. Third, the area remaining for cultivation after having installed vegetative strips on the contour lines, depends on the slope of the terrain and the distance between and width of the strips. For these reasons, the crop yield increases in response to the interventions have not been estimated. Instead, the analysis will show how much crop yields will have to increase in order for the farmer to recover his investments of time and money, taking into account the reduced cultivable area as a result of planting the vegetative strips.

Crop Sequencing and Associations

The assumptions pertaining to crop sequencing and associations for a 10-year analytical time period are given in Table 3. The table was developed after several interviews in the field and after consulting the literature on the most common crops grown in the Rwandan "farm belt" -- between 1,400 and 1,800 m in elevation. A farm field will typically combine at least three crops in one year. Bananas (for banana beer production) are assumed to occupy at least 1/3 of the field for the entire ten-year period. Beans, a staple crop, are generally cultivated as well, usually intercropped with bananas. Sorghum, sweet potatoes and manioc often follow a bean crop as a second crop for the second growing season of the year.

As shown in Table 3, crop yields and total revenues are assumed to decline over the 10-year period in the absence of the soil conservation or agroforestry interventions. This is not to say, however, that the farmer presently does nothing to improve his land. He is well aware that his farm is losing productivity each year and is taking steps to slow the rate of depletion. These steps include, for example, the use of compost for fertilizer and terracing. But this effort is not nearly sufficient. The assumed 10-percent annual decline in crop yields takes the farmer-initiated land improvements into account.

1/ Maximum productive capacity is a relative term. If the land is brought back into production too soon, its productivity will be lower than its potential under ideal conditions.

TABLE 3: CROP SEQUENCING AND ASSOCIATIONS: TRADITIONAL FARMING

YR	CROP	HA	YLD	CROP	HA	YIELD	CROP	HA	YIELD	REVENUE
1	Beans	1	630	Sorghum	0.67	645	Bananas	0.33	2,851	65,373
2	Beans	1	567	Sw. Pot.	0.67	2,985	Bananas	0.33	2,566	65,712
3	Beans	1	510	Maize	0.67	552	Bananas	0.33	2,309	52,957
4	Beans	1	459	Sorghum	0.67	470	Bananas	0.33	2,079	47,657
5	Beans	1	413	Sorghum	0.67	423	Bananas	0.33	1,871	42,891
6	Beans	1	372	Sorghum	0.67	381	Bananas	0.33	1,684	38,602
7	Beans	1	335	Sw. Pot	0.67	1,763	Bananas	0.33	1,515	38,802
8	Beans	1	301	Maize	0.67	326	Bananas	0.33	1,364	31,271
9	Beans	1	271	Sorghum	0.67	278	Bananas	0.33	1,227	28,141
10	Beans	1	244	Sorghum	0.67	250	Bananas	0.33	1,105	25,327
AVERAGES			410			807			1,857	

Notes to the table:

1. The sorghum, sweet potatoes, and maize crops are second crops during the same growing season.
2. Yields decline over time according to the assumed 10 percent rate.
3. Banana yields will usually decline at elevations above 1,600 m. This has not been factored into the analysis.

TABLE 4: ALTERNATIVES: CONTOUR VEGETATION STRIPS

	Width (m)			Distance (m)		
Alternatives Slope:	10-20	30-50	≥50	10-20	30-50	≥50
1. Graduated Width of and Distance between Veg. Strips	2.7	7.2	12.6	3.5	22.0	14.9
2. Moderate Width and Distance	1.0	2.0	3.0	10.0	8.0	6.0
3. Even Width and Distance	1.5	1.5	1.5	7.0	7.0	7.0

Source: Weber, 1985

2. Alternatives: Contour Vegetation Strips

Table 4 summarizes the three technical alternatives analyzed for the soil conservation and agroforestry interventions. The intervention consists of planted trees in 0.5 meters spacing along the contour lines where the width of the strips and the distance between them vary between the alternatives. The alternatives have different cost and benefit implications.

3. Results: Soil Conservation and Agroforestry Interventions

The results, expressed in terms of how much crop yields will have to increase in order to break even on the investments of time and money, are summarized in Tables 5 - 8 below, including the sensitivity analyses. The breakeven crop yield increases have three components:

a. Make up the loss of having decreased the area available for cultivation (width of the vegetative strips multiplied by the number of strips).

b. Recover the investments of time and money in year one and during subsequent years. In addition to the year one investment costs, the farmer will also have to spend time on the maintenance of the vegetative strips (see the assumptions in Table 1 above).

c. Receive a return for having made the investment equal to at least the opportunity cost of capital. The three components are added and expressed on a kilo basis by individual crops.

The test of whether the required breakeven increases are attainable depends on the productive capacity of the farm after having made the investments. If the required breakeven yield increase is X kg per hectare, for example, and agronomists familiar with the site in question are confident that the investment will generate higher yields than that, then the investment should be judged feasible.

Table 5 shows the total costs that farmer will have to spend on the intervention in year one, by slope. The investment levels differ between alternatives as the width of and the distance between the vegetative strips change. The steeper the slope, the higher the investments required. Alternative 1 has, by far, the lowest investment requirement. However, less area remains available for cultivation on the steeper slopes than in the other alternatives. The number of trees planted per hectare is based on the 0.5 meter spacing between the trees multiplied by the number of strips per hectare. The remaining cultivable area is based on 100 meters less the number of strips planted multiplied by the width of the strips.

X
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TABLE 5: CONTOUR VEGETATION STRIPS

SLOPE %	WIDTH (M)	DIST (M)	TREES/ HA	AREA REM.	TOTAL COST YR 1 (FRW)
Alternative 1: Graduated Width and Distance					
10-20	2.7	33.5	597	0.92	8,259
30-50	7.2	22.0	909	0.67	15,227
_50	12.6	14.9	1,342	0.15	27,371
Alternative 2: Moderate Width and Distance					
10-20	1.0	10.0	2,000	0.90	46,111
30-50	2.0	8.0	2,500	0.75	41,875
_50	3.0	6.0	3,333	0.50	47,083
Alternative 3: Even Width and Distance					
10-20	1.5	7.0	2,857	0.79	39,524
30-50	1.5	7.0	2,857	0.79	47,857
_50	1.5	7.0	2,857	0.79	63,333

TABLE 6: BREAKEVEN YIELD INCREASES BY SLOPE AND CROPS (KG)

Slope	Beans	Composite	Bananas
Alternative 1: Graduated Width and Distance			
10-20	66	119	201
30-50	188	358	751
_50	429	400	1,895
Alternative 2: Moderate Width and Distance			
10-20	115	197	277
30-50	188	342	611
_50	301	370	1,160
Alternative 3: Even Width and Distance			
10-20	195	344	551
30-50	195	344	551
_50	195	344	551

Table 6 shows the breakeven yield increases by slope and crops for the three alternatives. In alternative 3, for example, bean yields will have to increase by 195 kg per 0.79 hectare (the remaining area allocated to bean production after installation of the vegetative strips). The composite crop yields, consisting of maize, sorghum and sweet potatoes (see the middle column of Table 3), will have to increase by 344 kg on the average on 0.52 hectares, and bananas by 551 kg over 0.26 hectares. Of the three alternatives, no. 3 appears most attractive, given the lower investments required expressed in terms of the breakeven crop yield increases.

4. Sensitivity Analysis: Soil Conservation and Agroforestry Interventions

The sensitivity analysis covers two variables: tree spacing and the discount rate (or as used here -- the required profit margin for the farmer). The results for alternative 3, 30 - 50 percent slope, are given in Table 7. If the tree spacing increases from 0.5 m to one meter, the farmer has fewer seedlings to buy and transport and breakeven crop yields decrease. A two-meter spacing will further decrease the breakeven yield increases. It should be noted that a wider tree spacing will give less natural resource protection. The profit margin variable is less sensitive than the tree spacing variable.

The breakeven crop yield increases are given for fractions of one hectare, as discussed above. They are converted to a per hectare basis in Table 8 below. The proportion of farming space for the different crops on a typical hectare (Table 3) remains the same with the intervention. The only difference is that the same hectare now has less farmable land. Beans are grown on 0.79 ha, the composite crops on 0.52 ha and the bananas on 0.26 of one hectare.

On a per hectare basis, the increases in crop yields required to break even on the investments are 240, 662 and 2,119 kg for beans, the composite crops and bananas respectively. To that is added the average production over the 10-year period from Table 3 (converted to a per hectare basis). The average total production required over the 10-year period to break even on the investments, therefore, is 766, 2,214, and 9,262 kg for the beans, the composite crops and bananas respectively. It is interesting to note that these breakeven crop yields over the 10-year period, taking into account the crop yield declines without the interventions, are roughly equal to the initial crop yield assumed in Table 2 above. This means that, if the soil conservation/agroforestry intervention prevents a decline in yields over time, the investment is judged feasible.

TABLE 7: SENSITIVITY ANALYSIS OF FINANCIAL RESULTS, ALTERNATIVE 3, 30-50 SLOPE

Crops	Base Case	Tree Spacing 1m	Tree Spacing 2m	Profit Margin 10%	Profit Margin 0%
Beans	195	155	135	178	162
Composite	344	283	253	315	286
Bananas	551	518	502	505	459

TABLE 8: AVERAGE PRODUCTION REQUIREMENT FOR 10 YEARS, ALT. 3, 30-50 % SLOPE (KG/HA)

	Beans	Composite	Bananas
Break Even Yield Increase Given Crop Alloc./Ha	195	344	551
Crop Allocation/Ha	0.79	0.52	0.26
Break Even Yield Increase/Ha	247	662	2,119
Average Prod. Tradit. Farming/Ha	519	1,552	7,142
Average Total Prod/Ha for 10 Years	766	2,214	9,262
Initial Yields	700	2,567	9,600

TABLE 9: SUMMARY OF ASSUMPTIONS: FORESTRY INTERVENTIONS

Assumptions:			Financial	Economic
Discount rate			10%	5%
Labor cost, FRW/person day			100	60
SP = Site prep.:	120 PD/ha		12,000	7,200
Seedling cost, FRW ea			6	11
G = Guardian protection, FRW/ha annually			1,825	1,095
Spacing:	3 x 4 = 833			
PL = Planting labor:	30 tree/PD	28	2,778	1,667
RP = Replanting:	20%Yr 1		556	333
W = Weeding:	20 PD/ha, 3 years		2,000	1,200
FBC = Firebreak clear:	120 PD/ha, year 1		12,000	7,200
FBM = Firebreak maint:	60 PD/ha annually		6,000	3,600
Stumpage value, FRW/m3			500	500
Rotation age:	6 Years			
Time horizon:	24 Years			
Yield:	8 m3/ha/year			

5. The Project Paper Context

In the context of the Project Paper, a "bottom-line" judgement must be made about the economics of the interventions proposed. The analysis presented above does not permit an authoritative "yes" or "no" answer because the information on which the analyses should ideally be based, is not available. The judgement is, nevertheless, made that the interventions should be supported in the project for two major reasons:

a. As a point of reference, the Farming Systems Research Project has documented actual crop yield increases (for maize) nearly twice as high as the breakeven increases reported here using interventions similar to the interventions analyzed above. Because the assumptions used are conservative (relatively low farm gate prices, high costs and a high return on investment requirement), it is probable that the interventions will generate substantially higher crop yields than those the farmer would require to break even on his investments.

b. The costs of doing nothing will be staggering. The longer one waits before action is taken to stop the degradation of the natural resource base, the more costly will be the actions required to restore it.

6. Forestry Interventions: Assumptions and Alternatives

Positive financial and economic returns are inherently difficult to obtain almost anywhere, if the returns are based only on the wood volumes and values produced. Reforestation under the auspices of the project should be carried out for soil conservation and watershed management reasons, not hoping for any positive economic returns based on the wood values alone. Where the returns based on the wood values only are negative, therefore, the intervention should not be automatically be rejected.

Following are economic and financial analyses of several management alternatives based on a set of assumptions partly drawn from the Gituza project evaluation report (1987) and partly derived from field interviews. The costs include the plantation establishment and subsequent management costs. Benefits are the wood quantities produced multiplied by a stumpage price (the value of the wood before it is cut). The purpose of the analyses is not to recommend for or against forestry interventions on the basis of the results, but rather to illustrate the economic and financial differences between management intensities. The more intensive the management regime, the more costly it is and the lower the return, given the prices and the quantities of wood produced, unless there is an increase in the quality of the wood products to offset the costs of the management.

The analyses cover different eucalyptus plantation management alternatives. Pine plantation alternatives were analyzed in the Gituza evaluation report (1988). The assumptions are summarized in Table 9 below.

The financial and economic discount rates are assumed at 10 and five percent respectively. The lower economic discount rate is used to reflect

(the assumed) GOR prioritization of the forestry interventions. Labor is valued at 100 and 60 FRw/day for the financial and economic analyses respectively. The 60 FRw/day financial assumption reflects daily wages paid to refugees. The financial seedling price delivered at the planting site represents a subsidized nursery price plus transportation to the planting site. The 11 FRw economic price per seedling assumption reflects actual production cost plus transportation. Labor requirements are estimated for each management activity.

The stumpage price assumption is not documented. Based on a market price for fuelwood in Kigali of approximately 800 FRW/m3, the assumption was made that the average stumpage values for poles and fuelwood would be roughly 500 FRw/m3 after deducting handling, harvesting and transporting costs from the final market price. (It should be noted that the results will not change significantly if the stumpage price were much higher than assumed in the base case).

The eight m3/ha/year volume and six-year rotation assumptions are reasonable for eucalyptus plantations in the Gituza area. Three coppice rotations are assumed following the first harvest after planting. The total time horizon considered, therefore, is 24 years. The silvicultural interventions include planting (PL), replanting (RP), weeding (W), firebreak clearing (FBC) and maintenance (FBM) and guard protection (G). Labor requirements associated with each intervention are estimated in the table.

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2. The stumpage price should ideally be derived rather that be given. If there is more than one product, fuelwood and poles, for example, the stumpage prices will differ for each. Two perspectives are required: buyer and seller. The buyer's (consumer) perspective is governed by the market price, or the maximum price he/she is willing to pay. From the market price must be deducted all of the costs associated with bringing the product to market (felling, transporting, loading and unloading, fees, taxes, and a reasonable profit margin, etc.) to arrive at the residual which is the stumpage price. From the producer's perspective (the seller), the total of all costs of production equals the producer stumpage price, or the minimum amount he/she will accept for the wood. If there is overlap between the consumer and producer stumpage prices, then there is a market. If there is no overlap (the maximum amount consumers are willing to pay is lower than the minimum amount the producers are willing to accept), then there is no market and producers must sell at a loss. Feasibility of the forestry plantation occurs if there is overlap given the assumptions.

TABLE 10: MANAGEMENT ALTERNATIVES

Mgt. Alt.	Site Prep	Plant	Replant	Weed	Firebr.	Guard
1	x	x	x	x	x	x
2	x	x		x		x
3		x				x
4	x			x		
5	x					

TABLE 11: TIMING OF MANAGEMENT ALTERNATIVES

Management Activities	Timing: When Treatments Will Occur
Site Preparation	Year 1
Firebreak construction	Year 1
Fire break maintenance	Annually
Planting	Year 1
Replanting	Year 2
Weeding	Years 1, 2 and 3
Guardian protection	Annually

7. Alternatives: Forestry Interventions

Table 10 summarizes the management alternatives analyzed. Five different management alternatives are analyzed ranging from all silvicultural interventions included (no. 1) to doing nothing beyond planting the trees (no. 5). The other alternatives are in between in terms of intensity. Fire protection is presented as an alternative. If the entrepreneur does not incur fire protection costs and there is no fire, then he has gambled and won. If there is fire, on the other hand, he may lose his entire investment. (There is a probability associated with this gamble which is not considered in the analysis). The timing of the silvicultural interventions is given in Table 11.

8. Results: Forestry Intervention

Cash flows for the base case (the most intensive management option), given the assumptions, are given in Table 12. The results for all alternatives are expressed in net present value (NPV), internal rate of return (IRR) and soil expectation value (SEV) terms in Table 13. As discussed briefly in Section E below, the SEV is the most correct analytical approach to use in short rotation forestry. The true value of the land -- the soil expectation value (SEV) -- is reflected by the NPV of the flow of potential net revenues generated from it over an infinite number of rotations, not just the one 24-year time horizon.

The base case alternative is obviously far too expensive relative to the returns from the wood only. The question is whether the (unquantified) environmental benefits will outweigh the extent to which the returns from the wood only, are negative. The most intensive management alternative will yield the highest wood volume and quality (highest pole:firewood ration) because of higher survival rates, and probably is the best alternative from the resource protection perspective.

The most attractive of the alternatives from the wood values only perspective, is no. 5, the least expensive alternative: planting only without any further treatment. Trees are planted in 3 x 4 meter spacing without any special site preparation, no guard protection, no fire protection, and no weeding. The financial return in this case is barely negative and the economic return (IRR) is slightly positive. The yield under this alternative, however, is assumed to be only one m3/ha/year indicating a high rate of mortality. The resource conservation value of this alternative is probably the lowest among the five. The question firebreaks and replanting options are omitted.

The results given in Table 13 serve to illustrate how expensive intensive forestry can be. Intensive forest management is not automatically synonymous with "good forestry." What may be biologically optimal for a particular site probably is not economically optimal. The important point to retain is that the major purposes of the forestry plantations are to plant on agriculturally marginal or unsuitable sites and to promote soil conservation. The wood benefits, therefore, are incidental and a "bonus." In the economic and financial analyses, however, only the wood benefits are quantified because the resource conservation benefits are inherently difficult to identify and quantify.

TABLE 12: BASE CASE CASH FLOWS

		FINANCIAL			ECONOMIC		
Yr	Treatment	Costs	Benefits	NCF	Costs	Benefits	NCF
1	SP,G,PL,W,FBC	30,603		(30,603)	18,362		(18,362)
2	G,RP,W,FBM	10,381		(10,381)	6,228		(6,228)
3	G,W,FBM	9,825		(9,825)	5,895		(5,895)
4	G,FBM	7,825		(7,825)	4,695		(4,695)
5	G,FBM	7,825		(7,825)	4,695		(4,695)
6	G,FBM,HARVEST	7,825	4,000	(3,825)	4,695	4,000	(695)
7	G,W,FBM	9,825		(9,825)	5,895		(5,895)
8	G,W,FBM	9,825		(9,825)	5,895		(5,895)
9	G,W,FBM	9,825		(9,825)	5,895		(5,895)
10	G,FBM	7,825		(7,825)	4,695		(4,695)
11	G,FBM	7,825		(7,825)	4,695		(4,695)
12	G,FBM,HARVEST	7,825	4,000	(3,825)	4,695	4,000	(695)
13	G,W,FBM	9,825		(9,825)	5,895		(5,895)
14	G,W,FBM	9,825		(9,825)	5,895		(5,895)
15	G,W,FBM	9,825		(9,825)	5,895		(5,895)
16	G,FBM	7,825		(7,825)	4,695		(4,695)
17	G,FBM	7,825		(7,825)	4,695		(4,695)
18	G,FBM,HARVEST	7,825	4,000	(3,825)	4,695	4,000	(695)
19	G,W,FBM	9,825		(9,825)	5,895		(5,895)
20	G,W,FBM	9,825		(9,825)	5,895		(5,895)
21	G,W,FBM	9,825		(9,825)	5,895		(5,895)
22	G,FBM	7,825		(7,825)	4,695		(4,695)
23	G,FBM	7,825		(7,825)	4,695		(4,695)
24	G,FBM,HARVEST	7,825	4,000	(3,825)	4,695	4,000	(695)

TABLE 13: RESULTS

Results:		Financial	Economic
Alt. 1, Base Case: All silvicultural options included. Yield: 8 m3	SEV	(104,928)	(101,832)
	NPV	(95,256)	(77,729)
	IRR	-164.5%	-117.2%
Alt. 2: Site prep. plant, weed, guard. Yield: 7 m3	SEV	(39,674)	(33,195)
	NPV	(36,016)	(25,338)
	IRR	-56.2%	-35.8%
Alt. 3: Plant, guard. Yield: 3 m3	SEV	(18,920)	(17,888)
	NPV	(17,176)	(13,654)
	IRR	-121.7%	-73.0%
Alt. 4: Plant, weed. Yield: 4 m3	SEV	(11,519)	(8,404)
	NPV	(10,457)	(6,414)
	IRR	-24.5%	-14.2%
Alt. 5: Plant only Yield: 1 m3	SEV	(2,141)	(752)
	NPV	(1,943)	(573)
	IRR	-2.2%	1.3%

The perceived resource conservation or environmental benefits lack precise definition, thus making their measurement questionable. People have different value perspectives for a given resource conservation benefit. To quantify, for example, the extent to which agricultural productivity increases in an area as a result of a forestry project upstream in the watershed would be a major and costly undertaking. It would entail, first, defining the impact area, which is no easy task, and second, deriving a believable multiplier effect that accurately quantifies the benefits attributable to the forestry plantation. The environmental benefits, nevertheless, are present and real, though not included in the analytical spreadsheets. Their presence, however, should be counted in the decision making process. The results given in Table 12 constitute information for decision makers. They are not the sole decision-making criterion. They may help to "short list" the alternatives to a choice that best balances the economic and resource conservation objectives. The base case alternative is clearly far too expensive and the fifth alternative is clearly ineffective from the resource conservation perspective. Alternative 4 appears the most reasonable of the five analyzed.

C. Aquaculture/Marais

The economics of aquaculture in the marais has been well documented. Based on previous analyses, aquaculture in the marais is financially and economically feasible and farmers compete for the opportunity to participate in aquaculture development programs.

In the Final Project Report of the National Fish Culture Project, Moehl and Hishamunda (1989) examine the financial and economic returns to fish culture in Rwanda. They found that production of tilapia in a pond of four ares in size (an are is 1/100 of a hectare) resulted in net positive returns to a farmer's investment. This was true for both an average management of the pond (yielding 14.5 kg/are/year) and above average management (producing 20 kg/are/year). The authors calculated the net present value of a farmer's investment over 25 years at 21,197 FRw. Net returns were negative in the first two years, but returns were greater than costs for years 3 to 25. The net benefit investment ratio was 17:1 (a project is acceptable if it has a benefit ratio greater than 1:1).

In the above analysis, the internal rate of return (IRR) for the farmer's investment was 41 percent. Since this is substantially greater than the cost of capital in Rwanda (about 15 percent), it more than justifies the farmer's investment. The net present value for the farmer's aquaculture operation, calculated at a 15 percent rate of interest, was 21,197 FRw. Table 14 presents the returns to a four are pond.

Moehl and Hishamunda, in order to estimate the returns to the Fish Culture Project as a whole, multiplied the discounted net return to an individual farmer by the number of farmers in the project. GOR expenditures were then subtracted to obtain an estimate of the net returns to the project. The IRR for the National Fish Culture Project as a whole was estimated at 27 percent, greater than the opportunity cost of capital. The net present value for the government's investment was calculated (at a 15 percent rate of interest) to be 19,564,849 FRw (approximately $260,000).

Table 14: Returns to a Four Are Pond

Production Level	14.5 kg/are/yr	20 kg/are/yr
a. Gross Returns	7,844	10,559
b. Operating Costs	3,614	5,018
c. Revenue above Operating Costs (a-b)	4,230	5,541
d. Depreciation	345	345
e. Gross returns to Management and Capital (c-d)	3,885	5,096
f. Management Costs	1,350	2,250
g. Returns to capital (e-f)	2,535	2,846

Source: Moehl and Hishamunda (1989), p. 20.

Table 15: Annual Gross Returns Per Are from Marais Crops

System	--Yield (kg/are)-- Crop 1	Crop 2	--Value (FRw/kg)-- Crops 1	Crops 2	Gross Returns per Are (FRw)
a. bean/bean	8	8	33	33	528
b. bean/sorghum	8	11.5	33	35	667
c. bean/corn	8	13	33	18	498
d. sweet potato/ sweet potato	70	70	11	11	1540
e. sweet potato/ soybean	70	8	11	34	1042
f. rice/rice	27	27	25	25	1350
g. fish		20		150	2445

Source: Moehl and Hishamunda (1989), p. 21.

Moehl and Hishamunda also assessed the economic viability of fish culture compared with alternative crops. Table 15 compares fish culture production of 20 kg/are/year with alternative uses of a marais plot.

Land is the limiting factor in marais production, and therefore a rational farmer would try to maximize returns to land. Figures for labor and other inputs are neither consistent nor reliable. There is reason to believe, however, that other crops grown in the marais are as labor intensive as fish culture. In any case, labor is surplus in most rural areas and there is little competition for this resource. At the same time, Rwandan agriculture uses notably few inputs, such as pesticides and fertilizer.

Table 16 presents gross returns to land and labor to fish culture with that of alternative crops. This table demonstrates that the return to land from fish production are nearly 40 percent greater than its nearest competitor, sweet potatoes.

Moehl and Hishamunda concluded that fish culture is a profitable activity for Rwandan farmers, competing favorably with alternative marais crops. Furthermore, they point out, fish farming has no defined season. Therefore harvests can be planned to take place when labor demand for other crops is not high, or during periods when farmers have little income from other sources. Fish culture does, however, compete with other crops for inputs in the form of organic fertilizers (although the integration of fish culture with crop and livestock production could alleviate this).

Economics of Integrated Fish Ponds

The above analyses examined the economics of cultivating fish in isolation. Additional benefits, however, would be entailed if fish culture is integrated with livestock (e.g. ducks, chickens or pigs) and crop production. If the returns to the fish ponds are high, the farmer can afford to make additional investments towards full integration of the aquaculture activity, i.e. investments in livestock infrastructure and in improved gardening practices. In economic terms, the farmer will be able to spend up to the point where the NPV is zero, or where the discount rate used (which should reflect the opportunity cost of capital) equates benefits and costs.

Tables 17 (assumptions) and 18 (analysis) recreate the cash flows on the cost side of the analysis carried out by Hishamunda, et. al. (1987). Although the benefit side could not be accurately re-created from the report, the benefit cash flow given in Table 17 is close. The NPV (using the same discount rate of nine percent) is 31,748 FWR. The IRR is 32.1 percent. This result indicates that investment in fish ponds is financially attractive vis-a-vis alternative investment opportunities (if the discount rate used reflects the opportunity cost of capital).

Table 16. Gross Returns to Land and Labor for Fish Culture and other Crops

Crop	Gross Returns to Land (000 FRw/ha)	Gross Returns to Labor (FRw/day)
Fish (tilapia)	271.5	181
Yams	105.4	n/a
Cassava	90.9	520
Rice	73.9	n/a
Taro	70.0	n/a
White Potatoes	63.9	376
Sweet Potatoes	50.2	314
Soy Beans	31.0	n/a
Dry Beans	25.3	168
Sorghum	23.2	166
Dry Corn	20.4	151

Source: Moehl and Hishamunda, p. 22.

TABLE 17: ASSUMPTIONS FOR AN ANALYSIS OF INTEGRATED FISH CULTURE

Discount rate:	9%
Fingerlings:	15% of total harvest weight
Weight/fingerlings:	10 grams
Price/fingerling:	3 FWR each
Size of pond:	4 are
Price/kg fish:	150 FWR

TABLE 18: NPV AND IRR OF A 4-ARE FISH POND

Year	Construction	Labor	Fingerlings	Total Cost	Yld Kg/ are/yr	Total Revenue	Net Cash Flow
1	11,500	1,302	801	13,603	0.0	0	(48,208)*
2		5,872	801	6,673	12.6	8,694	2,021
3		6,800	801	7,601	18.4	12,696	5,095
4		7,440	801	8,241	20.0	13,800	5,559
5		8,448	1602	10,050	20.0	13,800	3,750
6		7,440	801	8,241	20.0	13,800	5,559
7		7,440	801	8,241	20.0	13,800	5,559
8		7,440	801	8,241	20.0	13,800	5,559
9		7,440	801	8,241	20.0	13,800	5,559
10		8,448	1602	10,050	20.0	13,800	3,750
11-25		7,440	801	8,241	20.0	13,800	5,559

NPV @ 9% without addit. inv: 0 NPV, pond only 31,748
IRR with added inv.: 9.0% IRR, pond only 32.1%

* Note: the initial investment figure of 48,208 FRW includes the 34,605 FWR additional investment in livestock infrastructure and garden improvements. The investment in the fish ponds is only 48,208 - 34,605 = 13,603 FRW.

Given this positive NPV, the farmer has some minimal financial flexibility. In order to have a fully integrated fish culture system, additional investments will have to be made in livestock infrastructure and improved gardening practices. If the discount rate used reflects the opportunity cost of capital, or the rate of return that can be reasonably expected from alternative investments, then the farmer will be able to afford to spend up to 34,605 FWR towards the requirements for an integrated system. This amount represents approximately 10 percent of the total cost of a pig installation, four percent of a duck installation and three percent towards a chicken installation.

The average yield figure of 20 kg/are assumed in Table 17 is a conservative estimate. Yields have reached as high as 64 kg/are (in a cooperative pond) which indicates there is much room for improvement. Table 17 shows the amounts that could be made available for investments towards a fully integrated aquaculture system given the nine percent discount rate, if yield improvements were made.

The figures given in Table 18 represent the amount an "economically rational" farmer should be willing to spend towards a fully integrated aquaculture system and still be competitive with alternative investment opportunities, all things being equal. The more productive he is, the more funds he will be able to afford to invest. However, the real world is more complicated. The investments in the livestock infrastructure and improved gardening methods will have to made in year one so that the system is fully integrated from the start. The farmer does not have the investment funds, and the banks will not readily lend to individual farmers or groupements against the possibility that the fish farming will succeed. The important point about the figures in Table 18 is that, as long as the NPV from the fish ponds only is positive, farmers may be able and willing to make additional investments toward the fully integrated system, if credit was made available. This would suggest that a study on credit availability and the financial constraints to large scale replication of successful fish culture interventions would be appropriate.

TABLE 18: AVAILABILITY OF ADDITIONAL INVESTMENT FUNDS

Avg. Yield Kg/Are	Can Afford to Spend (FWR)
20	34,605 (Base Case)
30	89,500
40	144,000
50	200,000
60	254,000

X
240

Concluding Points of Fish Culture

Fish culture supplies a cheap source of high quality protein. The price per kilogram of fish is relatively high. However, when the comparison is based on kilograms of protein, the price of fish compares favorably with other protein sources. This is because the protein content of fish is fairly high (35 percent, as compared to 23 percent in beef). In many areas, demand for fish is greater than supply, with some sales taking place on the pond bank during harvesting. The principal problem remains one of buying power in rural areas, due to the subsistence nature of the agriculture in these areas, and their poorly development rural and marketing infrastructure. This shortage of ready cash can make selling fish, as well as numerous other crops, difficult. In such areas, the profitability of fish can perhaps be increased through more organized marketing (e.g. scheduling harvests to coincide with principal market days, developing intermediaries, and staggering harvests.

In conclusion, the returns to farm families from fish culture appear to be adequate to encourage farmers to engage in this activity. The rapid spread fish ponds in Rwanda is testament to the positive economics. Moreover, fish culture represents an appropriate use of the country's resources, particularly given the national goal of improving income and nutrition in rural areas. Finally, fish production uses local resources, such as animal wastes, and can complement animal production through integrated aquaculture practices. It does not require external inputs and is therefore not a drain on Rwanda's foreign exchange reserves. This makes fish culture a relatively sustainable activity from the macroeconomic perspective.

D. Biodiversity and Natural Forest Management

The biodiversity component of the project is limited to two geographic areas, the Parc de Volcans and the Nyungwe Forest Reserve. The benefits of these forests, particularly in terms of watershed protection, in incalculable. Moreover, in the long term, the economic value of the biological diversity they contain could dwarf any short-term benefits derived from their exploitation and destruction. Unfortunately, solid information on the economic value of these natural forests is inadequate, either to gauge recent impact at the local or national level, or to forecast the economic costs and benefits of the proposed project interventions.

While many believe that the untapped potential of "back-pack" and "ecological tourism" is large, the present market absorptive capacity is unassessed. Moreover, increasing competition exists throughout the region from Uganda, Zaire and Burundi. To assess better the tourist market potential, it is recommended that the project finance a comprehensive marketing study. More importantly, the project should also finance a study to determine how best to insure that the local people, who shoulder nearly all the opportunity costs of protection and tourism development, benefit to the fullest extent possible.

The national economic value of the Parc Nationale des Volcans (PNV) has been exploited to a great degree. To allow conservation to pay for itself, and to draw the interest of the GOR in protecting the PNV, a tightly-controlled tourism program, focused on gorilla visits, was established in 1979

by the MGP. This program has been extremely successful economically, currently bringing in the equivalent of approximately $400,000/year in direct park receipts, and an additional estimated $2,000,000/year in indirect revenue (hotels, restaurants, vehicle rental, etc). Figures 1 and 2 below depict current visitation and currency generation trends.

Tourist saturation in VNP is a major constraint. Presently a maximum of 24 tourists/day can be accommodated for gorilla visits - 4 groups of 6 persons each. While the financially opportune action would be to increase per group numbers, there are unknown costs associated with such short-sighted economics, stress and disease transmission risks and reduced quality of visitation being among the most obvious. Per visit prices have increased nearly fourfold in the last four years ($170/day now) and the price inelasticity must have its limit.

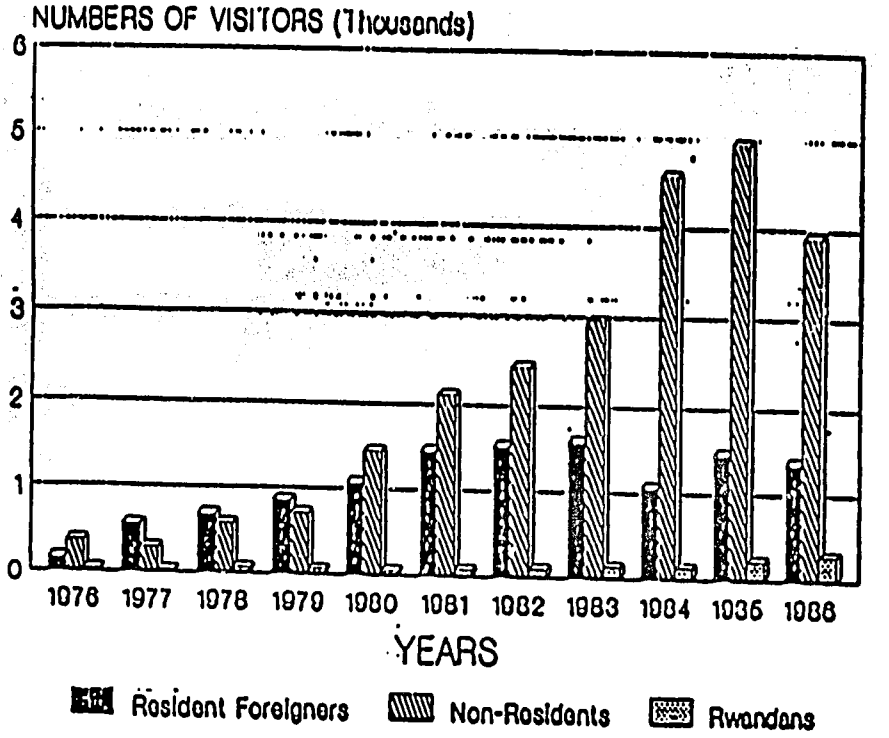
If the tourist industry is to become a significant part of the Rwandan Economy, diversification of foreign and Rwandan tourist activities are needed. Alternatives which can increase value-added revenues by encouraging tourists to stay longer and at different locations should be investigated.

The major economic activities being exploited in the Nyungwe Forest include commercial timber harvesting, fuelwood and bamboo collection, gold mining, game from unregulated hunting, and honey production. Many of these activities are illegal either due to lack of permits or outright contravention to existing statutes. Exploitation of some of these products is certainly based on short-term economic gain and would be detrimental to the preservation of the forest if continued at current levels. The GOR has developed plans, however, to monitor these uses in one sector of the forest and allow only those activities shown to be sustainable to continue.

Results from recent timber inventories suggest that timber is not available for exploitation in commercial quantities, within Nyungwe. The Swiss-sponsored inventory found that only three percent of Nyungwe's standing volume is commercially exploitable. If the mean annual increment is $4m^3$/year/hectare and the exploitable area is 20,000 hectares, this would yield an allowable cut of $0.12m^3$/year/hectare and an annual commercial yield of some $2,400m^3$. This has a large potential market value and substantial employment benefits. However, given Nyungwe's slopes, difficulty of access, and distance to market, it is not feasible to expect more than a fraction of this resource to be exploited by traditional pit sawyers. Fortunately, traditional pit sawing is the extraction method which causes the least damage and should be supported by the project.

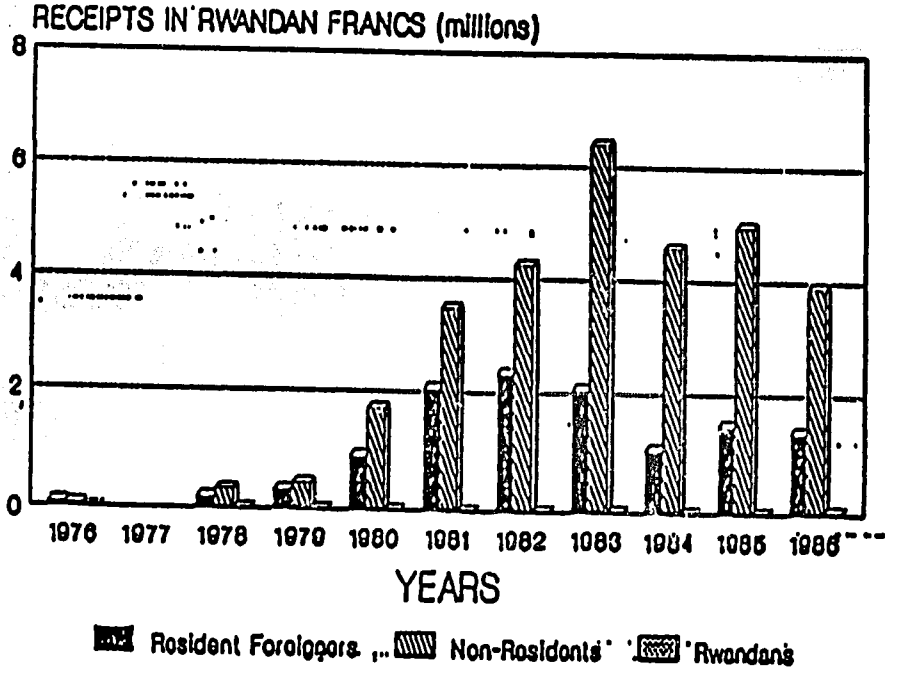
The NYZS will promote non-consumptive uses of the forests, with a tourist program as the major component. At present approximately 40 visitors per week venture into Nyungwe with expansion to some degree feasible. Guides will be trained, and trails developed for nature walks and scheduled visits to colobus monkeys will be organized . There is, however, inadequate information as to the market potential for expanded tourism in Nyungwe. This will necessitate further study and monitoring by ORTPN aided by project staff.

Figure 2. Visitation to Volcano National Park 1976-1986



source: ORTPN 1987

Figure 3. Receipts from tourism in Volcano National Park 1976-1986*



source: ORTPN 1987.

E. Analytical Framework for Economic and Financial Analysis

This section provides a general step-wise analytical framework for carrying out economic and financial analyses of interventions during project implementation. As mentioned in Section 1, there is little information available in Rwanda on variables essential to economic and financial analysis of NRM activities. Such information will have to be collected before any reliable analytical results can be generated.

1. Economic and Financial Analyses

Economic and financial analyses should be carried out for all technical project components during project implementation. The difference between economic and financial analysis is one of perspective rather than method. The same discounted cash flow method can be applied in both analyses. Only the assumptions and the point-of-view from which the analyses are made, differ. Hence, the results and their significance differ. Financial analysis is from the individual investor's point-of-view. It measures the private returns of a project to the investor using actual costs and revenues. The analysis does not consider whether the costs and revenues are subsidized or fixed or otherwise distorted by some government regulation. Economic analysis measure the returns that accrue to society as a whole regardless of who invests or receives the benefits. The analysis is neutral to the income distribution effects of the project. Taxes, subsidies and other government regulations affecting prices and costs, are regarded as transfer payments within the economy and are not reflected in the cash flows of the project.

Time series information on the crucial economic and financial variables must be collected. They include the real discount and cost and price appreciation rates. Real rates are adjusted for the influence of inflation. All analyses should be carried out in real, not nominal terms.

The basic procedures for carrying out NRM economic and financial analyses are briefly outlined below. In the context of the project, the information associated with each of the steps could be collected both on-farm and from demonstration plots. A summary of the information requirements is presented in Table 18 below.

2. Specify a Range of Management Alternatives

In forestry, agroforestry, fish culture and other NRM interventions, there are many different ways or alternatives of achieving objectives. Each alternative is associated with a particular cash flow evolution over time. Some are expensive, others are inexpensive. Intensive management alternatives produce more of the desired end product but are more costly. Less intensive alternatives produce less product but are also less expensive. In soil conservation, agroforestry, forestry and other NRM interventions there is literally an infinite number of alternatives and combinations thereof that one could apply, including different species, spacing, maintenance frequency and intensity. etc.

The purpose of analyzing several different alternatives is not to identify and choose the economically optimal alternative to implement. It

means, rather, that more information will be made available to the decision makers, in order to enable them to make better resource allocation decisions. They still may choose to implement non-economic alternatives for a variety of reasons. But when they do, they will have the information to measure the economic tradeoffs between the alternatives.

3. Estimate Yield Response to Management Alternatives

The reasons for promoting NRM interventions are ultimately to foster sustained yield management of the natural resource base, to improve soil productivity on the farms, and to increase the output of products (higher crop yields, wood products, etc.). These are the benefits of the interventions which must be measured and counted as returns on the investments. In soil conservation and agroforestry interventions, the direct benefits are the increases in crop yields the farmer can expect. In forestry, the direct benefit is the wood produced -- fuelwood, poles and sawn logs.

4. State the Base Case Assumptions

Financial and economic analyses must be anchored to a set of assumptions and predictions about the future. The base case scenario should reflect the most realistic assessment of the probable future behavior of the variables. Assumptions must be carefully developed, and justified, for all of the information categories listed in Table 19 below.

5. Interpret the Results

This step involves the comparison of returns associated with each of the alternatives considered. Always include a "do nothing" option. All of the alternatives should be compared against each other as well as against the do nothing alternative. The alternative with the highest economic return is economically optimal. This return is competitive if it exceeds or at least equals the returns one could reasonably expect to obtain from alternative investments.

6. Carry Out Sensitivity Analysis

Sensitivity analyses cover the "what-if" questions. Although base case assumptions are supposed to representative and realistic, the real world is filled with uncertainties and all variables are subject to unanticipated fluctuations. What would happen to the analytical results if the price were X instead of the base case assumption of Y? What would happen to the results if costs were higher or lower than those originally assumed in the base case? The base case assumptions should be changed one by one and the effects on the analytical results determined. Where a large change in an assumption causes only a small change in the overall result, the assumption is not very sensitive and need not be as carefully monitored. Where, on the other hand, a small change in the assumption triggers a large change in the overall result, this assumption is sensitive and should be carefully watched.

7. Analytical Techniques

The most common analytical techniques include net present value (NPV), benefit/cost ratio (B/C), internal rate of return (IRR), and for forestry

interventions -- a special forestry application of the NPV technique, the soil expectation value (SEV). The SEV is used less frequently, although it is the most correct approach, particularly in short rotation forestry analysis. All of the techniques are standard and well documented in the economics literature and are not described in detail here. The NPV approach is recommended over the IRR and B/C approaches for all interventions except forestry. The SEV approach is recommended for the forestry interventions.

TABLE 19: INFORMATION REQUIREMENTS

Info. Categories	How
ECONOMIC INFORMATION	
Discount rate	Time series of bank lending, savings rates, indices, etc. Use real rates (1).
Price Appreciation	Time series of agricultural, forestry and fish prices, indices, etc. Use real rates
Cost Appreciation	Time series of labor and materials costs, indices, etc. Use real rates.
Unemployment	The shadow price of labor (2) depends on the rate of unemployment in the country.
Subsidies	If materials used in the interventions (seedlings, etc.) are subsidized, the real (unsubsidized) price must be determined and used in the economic analysis.
Fixed prices	Identify where GOR has fixed prices (producer or consumer) on the agricultural, forestry or fish products. Use the fixed prices for the financial analysis and the true prices for the economic analysis.
INTERVENTIONS	
Labor (Time)	How many person days it takes to realize the investment (site preparation, transportation of seedlings to the field, planting, annual maintenance). Identify and measure each of the activities required in terms of the number of person days for each.
Materials Costs	Cost of seedlings, subsidized (financial analysis) or full market price (economic analysis), fertilizer costs, any other materials costs required for the interventions.
Labor Costs	Labor cost/day, supervisory and unskilled.

Crop Yields	Measure crop yields before intervention to establish reference point. Measure crop yields during project period w/interventions.
Wood Yields	Measure growth and yields in forestry plantations annually.
Fish yields	Measure all harvests
Stumpage Prices	For forestry plantations, derive stumpage prices. Buyer: final market prices (fuelwood, poles, sawn logs) less all costs of bringing the products to market. Residual is the stumpage price. Seller: stumpage price is the total of all production costs.

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1. $$\text{Real rate} = \left(\frac{1 + \text{nominal rate}}{1 + \text{inflation rate}} - 1\right) \times 100$$

2. Use shadow prices for labor in the economic analysis when there is unemployment in the country. When a project employs people who are otherwise producing nothing, production is not foregone elsewhere and the true economic wage is zero.

ANNEX I

DETAILED COST ESTIMATES

This annex is divided into four sections:

- Section A: a Pro Forma Budget for the NRM Project which details expenditures by fiscal year and by budget element.
- Section B: a breakdown of project inputs for both USAID and the GOR.
- Section C: detailed information on the calculation of technical assistance, training, and commodity costs.
- Section D: a detailed breakdown of project expenditures by project component.

SECTION A. PRO FORMA BUDGET

The cost estimate and financial plan for the Natural Resources Management Project, as shown on Table I, is based on the following assumptions and calculations:

- Standard costs for contractor services, averaged $18,000 per person/month for services including overseas travel, with 5 percent added for inflation in FY 90.

- An estimated $200,000 will be provided through a U.S. PVO "buy-in" mechanism to finance the Soil Conservation and Agroforestry component.

- An estimated $200,000 will be provided through AID/W's Natural Resources Management Support Project to finance the Natural Forest Management component.

- The design of NRMP required the lower cost in-country and third-country training options over U.S. based training.

- NRMP Pro Forma Budget (attached).

- Financing Plan activities (attached).

- Unit costs for goods and services (attached).

NATURAL RESOURCES MANAGEMENT PROJECT (696-0129)
PRO FORMA BUDGET (IN THOUSANDS OF U.S. DOLLARS)

USE OF FUNDS	QUANT.	PERSON MONTHS	GOR CONTRI-BUTION	A.I.D. CONTRI-BUTION	TOTAL COMPONENT AMOUNT	PROJECTED EXPENDITURES OF A.I.D. CONTRIBUTION Y1 89	Y2 90	Y3 91	Y4 92	Y5 93	Y6 94	TOTAL 1989-1994
1. TECHNICAL ASSISTANCE			0.0	2,116.5	2,116.5							
a) Project Coordination												
Long term Advisor		48		708.0		0.0	177.0	177.0	177.0	177.0	0.0	708.0
Civil Engineer		12		100.0		5.0	45.0	40.0	10.0	0.0	0.0	100.0
Short term consultants		12		364.5		0.0	85.0	85.0	82.0	75.0	37.5	364.5
SubTotal				1,172.5								
b) Marais Management												
Long term Advisor		18		60.0		10.0	35.0	15.0	0.0	0.0	0.0	60.0
SubTotal				60.0								
c) Fish Culture												
Short term consultants		10		150.0		0.0	100.0	25.0	25.0	0.0	0.0	150.0
SubTotal				150.0								
d) Soil Conservation + Agroforestry						0.0						
Long term Advisor		24		200.0		0.0	50.0	50.0	50.0	50.0	0.0	200.0
Short term consultants		8		120.0		0.0	30.0	30.0	30.0	30.0	0.0	120.0
ST TDY - runoff plot analysis		2		35.0		0.0	20.0	10.0	5.0	0.0	0.0	35.0
ST TDY - erosion problems		2		25.0		0.0	15.0	10.0	0.0	0.0	0.0	25.0
SubTotal				380.0								
e) Environment Policy												
Long term advisor		24		354.0		0.0	177.0	177.0	0.0	0.0	0.0	354.0
SubTotal				354.0								
2. TRAINING			345.0	979.0	1,324.0							
a) Marais Management												
Short term/Third country				30.0		0.0	10.0	10.0	10.0	0.0	0.0	30.0
In-country				200.0		0.0	95.0	82.0	18.0	5.0	0.0	200.0
Personnel			253.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0
Formation			92.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0
SubTotal			345.0	230.0								
b) Fish culture												
Long Term/Masters	2	48		120.0		0.0	60.0	0.0	60.0	0.0	0.0	120.0
Short term/Third country				15.0		0.0	10.0	0.0	5.0	0.0	0.0	15.0
In-country				130.0		0.0	65.0	28.0	27.0	10.0	0.0	130.0
SubTotal				265.0								

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NATURAL RESOURCES MANAGEMENT PROJECT (696-0129)
PRO FORMA BUDGET (IN THOUSANDS OF U.S. DOLLARS)

USE OF FUNDS	QUANT.	PERSON MONTHS	GOR CONTRI-BUTION	A.I.D. CONTRI-BUTION	TOTAL COMPONENT AMOUNT	PROJECTED EXPENDITURES OF A.I.D. CONTRIBUTION Y1 89	Y2 90	Y3 91	Y4 92	Y5 93	Y6 94	TOTAL 1989-1994
Training (continued)												
c) Soil conservation + Agroforestry												
long term/masters	1	24		60.0		0.0	60.0	0.0	0.0	0.0	0.0	60.0
Short term/ICRAF Workshops				70.0		0.0	20.0	20.0	20.0	10.0	0.0	70.0
In-country				20.0		0.0	10.0	0.0	10.0	0.0	0.0	20.0
SubTotal				150.0								
d) Natural Forest Management												
i) Nyungwe forest												
Short term/Third country				24.0		0.0	0.0	24.0	0.0	0.0	0.0	24.0
International workshops				20.0		0.0	10.0	0.0	10.0	0.0	0.0	20.0
Incountry				40.0		0.0	10.0	10.0	10.0	10.0	0.0	40.0
ii) Karisoke Center												
In-service training				55.0		0.0	20.0	20.0	15.0	0.0	0.0	55.0
iii) Mountain Gorilla Project												
Third country training				40.0		0.0	40.0	0.0	0.0	0.0	0.0	40.0
In-country workshop				50.0		0.0	20.0	20.0	10.0	0.0	0.0	50.0
Conservation Educ. Program				25.0		0.0	7.5	5.0	5.0	5.0	2.5	25.0
Materials development				50.0		0.0	15.0	15.0	15.0	5.0	0.0	50.0
SubTotal				304.0								
e) Environmental Policy												
Third country/Study tours				20.0		0.0	10.0	10.0	0.0	0.0	0.0	20.0
In-country workshops				10.0		0.0	5.0	5.0	0.0	0.0	0.0	10.0
SubTotal				30.0								
3. COMMODITIES			51.0	894.5	945.5							
a) Project Coordination												
Computer Equipment	1			10.0		10.0	0.0	0.0	0.0	0.0	0.0	10.0
Office equipment				8.0		4.0	4.0	0.0	0.0	0.0	0.0	8.0
Vehicle	1			20.0		0.0	0.0	20.0	0.0	0.0	0.0	20.0
Household furnishings				30.0		30.0	0.0	0.0	0.0	0.0	0.0	30.0
Subtotal				68.0								
b) Marais Management												
Vehicles	2			70.0		0.0	70.0	0.0	0.0	0.0	0.0	70.0
Training materials				10.0		0.0	10.0	0.0	0.0	0.0	0.0	10.0
Rural training equip.				115.0		0.0	75.0	40.0	0.0	0.0	0.0	115.0
Commnes/Tech. equipment				30.0		0.0	0.0	30.0	0.0	0.0	0.0	30.0
Computer equip.	1			10.0		0.0	10.0	0.0	0.0	0.0	0.0	10.0
DAHA misc. equipment				20.0		0.0	10.0	10.0	0.0	0.0	0.0	20.0
SubTotal				255.0								

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NATURAL RESOURCES MANAGEMENT PROJECT (696-0129)
PRO FORMA BUDGET (IN THOUSANDS OF U.S. DOLLARS)

USE OF FUNDS	QUANT.	PERSON MONTHS	GOR CONTRI-BUTION	A.I.D. CONTRI-BUTION	TOTAL COMPONENT AMOUNT	PROJECTED EXPENDITURES OF A.I.D. CONTRIBUTION Y1 89	Y2 90	Y3 91	Y4 92	Y5 93	Y6 94	TOTAL 1989-1994
Commodities (continued)												
c) Fish Culture												
Vehicles	2			40.0		0.0	40.0	0.0	0.0	0.0	0.0	40.0
Computer equipment	1			10.0		0.0	10.0	0.0	0.0	0.0	0.0	10.0
Fishing equipment				30.0		0.0	10.0	10.0	10.0	0.0	0.0	30.0
SubTotal				80.0								
d) Soil Conservation + Agroforestry												
Vehicles	3			100.0		0.0	50.0	0.0	50.0	0.0	0.0	100.0
Motorbikes	7			21.0		0.0	21.0	0.0	0.0	0.0	0.0	21.0
Misc. equipment			15.0	29.0		0.0	6.0	10.0	8.0	5.0	0.0	29.0
SubTotal			15.0	150.0								
d) Natural Forest Management												
i) Nyungwe forest												
Vehicles	2			40.0		0.0	40.0	0.0	0.0	0.0	0.0	40.0
Motorbikes	3			7.5		0.0	7.5	0.0	0.0	0.0	0.0	7.5
Educational material				15.0		0.0	5.0	5.0	5.0	0.0	0.0	15.0
Field equipment				16.0		0.0	8.0	4.0	4.0	0.0	0.0	16.0
Furnishings/exhibit material				20.0		0.0	0.0	20.0	0.0	0.0	0.0	20.0
Office supplies				13.0		3.0	4.0	4.0	0.0	2.0	0.0	13.0
Park guards equip.			12.0									
ii) Karisoke Center												
Laboratory equipment				5.0		0.0	5.0	0.0	0.0	0.0	0.0	5.0
Computer equipment				10.0		0.0	10.0	0.0	0.0	0.0	0.0	10.0
Vehicle	1			20.0		0.0	20.0	0.0	0.0	0.0	0.0	20.0
Motorbikes	3			5.0		0.0	5.0	0.0	0.0	0.0	0.0	5.0
Park guards equipment			12.0									
iii) Mountain Gorilla Project												
Vehicles	2			40.0		0.0	40.0	0.0	0.0	0.0	0.0	40.0
Office Equipment				15.0		5.0	10.0	0.0	0.0	0.0	0.0	15.0
Audio visual and exhibiting materials and equipment				30.0		0.0	10.0	20.0	0.0	0.0	0.0	30.0
Office supplies				25.0		2.5	5.0	5.0	5.0	5.0	2.5	25.0
Park guards equipment			12.0									
SubTotal			36.0	261.5								
e) Environmental Policy												
Vehicle	1			25.0		0.0	25.0	0.0	0.0	0.0	0.0	25.0
Office furnishings				10.0		0.0	5.0	5.0	0.0	0.0	0.0	10.0
Household furnishing				30.0		30.0	0.0	0.0	0.0	0.0	0.0	30.0
Computer and other equipment				15.0		0.0	15.0	0.0	0.0	0.0	0.0	15.0
SubTotal				80.0								

NATURAL RESOURCES MANAGEMENT PROJECT (696-0129)
PRO FORMA BUDGET (IN THOUSANDS OF U.S. DOLLARS)

USE OF FUNDS	QUANT.	PERSON MONTHS	GOR CONTRI-BUTION	A.I.D. CONTRI-BUTION	TOTAL COMPONENT AMOUNT	PROJECTED EXPENDITURES OF A.I.D. CONTRIBUTION Y1 89	Y2 90	Y3 91	Y4 92	Y5 93	Y6 94	TOTAL 1989-1994
4. CONSTRUCTION			300.0	945.0	1,245.0							
a) Marais Management												
Canals + small warehouse				170.0		0.0	0.0	70.0	70.0	30.0	0.0	170.0
SubTotal				170.0								
Construction continues:												
b) Fish Culture												
Addition to Kigembe station and 3 regional houses			23.0	200.0		0.0	75.0	75.0	50.0	0.0	0.0	200.0
Fish culture centers	7		37.0	375.0		0.0	50.0	150.0	125.0	50.0	0.0	375.0
SubTotal			60.0	575.0								
c) Soil Conservation + Agroforestry												
Office building in Ruhengeri			40.0	100.0		0.0	75.0	25.0	0.0	0.0	0.0	100.0
Land for Office + Nurseries			20.0									
SubTotal			60.0	100.0								
d) Natural Forest Management												
i) Nyungwe forest												
Project staff housing			80.0									
Interpretive center			25.0	50.0		0.0	10.0	40.0	0.0	0.0	0.0	50.0
SubTotal			105.0	50.0								
ii) Mountain Gorilla Project												
Interpretive center			75.0	50.0		0.0	10.0	40.0	0.0	0.0	0.0	50.0
SubTotal			75.0	50.0								
5. OTHER COSTS			2,483.0	2,115.0	4,598.0							
a) Project Coordination												
Office rental				54.0		0.0	12.0	12.0	12.0	12.0	6.0	54.0
Office furn./Oper. Costs and supplies				46.0		4.0	16.0	8.0	8.0	6.0	4.0	46.0
Personnel			32.0	42.0		2.0	8.8	8.8	8.8	8.8	4.8	42.0
House Rental				52.0		0.0	13.0	13.0	13.0	13.0	0.0	52.0
Vehicle Maintenance				22.5		0.0	5.0	5.0	5.0	5.0	2.5	22.5
SubTotal			32.0	216.5								
b) Marais Management												
Formation of Groupments				15.0		0.0	5.0	5.0	5.0	0.0	0.0	15.0
Research				55.0		0.0	20.0	20.0	15.0	0.0	0.0	55.0
Vehicle operations/maint.			40.0	40.0		0.0	10.0	20.0	10.0	0.0	0.0	40.0
SubTotal			40.0	110.0								

NATURAL RESOURCES MANAGEMENT PROJECT (696-0129)
PRO FORMA BUDGET (IN THOUSANDS OF U.S. DOLLARS)

USE OF FUNDS	QUANT. PERSON MONTHS	GOR CONTRI-BUTION	A.I.D. CONTRI-BUTION	TOTAL COMPONENT AMOUNT	PROJECTED EXPENDITURES OF A.I.D. CONTRIBUTION Y1 89	Y2 90	Y3 91	Y4 92	Y5 93	Y6 94	TOTAL 1989-1994
Other Costs (continued)											
c) Fish Culture											
Applied research on topics			150.0		0.0	40.0	40.0	40.0	30.0	0.0	150.0
Personnel		1,080.0	50.0		0.0	27.0	23.0	0.0	0.0	0.0	50.0
Vehicle operations/maint.		24.0	15.5		0.0	6.0	9.5	0.0	0.0	0.0	15.5
Revolving credit/bicycles			4.5		0.0	4.5	0.0	0.0	0.0	0.0	4.5
Operating cost for centers		37.5	60.0		0.0	15.0	20.0	25.0	0.0	0.0	60.0
SubTotal		1,141.5	280.0								
d) Soil Conservation + Agroforestry											
Personnel		607.0	53.0		10.6	21.2	21.2	0.0	0.0	0.0	53.0
Local support for one PCV			20.0		0.0	5.0	5.0	5.0	5.0	0.0	20.0
Rent/expatriate			35.0		0.0	7.0	7.0	7.0	7.0	7.0	35.0
Rent/Rwanda Director		12.0	12.0		0.0	4.8	4.8	2.4	0.0	0.0	12.0
Vehicle operations/maint.		22.5	50.0		10.0	10.0	15.0	15.0	0.0	0.0	50.0
Local costs for AFRENA			200.0		0.0	50.0	50.0	50.0	50.0	0.0	200.0
Wischmeier runoff trials			30.0		3.0	6.0	6.0	6.0	6.0	3.0	30.0
Hydrology study			75.0		0.0	25.0	50.0	0.0	0.0	0.0	75.0
Communes forestry plans			20.0		20.0	0.0	0.0	0.0	0.0	0.0	20.0
Local costs-erosion control			200.0		0.0	50.0	50.0	50.0	50.0	0.0	200.0
Research + demonstra. center			100.0		0.0	24.0	24.0	24.0	22.0	6.0	100.0
Local costs-sector nurseries		6.0	100.0		0.0	24.0	24.0	24.0	22.0	6.0	100.0
SubTotal		647.5	895.0								
e) Natural Forest Management											
i) Nyungwe forest											
Personnel		233.0	80.0		8.2	15.9	15.9	15.9	15.9	8.2	80.0
Vehicle oper., maint., insur.			42.5		0.0	10.0	10.0	10.0	10.0	2.5	42.5
Publications/reportings			10.0		0.0	2.0	2.0	2.0	2.0	2.0	10.0
Research grants			125.0		0.0	25.0	50.0	50.0	0.0	0.0	125.0
Local costs		3.0									
ii) Karisoke Center											
Research Grants		8.0	150.0		0.0	40.0	40.0	40.0	30.0	0.0	150.0
Surveys			5.0		0.0	5.0	0.0	0.0	0.0	0.0	5.0
Map Development			20.0		0.0	10.0	10.0	0.0	0.0	0.0	20.0
Aerial photos			5.0		0.0	5.0	0.0	0.0	0.0	0.0	5.0
Vehicle operation/maint.			30.0		0.0	5.0	10.0	10.0	5.0	0.0	30.0
Operating costs			35.0		0.0	10.0	10.0	10.0	5.0	0.0	35.0
Personnel		115.0									
iii) Mountain Gorilla Project											
Personnel		216.5	40.0		0.0	0.0	15.0	15.0	10.0	0.0	40.0
Vehicle operation/maint.			25.0		0.0	5.0	5.0	5.0	5.0	5.0	25.0
SubTotal		575.5	567.5								

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USE OF FUNDS	QUANT.	PERSON MONTHS	GOR CONTRI-BUTION	A.I.D. CONTRI-BUTION	TOTAL COMPONENT AMOUNT	PROJECTED EXPENDITURES OF A.I.D. CONTRIBUTION Y1 89	Y2 90	Y3 91	Y4 92	Y5 93	Y6 94	TOTAL 1989-1994
f) Environment Policy												
Personnel			29.0									
House rental/Advisor				26.0		0.0	13.0	13.0	0.0	0.0	0.0	26.0
Local costs			17.5	10.0		0.0	5.0	5.0	0.0	0.0	0.0	10.0
Vehicle operation/maint.				10.0		0.0	5.0	5.0	0.0	0.0	0.0	10.0
SubTotal			46.5	46.0								
6. EVALUATION AND AUDIT				150.0	150.0							
a) Evaluation				100.0		0.0	0.0	50.0	0.0	50.0	0.0	100.0
b) Audit				50.0		0.0	0.0	0.0	50.0	0.0	0.0	50.0
SubTotal				150.0								
Sub-Total			3,179.0	7,200.0	10,379.0	157.3	2,517.2	2,133.2	1,454.1	838.7	99.5	7,200.0
7. INFLATION	5%		159.0	360.0	519.0	7.9	125.9	106.7	72.7	41.9	5.0	360.0
Sub-Total			3,338.0	7,560.0	10,898.0	165.2	2,643.1	2,239.9	1,526.8	880.6	104.5	7.560.0
8. CONTINGENCY	4.93%		164.7	373.0	537.7	8.1	130.4	110.5	75.3	43.5	5.2	373.0
GRAND TOTAL			3,502.7	7,933.0	11,435.7	173.3	2,773.5	2,350.4	1,602.1	924.1	109.6	7,933.0

SECTION B: DETAILED COST ESTIMATES: BREAKDOWN OF PROJECT INPUTS

I. AID CONTRIBUTION TO THE PROJECT

AID will finance the following inputs:

A. Technical Assistance

1. Long-term Technical Assistance (approximately $1,422,000)

A.I.D. will finance approximately 156 person months of long-term technical assistance in natural resources management:

- one project coordinator for 48 person months;
- one civil engineer for 12 person months;
- one advisor in marais management for 18 person months;
- one advisor in agroforestry and soil conservation for 24 person months. These services will be co-financed by a U.S. PVO to cover an additional 24 person months; and
- one advisor to MINIPLAN for 24 person months.

2. Short-term Technical Assistance (approximately $694,500)

USAID will finance approximately 34 person-months of short term technical assistance:

- consultants for fish culture for 10 person months;
- consultants for overall coordination for 12 person months; and
- consultants for the analysis of Wischmeier runoff plots for 2 person months
- consultants to develop plans for addressing erosion problems in the communes for 2 person months.

B. Training (approximately $979,000)

USAID will finance the following training activities:

1. Improved Marais Management

- computer science training for staff of the DAHA;
- 3 short-term training activities or study-tours for DAHA staff;
- 18 months (540 days) of in-country training for 30 students in rural engineering, including room and board, instructor costs, and miscellaneous costs encountered in implementing the field work (stage) aspects of the training program; and
- in-country training of farmers and commune officials.

2. Fish Culture in the Marais Component

- two Master's degree candidates in fish culture;
- two short-term training activities or study tours for SPN staff;
- in-country training in construction of fish ponds and facilities for integrated fish culture for 20 new moniteurs and 6 members of a mobile extension team;
- in-country training of up to 45 Pisciculture National moniteurs; and
- in-country training of students, cooperative members, and farmers in integrated fish culture.

3. Soil Conservation and Agroforestry Component

- one master's degree in agroforestry or soil conservation;
- two short-term training activities or study tours for local project staff in soil conservation and agroforestry;
- participation by local project staff in two seminars sponsored by AFRENA;
- in-country training of communal extension agents; and
- training materials for extension, and the organization of field days for farmers.

4. Conservation of Nyungwe Forest

- third country training for Nyungwe Forest Program local staff;
- attendance by project staff to two international workshops; and
- attendance by project staff in four international short courses or various aspects of natural resources management and conservation.

5. Karisoke Research Center

- in-service training and workshops for local project staff.;

6. Mountain Gorilla Project

- third-country training for project staff;
- attendance at five workshops for local project staff;
- a conservation education program; and
- development of training materials for the conservation education program.

7. Environmental Planning and Policy Assistance to MINIPLAN

- two in-country workshops for MINIPLAN staff; and
- two third country short courses or study tours for MINIPLAN staff.

C. Commodities (approximately $894,500)

USAID will finance the following commodities:

1. Project Coordination

- computer equipment;
- office equipment;
- one four-wheel drive vehicle; and
- household furnishings.

2. Improved Marais Development

- one minibus;
- one 4-wheel drive (double cabin) truck;
- training materials (e.g. books, calculators, paper and other supplies) for the rural engineering training program;
- other engineering equipment for newly trained technicians; and
- miscellaneous field equipment for the DAHA.

3. Fish Culture in the Marais Component

- two small 4-wheel drive trucks;
- computer equipment for the Kigembe Fish Culture Center; and
- fishing equipment and supplies.

4. Soil Conservation and Agroforestry Component

- one pick-up truck;
- two 4-wheel drive vehicles;
- seven motorbikes; and
- miscellaneous equipment for agroforestry nurseries.

5. Conservation of Nyungwe Forest

- one pick-up truck;
- two 4-wheel drive vehicles;
- three motorcycles;
- office supplies;
- education materials;
- technical materials and field equipment; and
- furnishings and exhibiting materials for the interpretive center.

6. Karisoke Research Center

- laboratory equipment;
- computer equipment;
- office equipment;
- one 4-wheel drive vehicle; and
- three motorcycles.

7. Mountain Gorilla Project

- two 4-wheel drive vehicles;
- office supplies;
- office equipment; and
- exhibiting materials and audio-visual equipment.

8. Environmental Planning and Policy Assistance to MINIPLAN

- one vehicle;
- computer equipment; and
- office equipment.

D. Construction (approximately $945,000)

USAID will finance the following construction activities:

1. Improved Marais Development

- construction of canals and related works; and
- one small warehouse.

2. Fish Culture in the Marais Component

- seven communal fish culture centers in marais area; and
- additional construction at the Kigembe station and three regional stations.

3. Soil Conservation and Agroforestry Component

- one office building for the soil conservation and agroforestry team.

4. Conservation of Nyungwe Forest

- an interpretive center for the Nyungwe Forest Reserve.

5. Mountain Gorilla Project

- an interpretive center at Kinigi for the Parc des Volcans.

E. Other Costs (approximately $2,848,000)

USAID will finance the operating costs of the following activities

1. Project Coordination

- Coordination Unit (e.g. office rental, salaries of secretary, accountant, guards); and
- office furnishings, equipment and supplies.

2. Improved Marais Management

- research in marais management;
- formation of groupements within the communes; and
- operation and maintenance of project vehicles for 18 months.

3. Fish Culture in the Marais Component

- applied research on topics related to fish culture;
- salaries of up to 20 newly recruited Pisciculture National moniteurs for the first two years;
- operation and maintenance of project vehicles for 18 months;
- a revolving credit fund for the purchase of bicycles; and
- operation of the communal and regional fish culture centers for up to 36 months.

4. Soil Conservation and Agroforestry Component

- salaries of GOR project support staff in Ruhengeri Prefecture (e.g. 1 accountant, 1 secretary, 3 guards, 3 drivers) for 30 months;
- local costs for one or more Peace Corps Volunteers;
- rent for the expatriate technical advisor for 48 months;
- rent for the Rwandan field director in Ruhengeri for 30 months;
- operation and maintenance of project vehicles for 18 months;
- local costs of AFRENA agroforestry and soil conservation research activities;
- local costs for monitoring the Wischmeier runoff experiments;
- one study of the hydrology of Parc des Volcans's watersheds;
- local costs of preparing commune forestry plans;
- local costs of implementing agroforestry and soil conservation measures;
- startup and operation of 5 research and demonstration centers; and
- operating costs for sector nurseries.

5. Conservation of Nyungwe Forest

- salaries of a Rwandan assistant director, secretary, accountant, chauffeur, and other staff support;
- operation and maintenance of project vehicles;
- publications and reports; and
- research grants on biological and sociological aspects and issues pertaining to the Nyungwe forest.

6. Karisoke Research Center

- research grants for biological, physical, and sociological research related to the Parc des Volcans;
- surveys, map development, and aerial photos;
- operation and maintenance of project vehicles; and
- office operations and supplies.

7. Mountain Gorilla Project

- salaries of Rwandan personnel to staff the Kinigi interpretive center during the first three years; and
- operation and maintenance of project vehicles.

8. Environmental Planning and Policy Assistance to MINIPLAN

- logistical support costs, report publication, and other miscellaneous materials.

F. Evaluation and Audit (approximately $150,000)

- one mid-term evaluation;
- one final evaluation; and
- one non-federal audit.

II. GOR CONTRIBUTION TO THE PROJECT

The GOR will make the following "in-kind" contributions:

A. Personnel (approximately $2,284,500)

1. Project Coordination

- salary/benefits for one National Project Director for 60 months.

2. Research and Training in Marais Management Component

- salary/benefits of a coordinator for the training and marais management component for 60 person months;
- part-time salary/benefits a second MINAGRI engineer of a 60 month period; and
- salaries/benefits of 30 new rural technicians for 36 months.

3. Fish Culture in the Marais Component

- salaries/benefits of the Director of the Fish Culture Service, one A-0 level Training and Extension Specialist, one A-0 level Data Processing Specialist, and one assistant Fish Culture Director;
- salaries/benefits of eight regional supervisors, and 45 fish culture extension agents;
- salaries/benefits of six members of a mobile extension team;
- salaries of the 20 newly-recruited fish culture extension agents;
- salaries/benefits of support staff (e.g. one secretary, one typist, one accountant and three chauffeurs); and
- wages to workers at 5 fish culture stations.

4. Soil Conservation and Agroforestry Component

- salaries/benefits of one A_0 level Agronome, one A_2 level forester, and one A_2-level agronomist for 60 person months;
- salaries and benefits of 5 agricoms and 50 monagris;
- salaries/benefits of the support personnel for 30 months; and
- in-kind contributions of local officials (e.g. Burgomeisters).

5. Conservation of Nyungwe Forest

- salaries/benefits of two Rwandan technicians (one in conservatio education and one in forest utilization) for 60 months;
- salaries/benefits of 3 tourist guides for 60 months;
- salaries/benefits of one conservator for 60 months; and
- salaries/benefits of 20 guards for 60 months.

6. Karisoke Research Center

- salaries/benefits of anti-poaching patrols (approximately 20 guards).

7. Mountain Gorilla Project

- salaries/benefits of two Rwandan Conservation Education technicians, 20 park guards and guides for 60 months.

8. Environmental Planning and Policy Assistance to MINIPLAN

- salaries/benefits for a counterpart for the long-term advisor for 30 months; and
- salaries/benefits of additional GOR technicians that will be provided by MINIPLAN.

B. Training (approximately $345,000)

1. Research and Training in Marais Management Component

- student fees at training centers; and
- tuition fee paid by the 30 students, which will be used to procure additional training materials for the use of the students.

C. Infrastructure/Construction (approximately $300,000)

1. Fish Culture in the Marais Component

- facilities at the Kigembe Station and other fish culture stations (e.g. Runyinya, Nkungu, Gitarama, and Rushashi); and
- land for the construction of the seven integrated fish culture centers.

2. Soil Conservation and Agroforestry Component

- construction costs (including land) in excess of $100,000 for the office building to be used by the soil conservation and agroforestry team; and
- land for research and demonstration centers.

3. Natural Forest Management Component

- land for the Interpretative Center at Kinigi;
- land for the Nyungwe interpretative center;
- construction of project staff housing (three units) at Nyungwe;

D. Commodities (approximately $51,000)

1. Soil Conservation and Agroforestry Component

- 3 vehicles, office equipment and other furnishings from the former RRAM project.

2. Natural Forest Management Component

- miscellaneous equipment for park guards at the Nyungwe Forest;
- miscellaneous equipment for the anti-poaching patrols supervised by the Karisoke Research Center; and
- miscellaneous equipment for the park guards and guides at the Parc des Volcans.

E. Other Costs (approximately $199,500)

1. Research and Training in Marais Management Component

- operations and maintenance of project vehicles procured under the contract for 42 months; and
- salaries/benefits of two chauffeurs.

2. Soil Conservation and Agroforestry Component

- wages for local labor for sector nurseries ("umuganda" labor); and
- rent for a house for the Rwandan field director in Ruhengeri for 30 months.

3. Natural Forest Management Component

- local costs for Rwandan scientists conducting research in the Nyungwe forest; and
- local costs for Rwandan researchers at the Karisoke research center.

4. Environmental Planning and Policy Assistance to MINIPLAN

- secretarial support at the MINIPLAN; and
- equipment and other material support.

SECTION C. BASES FOR CALCULATING PROJECT COSTS

A. LONG-TERM TECHNICAL ASSISTANCE COSTS

Estimated costs of long term technical assistance are based on a two-year tour (24 person months) for one advisor with a spouse and two children, one in one high school age and one in grade school. The post of assignment is assumed to be Kigali, Rwanda. The estimated average Long-term Technical Assistance, costs per year is approximately $230,000.00.

Budget Item/Description	Amount
1. Salary (FS 1/14 @ $ 289 per day)	$142,480.00
2. Post Differential (25%)	35,620.00
3. Fringe Benefits (25%)	35,620.00
4. Cost of living Allowance (Section 920)	23,268.00
5. Defense Base Insurance (est. $ 125.00/mo.)	3,000.00
6. Travel to and from Post (est. 5,000.00 per traveller)	15,000.00
7. Air Freight to and from Post ($3.50 x 750 lbs.)	5,250.00
8. Sea Freight to and from Post ($2.50 x 7200 lbs. and POV)	18,000.00
9. Comsumables Allowance ($2.50 x 2500 lbs.)	6,250.00
10. Temporary lodging ($60 x 30 days)	1,800.00
11. Education Allowance (Section 920)	30,500.00
12. R & R Travel (est. 3,000 per traveller)	10,500.00
13. In-country Travel (est. $100/mo. x 20 trips)	2,000.00
14. Furnishings (PIO/C)	0.00
15. Appliances (PIO/C)	0.00
16. Storage (est. $600 p/y)	1,200.00
17. Utilities (est. $250/mo.)	6,000.00
18. Rent ($13,000)	27,000.00
19. Residential maintenance (est. $200/mo.)	4,800.00
20. Guard Service (est. $250/mo. x 24)	6,000.00
21. Emergency medical/visitation ($400 p/y)	800.00
22. Overhead (10% of salary)	37,508.00
23. Local support overhead (est. $3,000 p/y)	6,000.00
24. Subtotal	418,596.00
25. Inflation (5%)	20,947.80
26. Contingency (4.762%)	20,931.08
Total estimated cost for 24 months (lines 1 thru 26)	$460,458.16
Total estimated amount of Foreign Exchange	$382,358.00
Total estimated of Local Currency	$ 78,100.00

B. SHORT-TERM TECHNICAL ASSISTANCE COSTS

The estimated average short-term technical assistance cost for one person month is approximately $ 18,000

Budget Item/Description	Amount
1. Salary (25 days @ $250/day)	$6,250
2. Overhead (100% of salary)	6,250
3. Defense Base Insurance (estimate)	300
4. Travel:	
a. US - Rwanda - US air fare/per diem/MSE	4,000
b. In-country transportation	950
c. Miscellaneous	500
Total estimated cost for one person month	$18,000

C. TRAINING COSTS

Long-term U.S. Training in the U.S.

1. Institutional fees and Maintenance Allowance (12 months)	$ 25,200
Travel - International	5,000
TOTAL	$ 30,200

Short-term U.S. Training

1. Training Fees and Maintenance Allowance ($3,500/mo.)	$ 3,500
2. Travel - International	4,000
3. Travel - U.S.A.	250
TOTAL	$ 7,750

Third Country Short-term Training

1. Training Fees ($300/mo.) and Maintenance Allowance	$ 300
2. Travel - International	2,500
3. Ground Transportation	600
TOTAL	$ 2,800

Third Country Study Tours and Seminars (per month)

1. Travel - International (Round Trip)	$ 2,500
2. Ground Transportation (600/mo.)	600
3. Per Diem for 30 days	3,300
4. Logistical fees $ 400/mo.	400
Subtotal	$ 6,800
5. Overhead 80%	5,440
TOTAL	$ 12,340
ROUNDED	$ 12,000

In-Country Seminar (per week)

1. Participant Per diem (RF 1,000.00 p/day) for 30 participants for 6 days	$ 2,400

2.	Transportation round trip	1,500
3.	Training materials	500
4.	Transportation for field trips	500
5.	Administrative Support	1,500
6.	Miscellaneous Supplies	200
7.	Audio-visual rental fees	500
	TOTAL	$ 6,600

D. COMMODITIES

Vehicles (Unit Cost)

1.	4 X 4 WD Pick-ups Dbl/Cabine	$ 23,000
	Spare Parts	4,600
	Maintenance	2,450
	TOTAL	$ 30,050
2.	4 x 4 WD Jeep Type	$ 24,000
	Spare Parts	6,000
	Maintenance	3,360
	TOTAL	$ 33,360

Computer Euipment (Unit Cost)

1.	Computer with monochrome screen, serial and parallel ports, keyboard, and software (Word Perfect, Lotus and DBase III	$ 3,619
	Maintenance Contract and spare parts (12 months period)	568
	Uninterrupted Power Supply 600W	4,000
	TOTAL	$ 8,187

Residential Appliances/Furnishings/Office Equipment (unit cost)

1.	Refrigerator, spare parts, packing and shipping	$ 1,289
2.	Freezer, spare parts, packing and shipping	1,063
3.	Stove, spare parts, packing and shipping	1,065
4.	Washer, spare parts, packing and shipping	818
5.	Dryer, spare parts, packing and shipping	700
6.	Household Furnishings and Office Equipment:	
	a. Living room	$ 4,800
	b. Dining room	3,900
	c. Bedroom - Queen	3,950
	d. Bedroom - single	3,300
	e. Bedroom - Single	3,300
	f. Packing and Shipping (one set)	17,950
7.	Office Equipment	
	a. Desk	950
	b. File Cabinet	750
	c. Chair	360
	d. Calculator	190
	e. Photocopying machine	8,850
	f. Typewriter	1,900
	g. Fax Equipment	2,000

SECTION D: DETAILED COST ESTIMATES BY PROJECT COMPONENT

Table D presents the cost estimates of the Natural Resources Management Project by project component.

ANNEX I-D: DETAILED COST ESTIMATES BY PROJECT COMPONENT
TABLE 1: IMPROVED MARAIS MANAGEMENT

	1989 AID	1989 GOR	1990 AID	1990 GOR	1991 AID	1991 GOR	1992 AID	1992 GOR	1993 AID	1993 GOR	1994 AID	1994 GOR	Total AID	Total GOR	Addn Recurrent Cost/Year After End of Project
INVESTMENT															
A. TRAINING															
1. Utilization MURAMBI Training Center Frw 400/student/day				47.0		36.0		3.0					0.0	86.0	
2. Room & Board students 01/90-06/91: 30 students at Frw 600/day			70.0		55.0		5.0						130.0	0.0	
3. Trainers honoraries 01/90-06/91: 34 lesson/week x 78 weeks			15.0		12.0		3.0						30.0	0.0	
4. Training Field Trip ("Stage") costs					8.0		7.0						15.0	0.0	
5. Training Equipment			75.0		40.0								115.0	0.0	
6. Training Materials			10.0										10.0	0.0	
7. Students Contribution to line 5, Frw 5,000 study fees per semester/student				6.0									0.0	6.0	
8. Minibus for student transport			35.0										35.0	0.0	
9. Field Equipment-new genie rural technicians					30.0								30.0	0.0	
10. TOTAL TRAINING	0.0	0.0	205.0	53.0	145.0	36.0	15.0	3.0	0.0	0.0	0.0	0.0	365.0	92.0	
B. MODEL MARAIS															
11. Studies on Model Marais			20.0		20.0		15.0						55.0	0.0	
12. Marais Development incl.construction 50 ha x 255.000 = Frw 12,750,000					70.0		70.0		30.0				170.0	0.0	5.0
13. Assist. local groupments in marais management			5.0		5.0		5.0						15.0	0.0	
14. In-country training of farmers & commune officials					5.0		5.0		5.0				15.0	0.0	
15. TOTAL MODEL MARAIS	0.0	0.0	25.0	0.0	100.0	0.0	95.0	0.0	35.0	0.0	0.0	0.0	255.0	0.0	5.0
C. INSTITUTIONAL SUPPORT															
16. Study Tours; Short-term Training			10.0		10.0		10.0						30.0	0.0	
17. Computer equipment			10.0										10.0	0.0	1.0
18. Computer training			5.0		5.0								10.0	0.0	
19. 4x4 truck, double cabin			35.0										35.0	0.0	
20. Misc. field equipment (DAHA)			10.0		10.0								20.0	0.0	
21. Long-term local T.A.-18 months	10.0		35.0		15.0								60.0	0.0	
22. TOTAL INSTITUTIONAL SUPPORT	10.0	0.0	105.0	0.0	40.0	0.0	10.0	0.0	0.0	0.0	0.0	0.0	165.0	0.0	1.0
TOTAL INVESTMENT (Line 10,15,22)	10.0	0.0	335.0	53.0	285.0	36.0	120.0	3.0	35.0	0.0	0.0	0.0	785.0 *	92.0 *	6.0
RECURRENT COST															
1. Coordinator (Training and Marais Management) Frw 33,750 x 60 months		3.0		5.5		5.5		5.5		5.5		2.0	0.0	27.0	5.5
2. Rural Engineer (part time) Frw 31,250 x 60 months (x 20 percent)		1.0		1.0		1.0		1.0		1.0			0.0	5.0	
3. 36 Rural technicians, salaries for 27 months after training, Rfw 17,850/month								65.0		86.0		43.0	0.0	194.0	86.0
4. Vehicle operation and maintenance 2 vehicles x Frw 62,500/month			10.0		20.0		10.0	10.0		20.0		10.0	40.0	40.0	10.0
5. Drivers' Salaries (2)				2.0		7.0		7.0		7.0		4.0	0.0	27.0	7.0
TOTAL RECURRENT COST	0.0	4.0	10.0	8.5	20.0	13.5	10.0	86.5	0.0	119.5	0.0	59.0	40.0	293.0 *	114.5
TOTAL COMPONENT COST	10.0	4.0	345.0	61.5	305.0	49.5	130.0	91.5	35.0	119.5	0.0	59.0	825.0	385.0	

ANNEX I - D: DETAILED COST ESTIMATE BY PROJECT COMPONENT
TABLE 2: FISH CULTURE IN THE MARAIS

	1989 AID	1989 GOR	1990 AID	1990 GOR	1991 AID	1991 GOR	1992 AID	1992 GOR	1993 AID	1993 GOR	1994 AID	1994 GOR	Total AID	Total GOR	Addn. Recurrent Cost/Year After End of Project
INVESTMENT															
A. RESEARCH			40.0		40.0		40.0		30.0				150.0	0.0	
B. TRAINING															
1. MS Degrees in Fish Culture			60.0				60.0						120.0	0.0	
2. Third country training; study tours			10.0				5.0						15.0	0.0	
3. Of 20 new moniteurs, 6 months at Kigembe			24.0										24.0	0.0	
4. In-service training for 45 moniteurs, 6 months at Kigembe			16.6		18.0		17.0						51.6	0.0	
5. Mobile team (6) for 12 months			14.4										14.4	0.0	
6. In-country training of farmers			10.0		10.0		10.0		10.0				40.0	0.0	
7. Use of Kigembe center for training (see lines 3-6)				10.0		10.0		10.0		7.0			0.0	37.0	
8. TOTAL TRAINING	0.0	0.0	135.0	10.0	28.0	10.0	92.0	10.0	10.0	7.0	0.0	0.0	265.0	37.0	
C. EXTENSION ACTIVITIES															
9. Computer equipment for Kigembe Station			10.0										10.0	0.0	
10. Credit Fund (bicycles for moniteurs)					4.5								4.5	0.0	
11. 2 small trucks			40.0										40.0	0.0	
12. Fishing Equipment and Supplies			10.0		10.0		10.0						30.0	0.0	
13. TOTAL EXTENSION ACTIVITIES	0.0	0.0	60.0	0.0	14.5	0.0	10.0	0.0	0.0	0.0	0.0	0.0	84.5	0.0	
D. CONSTRUCTION															
14. At Kigembe & 3 regional stations			50.0		150.0		125.0		50.0				375.0	0.0	
15. Up to 7 Communal Fish Culture Centers			75.0		75.0		50.0						200.0	0.0	
16. Land for Communal Fish Culture Centers				8.0		8.0		7.0					0.0	23.0	
13. TOTAL CONSTRUCTION ACTIVITIES													575.0	23.0	
E. TECHNICAL ASSISTANCE			45.0		40.0		40.0		25.0				150.0	0.0	
TOTAL INVESTMENT (Line 10,15,22)	0.0	0.0	235.0	10.0	82.5	10.0	142.0	10.0	40.0	7.0	0.0	0.0	1,224.5	60.0	

ANNEX I-D: DETAILED COST ESTIMATES BY PROJECT COMPONENT
TABLE 2: FISH CULTURE IN THE MARAIS (cont.)

	1989 AID	1989 GOR	1990 AID	1990 GOR	1991 AID	1991 GOR	1992 AID	1992 GOR	1993 AID	1993 GOR	1994 AID	1994 GOR	Total AID	Total GOR	Adds. Recurrent Cost/Year After End of Project
RECURRENT COST															
A. PERSONNEL SALARIES															
14. Fish Culture Director, Frw 33,750 x 60 mo		2.7		5.4		5.4		5.4		5.4		2.7	0.0	27.0	
15. Extension Specialist Frw 30,000 x 60 mo		2.4		4.8		4.8		4.8		4.8		2.4	0.0	24.0	
16. Data Processing Specialist, Frw 27,500 x 60 mo		2.2		4.4		4.4		4.4		4.4		2.2	0.0	22.0	
17. Asst. Fish Culture Director, Frw 33,000 x 48 months				5.3		5.3		5.3		5.3		2.9	0.0	24.0	5.3
18. 8 Regional Supervisors (Agronomes) Frw 23,750 x 60 months		15.1		30.4		30.4		30.4		30.4		15.2	0.0	152.0	
19. 45 Fish culture extension agents Frw 8,000 x 60 months		30.6		61.2		61.2		61.2		61.2		30.6	0.0	306.0	
20. 20 additional "Moniteurs piscicoles" Frw 8,500 x 54 months			27.0		23.0	4.0		27.2		27.2		13.6	50.0	72.0	27.2
21. 2 secretaries, accountant, drivers FRw 96000 x 60 months		7.7		15.4		15.4		15.4		15.4		7.9	0.0	77.0	
22. 6 Mobile team technicians Frw 13,000 x 6 x 54 mo				12.5		12.5		12.5		12.5		6.1	0.0	56.0	
23. Workers at 5 regional stations Frw 80,000/station/month		32.0		64.0		64.0		64.0		64.0		32.0	0.0	320.0	
24. Vehicle operation & maintenance, 2 trucks 1000 km/mo at Frw 30/km			6.0		9.5			9.6		9.6		4.8	15.5	24.0	9.6
25. Start-up Costs, Stations and Communal Centers			15.0		20.0		25.0			25.0		12.5	60.0	37.5	25.0
TOTAL RECURRENT COST	0.0	22.5	0.0	50.3	0.0	50.3	0.0	50.3	0.0	50.3	0.0	132.9	125.5	1,141.5	67.1
TOTAL FISH CULTURE COMPONENT	0.0	22.5	235.0	60.3	82.5	60.3	142.0	60.3	40.0	57.3	0.0	132.9	1,350.0	1,201.5	

ANNEX I-D: DETAILED COST ESTIMATES BY PROJECT COMPONENT
TABLE 3: SOIL CONSERVATION AND AGROFORESTRY

	1989 AID	1989 GOR	1990 AID	1990 GOR	1991 AID	1991 GOR	1992 AID	1992 GOR	1993 AID	1993 GOR	1994 AID	1994 GOR	Total AID	Total GOR	Addn. Recurrent Cost/Year After End of Project
INVESTMENT															
A. TECHNICAL ASSISTANCE															
1. PVO Site Manager, 50% of annual salary			50.0		50.0		50.0		50.0				200.0	0.0	
2. House Rental Site Manager, Frw 60,000 per month, 48 months			8.6		8.8		8.8		8.8				35.0	0.0	
3. PCV Support Costs			5.0		5.0		5.0		5.0				20.0	0.0	
4. Short-term TA, Soil Conservation 1 pm/year x 4 years x $15,000/pm			15.0		15.0		15.0		15.0				60.0	0.0	
5. Short-term TA, Forestry, 1 pm/year x 4 years x $15,000/pm			15.0		15.0		15.0		15.0				60.0	0.0	
6. Short-term TA, Wischmeier Study 2 pm at $15,000 per pm			15.0						20.0				35.0	0.0	
7. Short-term - Soil Erosion Inventory			25.0										25.0	0.0	
8. TOTAL TECHNICAL ASSISTANCE	0.0	0.0	133.6	0.0	93.8	0.0	93.8	0.0	113.8	0.0	0.0	0.0	435.0	0.0	
B. TRAINING															
9. MS Degree in Soil Conservation/Agroforestry			60.0										60.0	0.0	
10. ICRAF Workshops, Short-term Training			20.0		20.0		20.0		10.0				70.0	0.0	
11. In-country Training			10.0				10.0						20.0	0.0	
12. TOTAL TRAINING	0.0	0.0	90.0	0.0	20.0	0.0	30.0	0.0	10.0	0.0	0.0	0.0	150.0	0.0	
C. CONSTRUCTION, COMMODITY PROCUREMENT															
13. Office Construction			75.0	40.0	25.0								100.0	40.0	
14. Land for Office and Nurseries				20.0									0.0	20.0	
15. Vehicles (3): 1 pickup, 2 4-wheel drive			50.0				50.0						100.0	0.0	
16. Vehicles (3), office equipment, and Household Furnishings from REAM Project		15.0											0.0	15.0	
17. Motorbikes: 7 at Frw 225,000 each			21.0										21.0	0.0	
18. Misc. Equipment Procurement			6.0		10.8		8.0		5.0				29.0	0.0	
19. TOTAL CONSTRUCTION/COMMODITY PROCUREMENT	0.0	15.0	152.0	60.0	35.0	0.0	58.0	0.0	5.0	0.0	0.0	0.0	250.0	75.0	
D. RESEARCH ACTIVITIES															
20. Local Cost Support for AFREMA Research			50.0		50.0		50.0		50.0				200.0	0.0	
21. Monitoring Wischmeier Plots	3.0		6.0		6.0		6.0		6.0		3.0		30.0	0.0	
22. Study of Torrential Runoff Problems			25.0		50.0								75.0	0.0	
23. TOTAL RESEARCH ACTIVITIES	3.0	0.0	81.0	0.0	106.0	0.0	56.0	0.0	56.0	0.0	3.0	0.0	305.0	0.0	
F. SOIL CONSERVATION AND AGROFORESTRY ACTIVITIES															
24. Est. and Oper. of Commune-level Demonstration Centers (5)			24.0		24.0		24.0		22.0		6.0		100.0	0.0	
25. Support for 40 Sector Nurseries Frw 30,000/nursery/year			24.0		24.0		24.0		22.0		6.0		100.0	0.0	
26. Communal Forestry Plans, Frw 300,000/commune			20.0										20.0	0.0	
27. Soil Conservation & Agroforestry Works Frw 600,000/commune/year			50.0		50.0		50.0		50.0				200.0	0.0	
28. TOTAL SOIL CONSERV & AGROFOR ACTIVITIES	0.0	0.0	118.0	0.0	98.0	0.0	98.0	0.0	94.0	0.0	12.0	0.0	420.0	0.0	
TOTAL INVESTMENT (Line 8, 12, 18, 22, 27)	3.0	15.0	574.6	60.0	352.8	0.0	335.8	0.0	278.8	0.0	15.0	0.0	1,560.0	75.0	

ANNEX I-D: DETAILED COST ESTIMATES BY PROJECT COMPONENT
TABLE 3: SOIL CONSERVATION AND AGROFORESTRY (cont.)

	1989		1990		1991		1992		1993		1994		Total		Addn. Recurrent Cost/Year After End of Project
	AID	GOR	AID	GOR	AID	GOR	AID	GOR	AID	GOR	AID	GOR	AID	GOR	
RECURRENT COST															
A. PERSONNEL SALARIES															
29. GOR Field Director, Frw 35,000 x 60 mo		2.8		5.6		5.6		5.6		5.6		2.8	0.0	28.0	
30. Agronome and Forester Frw 25,000 x 60 mo		4.0		8.0		8.0		8.0		8.0		4.0	0.0	40.0	
31. Commune Agronomes (5), FRw 20,000 x 60 mo		8.0		16.0		16.0		16.0		16.0		8.0	0.0	80.0	
32. Monagris (50), Frw 10,000 x 60 mo		40.0		80.0		80.0		80.0		80.0		40.0	0.0	400.0	
33. Accountant, Frw 30,000 per month	2.4		4.8		4.8			4.8		4.8		2.4	12.0	12.0	4.8
34. Secretary, FRw 25,000 per month	2.0		4.0		4.0			4.0		4.0		2.0	10.0	10.0	4.0
35. Guards, FRw 17,500 per month (3)	1.4		2.8		2.8			2.8		2.8		1.4	7.0	7.0	2.8
36. Drivers, Frw 60,000 per month (3)	4.8		9.6		9.6			9.6		9.6		4.8	24.0	24.0	9.6
37. TOTAL SALARIES	10.6	54.8	21.2	109.6	21.2	109.6	0.0	130.8	0.0	130.8	0.0	65.4	53.0	601.0	21.2
B. OTHER COSTS															
38. Communal Officials (part time)				2.0		2.0		1.0		1.0			0.0	6.0	
39. Beneficiary Contribution - nursery maintenance				1.0		1.0		2.0		2.0			0.0	6.0	2.0
40. House Rental - GOR Field Director FRw 30,000 Per Year			4.8		4.8		2.4	2.4		4.8		2.4	12.0	9.6	4.8
41. Vehicle Operation and Maintenance	10.0		10.0		15.0		15.0			15.0		7.5	50.0	22.5	15.0
42. TOTAL OTHER COSTS	10.0	0.0	14.8	3.0	19.8	3.0	17.4	5.4	0.0	22.8	0.0	9.9	62.0	44.1	21.8
TOTAL RECURRENT COST	20.6	54.8	36.0	112.6	41.0	112.6	17.4	136.2	0.0	153.6	0.0	75.3	115.0	645.1	43.0
TOTAL SOIL CONSERVATION AND AGROFORESTRY COMPONENT	23.6	69.8	610.6	172.6	393.8	112.6	353.2	136.2	278.8	153.6	15.0	75.3	1,675.0	720.1	

ANNEX I-D: DETAILED COST ESTIMATES BY PROJECT COMPONENT
TABLE 4: CONSERVATION OF NYUNGWE FOREST RESERVE

($000's)

	1989 AID	1989 GOR	1990 AID	1990 GOR	1991 AID	1991 GOR	1992 AID	1992 GOR	1993 AID	1993 GOR	1994 AID	1994 GOR	Total AID	Total GOR	Addn. Recurrent Cost/Year After End of Project
INVESTMENT															
A. RESEARCH															
1. Research Grants			25.0		50.0		50.0						125.0	0.0	
2. Local Costs UNR & ISAR researchers				1.0		1.0		1.0					0.0	3.0	
3. TOTAL RESEARCH	0.0	0.0	25.0	1.0	50.0	1.0	50.0	1.0	0.0	0.0	0.0	0.0	125.0	3.0	
B. COMMODITIES															
4. Pick-up truck			20.0										20.0	0.0	
5. Light 4-wheel drive			20.0										20.0	0.0	
6. Motorcycles			7.5										7.5	0.0	
7. Field Equipment			8.0		4.0		4.0						16.0	0.0	
8. Educational Materials			5.0		5.0		5.0						15.0	0.0	
9. Furnishings & exhibit material					20.0								20.0	0.0	
10. Park Guard Equipment				4.0		4.0		4.0		4.0			0.0	16.0	
11. TOTAL EQUIPMENT	0.0	0.0	60.5	4.0	29.0	4.0	9.0	4.0	0.0	4.0	0.0	0.0	98.5	16.0	
C. TRAINING															
12. Third Country Training					24.0								24.0	0.0	
13. International Workshops			10.0				10.0						20.0	0.0	
14. In-country Short Courses			10.0		10.0		10.0		10.0				40.0	0.0	
15. TOTAL TRAINING			20.0	0.0	34.0	0.0	20.0	0.0	10.0	0.0	0.0	0.0	84.0	0.0	0.0
D. CONSTRUCTION															
16. Interpretative Center			10.0	10.0	40.0	40.0							50.0	50.0	2.0
17. 3 Project Staff houses				40.0		40.0							0.0	80.0	3.0
18. Land for Interpretive Center				25.0									0.0	25.0	
19. TOTAL CONSTRUCTION	0.0	0.0	10.0	75.0	40.0	80.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0	155.0	5.0
20. TOTAL INVESTMENT	0.0	0.0	115.5	80.0	153.0	85.0	79.0	5.0	10.0	4.0	0.0	0.0	357.5	174.0	5.0

ANNEX I-D: DETAILED COST ESTIMATES BY PROJECT COMPONENT
TABLE 4: CONSERVATION OF NYUNGWE FOREST RESERVE (cont.)

	($000's)														Addn. Recurrent
	---1989---		---1990---		---1991---		---1992---		---1993---		---1994---		---Total---		Cost/Year After
	AID	GOR	AID	GOR	AID	GOR	AID	GOR	AID	GOR	AID	GOR	AID	GOR	End of Project
RECURRENT COST															
A. PERSONNEL															
21. Assistant Director, Frw 31,250/mo	2.5		5.0		5.0		5.0		5.0		2.5		25.0	0.0	5.0
22. Secretary/Accountant, Frw 18,500/mo.	1.6		3.0		3.0		3.0		3.0		1.6		15.0	0.0	3.0
23. Driver	1.6		3.0		3.0		3.0		3.0		1.6		15.0	0.0	3.0
24. Field Supervisors (2), Frw 15,600/mo	2.5		5.0		5.0		5.0		5.0		2.5		25.0	0.0	5.0
25. Conservation Ed. Tech., Frw 22,500/mo		1.8		3.6		3.6		3.6		3.6		1.8	0.0	18.0	3.6
26. Forest Utiliza. Tech., Frw 22,500/mo		1.8		3.6		3.6		3.6		3.6		1.8	0.0	18.0	3.6
27. Tourist Guides (3) at Frw 12,000/mo		3.0		5.8		5.8		5.8		5.8		3.0	0.0	29.0	
28. Conservateur, Frw 30,000/mo.		2.4		4.8		4.8		4.8		4.8		2.4	0.0	24.0	
29. Guards (20) Frw 9,000/mo		14.4		28.8		28.8		28.8		28.8		14.4	0.0	144.0	
30. TOTAL STAFF SUPPORT	8.2	23.4	15.9	46.6	15.9	46.6	15.9	46.6	15.9	46.6	8.2	23.4	80.0	233.0	23.2
B. OTHER COSTS															
31. Vehicle Operation and Maintenance			10.0		10.0		10.0		10.0		2.5	2.5	42.5	2.5	10.0
32. Office Supplies	3.0		4.0		4.0		2.0			2.0		1.0	13.0	3.0	2.0
33. Publications/Reports			2.0		2.0		2.0		2.0		2.0		10.0	0.0	2.0
34. TOTAL OTHER COSTS	3.0	0.0	16.0	0.0	16.0	0.0	14.0	0.0	12.0	2.0	4.5	3.5	65.5	5.5	14.0
35. TOTAL RECURRENT COSTS	11.2	23.4	31.9	46.6	31.9	46.6	29.9	46.6	27.9	48.6	12.7	26.9	145.5	238.5	37.2
36. TOTAL NYUNGWE FOREST CONSERVATION	11.2	23.4	147.4	126.6	184.9	131.6	108.9	51.6	37.9	52.6	12.7	26.9	503.0	412.5	42.2

ANNEX I-D: DETAILED COST ESTIMATES BY PROJECT COMPONENT
TABLE 5: KARISOKE RESEARCH CENTER

($000's)

SUPPORT TO KARISOKE RESEARCH CENTER	1989 AID	1989 GOR	1990 AID	1990 GOR	1991 AID	1991 GOR	1992 AID	1992 GOR	1993 AID	1993 GOR	1994 AID	1994 GOR	Total AID	Total GOR	Addn. Recurrent Cost/Year After End of Project
INVESTMENT															
A. RESEARCH															
1. Research Grants			40.0		40.0		40.0		30.0				150.0	0.0	
2. Local costs of UNR & ISAR researchers				2.0		2.0		2.0		2.0			0.0	8.0	
3. TOTAL RESEARCH	0.0	0.0	40.0	2.0	40.0	2.0	40.0	2.0	30.0	2.0	0.0	0.0	150.0	8.0	
B. TRAINING															
4. In-service training/workshops			20.0		20.0		15.0						55.0	0.0	
5. TOTAL TRAINING			20.0		20.0		15.0						55.0	0.0	
C. EQUIPMENT															
6. Laboratory Equipment			5.0										5.0	0.0	
7. Computer & Office Equipment			10.0										10.0	0.0	
8. Vehicle (4-wheel drive)			20.0										20.0	0.0	
9. Equipment for Park Guards				5.0									0.0	5.0	
9. Motorcycles (2)			5.0										5.0	0.0	
10. TOTAL EQUIPMENT	0.0	0.0	40.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	40.0	5.0	
D. MATERIALS DEVELOPMENT															
11. Map Development			10.0		10.0								20.0	0.0	
12. Aerial Photos			5.0										5.0	0.0	
13. Surveys			5.0										5.0	0.0	
14. TOTAL MATERIALS DEVEL.	0.0	0.0	20.0	0.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	30.0	0.0	
15. TOTAL INVESTMENT	0.0	0.0	120.0	7.0	70.0	2.0	55.0	2.0	30.0	2.0	0.0	0.0	275.0	13.0	0.0
RECURRENT COST															
16. Vehicle Operation & Maintenance			5.0		10.0		10.0		5.0	5.0		5.0	30.0	10.0	10.0
17. Office Operating Costs			10.0		10.0		10.0		5.0	5.0		5.0	35.0	10.0	10.0
18. Park Guards (20), FRw 9,000/mo				14.4		28.8		28.8		28.8		14.4	0.0	115.2	
18. TOTAL RECURRENT COST	0.0	0.0	15.0	14.4	20.0	28.8	20.0	28.8	10.0	38.8	0.0	24.4	65.0	135.2	20.0
19. TOTAL KARISOKE RESEARCH CENTER	0.0	0.0	135.0	21.4	90.0	30.8	75.0	30.8	40.0	40.8	0.0	24.4	340.0	148.2	20.0

ANNEX I-D: DETAILED COST ESTIMATES BY PROJECT COMPONENT
TABLE 6: MOUNTAIN GORILLA PROJECT

SUPPORT TO MOUNTAIN GORILLA PROJECT	($000's) 1989 AID	1989 GOR	1990 AID	1990 GOR	1991 AID	1991 GOR	1992 AID	1992 GOR	1993 AID	1993 GOR	1994 AID	1994 GOR	Total AID	Total GOR	Adm. Recurrent Cost/yr. After End of Project
INVESTMENT															
A. TRAINING															
1. Workshops			20.0		20.0		10.0						50.0	0.0	
2. Third Country Training			40.0										40.0	0.0	
3. TOTAL TRAINING	0.0	0.0	60.0	0.0	20.0	0.0	10.0	0.0	0.0	0.0	0.0	0.0	90.0	0.0	
B. CONSERVATION EDUCATION															
4. Short Courses			7.5		5.0		5.0		5.0		2.5		25.0	0.0	
5. Materials Development			15.0		15.0		15.0		5.0				50.0	0.0	
6. TOTAL CONSERVATION EDUCATION	0.0	0.0	22.5	0.0	20.0	0.0	20.0	0.0	10.0	0.0	2.5	0.0	75.0	0.0	
C. MATERIALS & EQUIPMENT															
7. Vehicles: 2 small 4-wheel drive			40.0										40.0	0.0	
8. Office Equipment	5.0		10.0										15.0	0.0	
9. Audio/Video and Exhibiting Materials			10.0		20.0								30.0	0.0	
10. Equipment for Park Guards				4.0		4.0		4.0					0.0	12.0	
11. TOTAL MATERIALS & EQUIP.	5.0	0.0	60.0	4.0	20.0	4.0	0.0	4.0	0.0	0.0	0.0	0.0	85.0	12.0	
D. CONSTRUCTION															
12. Interpretive Center			10.0	10.0	40.0	40.0							50.0	50.0	
13. Land for Interpretive Center						25.0							0.0	25.0	
14. TOTAL CONSTRUCTION	0.0	0.0	10.0	10.0	105.0	65.0	0.0	0.0	0.0	0.0	0.0	50.0	50.0	75.0	
15. TOTAL INVESTMENT	5.0	0.0	92.5	14.0	145.0	69.0	20.0	4.0	10.0	0.0	2.5	50.0	300.0	87.0	
RECURRENT COST															
A. PERSONNEL															
16. Conservation Ed. Tech (2), FRw 22500/mo		3.6		7.2		7.2		7.2		7.2		3.6	0.0	36.0	
17. Personnel for Interpretative Center (2)					15.0		15.0		10.0	5.0		7.5	40.0	12.5	15.0
18. Tourist Guides (10), Frw 12,000/mo		9.6		19.2		19.2		19.2		19.2		9.6	0.0	96.0	
19. Park Guards [illegible], FRw 9,000/mo		7.2		14.4		14.4		14.4		14.4		7.2	0.0	72.0	
20. TOTAL PERSONNEL	0.0	20.4	0.0	40.8	15.0	40.8	15.0	40.8	10.0	45.8	0.0	27.9	40.0	216.5	15.0
B. OTHER COSTS															
21. Vehicle Operation & Maintenance			5.0		5.0		5.0		5.0		5.0		25.0	0.0	5.0
22. Office Supplies	2.5		5.0		5.0		5.0		5.0		2.5		25.0	0.0	1.0
23. TOTAL OTHER COSTS	2.5	0.0	10.0	0.0	10.0	0.0	10.0	0.0	10.0	0.0	7.5	0.0	50.0	0.0	6.0
24. TOTAL RECURRENT COST	2.5	20.4	10.0	40.8	25.0	40.8	25.0	40.8	20.0	45.8	7.5	27.9	90.0	216.5	21.0
25. TOTAL MOUNTAIN GORILLA PROJECT	7.5	20.4	102.5	54.8	170.0	109.8	45.0	44.8	30.0	45.8	10.0	77.9	390.0	303.5	21.0

ANNEX I-D: DETAILED COST ESTIMATES BY PROJECT COMPONENT
TABLE 7: ENVIRONMENTAL PLANNING AND POLICY

($000's)

SUPPORT TO KARISOKE RESEARCH CENTER	1989 AID	1989 GOR	1990 AID	1990 GOR	1991 AID	1991 GOR	1992 AID	1992 GOR	1993 AID	1993 GOR	1994 AID	1994 GOR	Total AID	Total GOR	Addn. Recurrent Cost/yr. After End of Project
INVESTMENT															
1. Long-term Technical Assistance			177.0		177.0								354.0	0.0	
2. Third Country Training/Study Tours			10.0		10.0								20.0	0.0	
3. In-country Workshops			5.0		5.0								10.0	0.0	
4. Four-wheel Drive Vehicle			25.0										25.0	0.0	
5. Computer and Office Equipment			15.0										15.0	0.0	
6. House Rental for Advisor			13.0		13.0								26.0	0.0	
7. Household Furniture for Advisor	30.0												30.0	0.0	
8. Office Furniture			10.0										10.0	0.0	
9. TOTAL INVESTMENT	30.0	0.0	255.0	0.0	225.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	490.0	0.0	0.0
RECURRENT COST															
10. Vehicle Operation & Maintenance			[illegible]		5.0			5.0					10.0	5.0	10.0
11. GOR Counterpart, Frw 36,000/mo		3.0		5.8		5.8		5.8		5.8		3.0	0.0	29.0	5.6
12. Local Support	5.0		5.0			5.0		5.0		5.0		2.5	10.0	17.5	5.0
13. TOTAL RECURRENT COST													20.0	51.5	20.6
14. TOTAL ENVIRONMENTAL PLANNING AND POLICY													510.0	51.5	20.6

ANNEX I-D: DETAILED COST ESTIMATES BY PROJECT COMPONENT
TABLE 8: PROJECT COORDINATION

	1989		1990		1991		1992		1993		1994		Total		Addn. Recurrent Cost/Year After End of Project
	AID	GOR	AID	GOR	AID	GOR	AID	GOR	AID	GOR	AID	GOR	AID	GOR	
INVESTMENT															
1. Resident Advisor/Project Coordinator			177.0		177.0		177.0		177.0				708.0	0.0	
2. Quality Control Engineer (part time)	5.0		45.0		40.0		10.0						100.0	0.0	
3. Computer Equipment	10.0												10.0	0.0	
4. Office Equipment	4.0		4.0										8.0	0.0	
4. Office Furnishings/operating costs/supplies	4.0		16.0		8.0		8.0		6.0		4.0		46.0	0.0	
5. Small 4-Wheel Drive Vehicle			20.0										20.0	0.0	
6. Short-term Technical Assistance			85.0		85.0		82.0		75.0		37.5		364.5	0.0	
7. Rent - expatriate house			13.0		13.0		13.0		13.0				52.0	0.0	
8. Household Furnishings - expatriate house	30.0												30.0	0.0	
9. Evaluations					50.0				50.0				100.0		
10. Audit							50.0						50.0		
TOTAL INVESTMENT	53.0	0.0	360.0	0.0	373.0	0.0	340.0	0.0	321.0	0.0	41.5	0.0	1,488.5	0.0	
RECURRENT COST															
8. GOR Project Coordinator, Frw 40,000 x 60 mo		3.2		6.4		6.4		6.4		6.4		3.2	0.0	32.0	6.4
9. Accountant, Frw 30,000 x 60 mo			4.8		4.8		4.8		4.8		2.8		22.0	0.0	4.8
10. Secretary, Frw 25,000 x 60 mo	2.0		4.0		4.0		4.0		4.0		2.0		20.0	0.0	4.0
11. Office Rental, Frw 60,000/month			12.0		12.0		12.0		12.0		6.0		54.0	0.0	12.0
12. Vehicle Maintenance			5.0		5.0		5.0		5.0		2.5		22.5	0.0	5.0
TOTAL RECURRENT COST	2.0	3.2	25.8	32.2	32.2	32.2	32.2	32.2	32.2	32.2	19.7	16.5	116.5	32.0	32.2
TOTAL PROJECT COORDINATION	55.0	3.2	385.8	32.2	405.2	32.2	372.2	32.2	353.2	32.2	61.2	16.5	1,607.0	32.0	

ANNEX J

REVISED INITIAL ENVIRONMENTAL EXAMINATION

(March 1989)

Country: Rwanda

Project Title and Number: Natural Resources Management (696-0129)

Funding: FY 1990-1994 $7.93 million

Revised IEE prepared by: Edward McGowan, Regional Environmental Officer, REDSO/ESA

Positive Determination X (1)

Negative Determination X (2)

Action Requested by: James A. Graham, USAID Director Date: 5/10/89

Concurrence: X (3) Bureau Environmental Officer

(1) For construction of fish ponds.

(2) For all other aspects.

(3) State 94782 Delegated Authority to Mission Director to sign IEE with concurrence of Regional Legal Advisor.

APPROVED James A. Graham

DISAPPROVED _____

DATE 5/12/89

Clearance: REDSO/ESA [illegible]

ANNEX J: INITIAL ENVIRONMENTAL EXAMINATION

Project Title: Natural Resources Management Project

Project Number: 696-0129

Environmental Determination: Highly focused EA will be necessary for Integrated Fish Culture Activity. Categorical Exclusion or Negative Threshold for all subactivities except construction.

Prepared by: Dr. Edward McGowan, REO

A. Project Description

The project focuses upon four integrated activities within and affecting Rwanda's complicated hydrology or drainage system. This system, in simple terms, can be thought of as the hills, valleys and water courses that are Rwanda. As stated in the PP, the extensive use of land for subsistence agriculture by Rwanda's expanding population will soon reach the limits of its resource base. The four integrated activities are designed to increase understanding of the system, increase its production, assist in development of management capacity as well as assisting to stop degradation of Rwanda's natural resource base. These activities are for purposes of this environmental analysis arranged in relationship to the drainage system: (1) Natural Forest Management [top of drainage complex]; (2) Agroforestry and Soil Conservation [the sides of hills]; (3) Marais Research and Training in Marais Management [the bottom of the drainage complex]; and (4) Integrated Fish Culture [again in the bottom of the drainage complex]. The project's environmental impact, especially given the no project alternative is highly beneficial.

B. Focus of Environmental Considerations

The four major activities listed above were analyzed for potential adverse impacts. Reasoning is provided in Appendix 1 so that others may gain sufficient perspective to fully appreciate the overall environmental determination. A limited and highly focused Environmental Assessment (EA) for the Integrated Fish Culture subactivity is recommended. The EA SOW is attached as Appendix 2.

The table below indicates in brief tabular form the project's environmental determinations. It also indicates those areas warranting environmental review at the EA level. As noted from the table, many associated subactivities are accorded Environmental Determinations that are either Categorical Exclusions or Negative Threshold Decisions.

The subactivities related to research, training, education, and institutional support are accorded Categorical Exclusions. The subactivities related to development of Communal Forests Plans, Soil Conservation, Nurseries, and Demonstration Centers are accorded Negative Threshold Determinations.

The subactivities related to Construction, however, warrant further analysis during project implementation. A Negative Threshold Decision is warranted based on proper engineering.

C. Natural Forest Management Activity

The majority of effort within this activity relates to research, management training, conservation education, and TA. These activities warrant a CE based upon Section 216.2(c)(2)(i) [Education, training, and TA]; (ii)[Research]; (xiv) [Planning capability development].

The Natural Forest Activity centers its effort in the two principal afromontane forests: (1) Parc National des Volcans in the country's north, and (2) Nyungwe National Forest in the country's south. These two forests in addition to their immense value in the area of biodiversity are also principal watersheds. Research efforts will include analyses of the multiuse potential in biodiversity and hydrology*. Research will also consider socio-cultural influences of the surrounding areas for their impact on a sustained economy as well as affects on the forest**. The combined information will aid in the development of appropriate management plans.

Additionally, construction is envisioned by the project. These construction subactivities are not eligible for a CE and are further considered below. Interpretive centers are to be constructed in both forests to facilitate conservation education programs. The siting of these centers warrants consideration. The limited funds allocated, i.e. US $50,000 for Nyungwe and US $50,000 for the Mountain Gorilla Project, do not indicate that these centers will be major works. Although no substantial impact is anticipated, their siting and construction if inappropriate could pose some adverse environmental impacts. Engineers will need to be aware of such factors. A further but secondary consideration accruing to the centers is the additional traffic. This may create a consequent need to maintain roads and parking lots, both of which may affect runoff, hence erosion. The runoff from parking lots may contain numerous environmentally damaging pollutants. Such pollutants can collect in sensitive receptors. These issues are resolveable through proper design and can be reduced during implementation. Therefore a negative threshold determination is warranted.

* The research in biodiversity should also review impacts to the aquatic flora, fauna and habitat of these watersheds, including potential development interventions to enhance private enterprise.

** As an aside, the impact of microbial loss or population change can also be profound. The cutting of tropical forests with ensuing soil infertility can be linked to the ability of rhizosphere microbial populations to provide nutrient compounds not stockpiled in tropical soils. In some places, reestablishment of vegetation not having the associated microbes has depleted soil fertility and ultimately resulted in serious damage to the ecosystem. If the knowledge of rhizosphere associations had been used in the decision making process, these activities might have been adjusted to minimize the effect of forestry operations on soil fertility.

Table 1: Matrix of Environmental Impacts

This table is intended as a summary of overall environmental aspects accruing to the project and required actions under Reg.16.

Activity/ Subactivity	Environmental Determination* CE,	NT,	PT	Area of Focused EA
Natural Forest Mgt				
Research	X			
Training	X			
Conservation Educ.	X			
Institutional Support	X			
TA	X			
Construction		X		
Agroforestry Soil Conservation				
Research	X			
Training	X			
TA	X			
Institutional Support	X			
Nurseries		X		
Demo Centers		X		
Soil Conservation	X			
Communal Forestry Plans		X		
Office Construction		X		
Small Marais Activity				
Research	X			
Training	X			
Institutional Support	X			
Integrated Fish Culture				
Research	X			
TA	X			
Training	X			
Pond Construction			X	X
Centers Construction			X	X

* CE - Categorical Exclusion
NT - Negative Threshold
PT - Positive Threshold

D. Agroforestry and Soil Conservation Activity (ASC)

As with the Natural Forest Management Activity discussed above, this activity also plays a principal role in the drainage and hydrology of Rwanda. As indicated in the PP, agriculture has been virtually extended to its limit in the steep terrain of hilly Rwanda. Although much of the focus under this activity relates to reversing existing natural resource degradation, some aspects may require further analysis during implementation. The latter aspects will be discussed momentarily. First however it seems prudent to briefly note those areas warranting either a CE or a Negative Threshold Determination (NDT). These include: (1) Research in and the development of extendible technical packages for soil/water conservation and agroforestry; (2) TA; (3) Training and; (4) Replication of the CARE-Gituza Program.

In addition to the above, the ASC Activity proposes to (1) establish nurseries; (2) establish demonstration centers and; (3) construct buildings.

With respect to nurseries, principal areas of inquiry would include impacts from: (1) introduction of phyto pathogenic problems; (2) species that would foster pest development; and (3) species that would adversely affect income margins of adoptees causing later abandonment. Abandonment thereby affecting soil erosion. The project design should address these issues during implementation, and therefore a NTD is warranted. At the time of mid term evaluation, these issues should be reviewed. A monitoring provision in the design may be warranted. ISAR should be consulted to include such.

With respect to establishment of major demonstration centers, although it is acknowledged that they are overall beneficial care must be accorded to their siting and any accompanying construction. More specifics need to be known about potential sites. At the time of site selection the issue should be reviewed by REDSO engineers and environmental officer.

As for construction, it appears that building of an office will take place in Ruhengeri town. Since this may be only an addition to an existing town, there may be no significant adverse impact. Until the site is more clearly established a determination can not be made. Again, this aspect should be further evaluated during implementation.

E. Small Marais Activities

A Categorical Exclusion (CE) has been accorded this activity under two provisions of Reg. 16 discussed below. The Marais Activity encompasses essentially three principal categories of effort which fold into a coordinated program. The essence is: (1) utilization of research in a small Stage IV* marais, which as a laboratory allows for; (2) training of a multidisciplinary cadre of GOR technical staff; and (3) thereby builds institutional capacity to address the environmental issues accompanying marais development.

The two areas of the CE under are specifically 216.2 (c)(2)(ii) relating to continued and controlled research which is carefully monitored, and 216.2(c)(2)(xiv) relating to development of indigenous planning capacity. In this latter case, the importance of marais selection becomes critical to the provision in subsection (xiv) which precludes activities directly affecting the environment in a significantly adverse manner [(216.1(c)(3) and (11)]. As noted above, the small marais to be selected will be under existing agricultural production. Thus, the natural habitat, i.e. Stage I (see footnote) will no longer exist. As a prerequisite for provision of the CE, and as a necessary condition the marais must actually be in Stage IV, i.e. existing extensive use for crop production. From this prerequisite and the thrust of the activity, i.e. research to improve both staff understanding and institutional capacity, the overall impact is beneficial, therefore justifying the CE.

At mid point as well as upon completion of this activity but prior to replication under auspices of USAID, an evaluation of potential environmental impacts must be conducted. It is therefore recommended that during (a) implementation, (b) mid term evaluation; and (c) final evaluation, the team include input from an environmental scientist. It is further recommended that the GOR and USAID develop design criteria per Section 216.2(c)(2)(XV). This latter instance provides for development of a series of approved guidelines. These guidelines would be related to marais development policy and technology. Provision of such would allow the Mission to assure adequate environmental safe guards. The guidelines would also help in analysis and strengthening of Host Government capacity as well as to allow streamlining of its future activities.

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* Sikkens et al (1988) describes four stages of marais as a continuum progressing through their development. Stage I is the natural intact state, undisturbed by man. Stage II remains essentially in its natural state but is subjected to interspersed and periodic grazing. Stage III sees further conversion with not only grazing but some crop production. Stage IV is reached when the totality of the marais is under intensive crop production.

F. Integrated Fish Culture in the Marais Activity

Integrated fish culture/crop/livestock production within the marais has been proposed based on favorable economic indicators. The underlying intent is to improve farmer income by land use intensification, rather than continued expansion into yet more fragile areas. This activity carries the promise of great near term benefit but also raises environmental questions.

Amongst such questions are those relating to affect on overall system hydrology of the drainage and the activities of other users within the system*. Additional questions relate to potential impacts from the project's activities to internationally shared systems. These questions must be fleshed out and answered during the EA process.

The questions and areas to be fleshed out are detailed in the EA SOW and briefly include the following: An undetermined potential related to increased water borne disease, an unknown potential for zoonotic disease problems including parasites from introduction of other exotics, and an unknown potential for development of fish pathologies that could affect sensitive down stream systems including biodiversity of internationally shared systems. Additionally, there are questions relating to affects on overall hydrology and soils. Further, it is apparent that protected species, e.g. some birds, may become pests. The EA should address this issue with alternatives and mitigators.

Finally, questions must also consider other users of the marais and impact on the developing fishery. The activity of others users including potential use of pesticides -- e.g. fungicide because of damp microclimate within cropped area -- may adversely impact down stream fish culture. Thus the EA needs to consider the broader land use implications of the watershed such as aquatic systems, cultural uses, and placement of fish ponds in relationship to other potential users of the same transport network. Little work has been conducted on basin analysis and the drainage network. The EA should discuss the available knowledge and comment on its adequacy for the project at hand.

As a caveat, the EA should pay particularly close attention to potential impacts on aquatic biodiversity of downstream internationally shared systems. Special Design Criteria should be developed for any location where adverse impacts may result to non Rwandan systems. Additionally, findings of the EA should be used in development of training courses and institutional support efforts to strenghthen environmental analytical capacities. Finally, a form of risk analysis is warranted which would overview institutional and technical capacity to undertake and sustain programs.

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* The inclusion of integrated fish culture and the economic benefits may drive decision making to view land use planning in a more synoptic fashion. The synopsis would include incompatible land uses which could adversely affect the nation's economy. Examples would be the cost to fishery output from upstream polluters, i.e. pesticide use in adjoining agriculture. This form of serendipity as a market driven control may achieve what planners in early stages would find difficult.

G. Scoping Statement for Environmental Assessment

1. Significant Issues Relating to Construction or Siting

a. Integrated Fish Culture

Communal Fish Culture Centers, Kigembe, and the Three Regional Stations

[i] Assure siting and construction minimize environmental impacts, especially to non Rwandan systems. Discuss alternatives, mitigation, and monitoring.

[ii] Analyze potential for increased water borne disease, zoonotic disease, or fish pathology which can be transmitted to down stream systems. Discuss alternatives, mitigation and monitoring.

[iii] Analyze potential adverse impacts on hydrology and soils. Discuss alternatives, mitigation and monitoring.

[iv] Analyze potential adverse impacts accruing to fishery from upstream land uses. Discuss alternatives, mitigation and monitoring.

[v] Analyze potential for protected wildlife to become pests. Propose feasible and appropriate mitigators for Rwandan conditions.

2. Issues to be Eliminated

a. Per IEE, subactivities in following areas are accorded either CE or NTD and therefore need not be further analyzed.

[i] Natural Forest Management
[ii] Agroforestry and Soil Conservation
[iii] Small Marais Research

3. Timing Phasing

a. Analysis of siting, review of mitigators, and alternatives prior to construction.

[i] Design criteria per G,1,a above to be developed during the Small Marais Activity and early stages of Integrated Fish Culture as precedents to actual construction or siting under the Integrated Fish Culture Activity.

[ii] Phasing of construction and siting to consider initiating construction and siting activities in those drainages internal to Rwanda.

[iii] Further planning and decision making schedule for construction and siting for externally draining basins to be based on (a) monitoring and (b) lessons learned, and (c) subsequent changes to design criteria especially prior to placement west of Crete.

4. <u>Conduct of Analyses and Disciplines</u>

a. Analysis to be developped during EA with extension and feed back monitoring from Small Marais Research Phase and early phases of Integrated Fish Culture.

b. Disciplines necessary to study to include.

[i] Fish Culture expert familiar with Rwanda context, with background in limnology.

[ii] Environmental Scientist with background in major drainage basin studies, preferably systems similar to Rwanda.

ANNEXE K

NATURAL RESOURCES MANAGEMENT PROJECT ENGINEERING ANALYSIS.

Construction/Engineering support to the project will be provided in four areas:

1. Development of a model small marais which will be used as a "laboratory" for rural staff training and research.

2. Construction and improvement of infrastructure for the fish culture component of the project. This will include the low cost construction of hen houses, rabbit hutches, piggeries, etc. at Kigembe National Center and at three prefectorial centers at Runyinya, Gikongoro and Rushashi, as well as the construction of facilities, including ponds, at 7 communal fish culture centers.

3. Construction of an office complex in Ruhengeri to accommodate the project staff of the agroforestry and soil conservation team.

4. Construction of two interpretive centers for the Natural Forest Management component of the project. One of these centers will be located at the Nyungwe Forest Reserve and the other at the Parc des Volcans.

A. Marais Development

In order to improve our understanding of marais dev lopment, and as a vehicle for training rural technicians in marais management, the NRM Project will develop a small marais of approximately 50 ha as a model. Developing this this small marais will involve some irrigation works. This will entail land topography and hydrology surveys, construction of water supply canals, construction of small dams for water distribution, landscaping, etc. Based upon the results of the topography and hydrology surveys, plans for the execution of the works will be completed, including site plans for drainage or irrigation and for water distribution systems.

A small 75 m2 warehouse will be built at the site for storage of seeds and for crop drying. This warehouse will also contain a small office for the person responsible for the project. Proposed dimensions for this warehouse will be 10m x 7.50m having a height of 3m. This will be a single-story brick structure with corrugated iron roofing sheets supported on a steel or timber roof truss. The design should include skylighting, ventilation and security. Construction drawings could be based on the existing plans of the local crop storage project (696-0107) with some minor modifications to meet site and project needs.

The site for this project component has not been selected. The GOR will submit the selected site to the USAID Project Officer for approval.

Estimated Cost of Marais Development

1.	Construction of canals, small dams, and related-work at $2,800/ha x 50 ha	$140,000
2.	Warehouse at $200/m2 x 75 m2	15,000
3.	Contingencies at 10%	15,500
	Subtotal	170,500
	Rounded to	$170,000

B. Integrated Fish Culture

Under this component, the project will finance the expansion of the national fish culture center at Kigembe and three other prefectorial centers located at Runyinya, Rushashi and Gikongoro. In addition, 7 communal integrated fish culture centers will be created in marais areas. These communal fish culture centers will each have approximately one hectare of pond area, and will be used to demonstrate to farmers integrated fish culture on production ponds.

The engineering support to this project component will involve the renovation or construction of fish ponds, as well as the construction of hen houses, rabbit hutches, piggeries, and so forth. Most of these facilities will be constructed using locally available materials (e.g. bricks, timber, galvanized roofing, nails and cement). Unskilled and skilled labor are also available at the community levels.

Estimated Cost of Integrated Fish Culture

At Kigembe

1.	Expansion and/or Renovation of 1 ha of pond at $150/are x 100	$ 15,000
2.	Construction of 730 m2 of hen houses, rabbit hutches, piggeries, etc. at $120/m2 x 730 m2	87,600
3.	Construction of small warehouse for storage of animal food at $40/m2 x 100 m2	4,000
4.	Management of 1000 m2 for ducks at $20/m2 x 1000 m2	20,000
5.	Contingencies at 10%	12,660
	Subtotal for Kigembe	139,260
	Rounded to:	$140,000

At Runyinya, Rushashi and Gikongoro

1.	Expansion of Runyinya Center from 1 to 2 ha of pond areas at $150/are x 100	$ 15,000
2.	Construction of 330 m2 (126 m2 at Runyinya, 120 m2 at Rushashi, and 84 m2 at Gikongoro) of hen houses, rabbit hutches, piggerie, etc. $120/m2 x 330 m2	$ 39,600
3.	Contingencies at 10%	$ 5,460
	Subtotal	$ 60,060
	Rounded to:	$ 60,000

At 7 Communal Integrated Centers

1.	Construction and/or Renovation of 1 ha of pond at $280/are x 100 ares/center x 7 centers	$196,000
2.	Construction of 2 two holding tanks for fish storage at $4,700/center x 7 centers	32,900
3.	Construction of a small warehouse for storage of materials and animal food $40/m2 x 40 m2/center x 7 centers	11,200
4.	Construction of 120 m2 of hen houses, rabbit hutches, piggerie, etc. at each center at $120/m2 x 120 m2/center x 7 centers	100,800
5.	Contingencies at 10%	34,090
	Subtotal	374,990
	Rounded to:	$375,000
TOTAL FOR INTEGRATED FISH CULTURE		$575,000

C. Construction of an Office Building in Ruhengeri

To accommodate the project staff of the soil conservation and agroforestry team, an office building will be constructed in the town of Ruhengeri. This complex will consist of approximately 360 square meters and will house offices, a reception area, a conference room/library, toilets and a small store room. The cost of this building is estimated to be $140,000. USAID will contribute $100,000 to the cost of this construction and the GOR will contribute the rest. The office complex will be of simple construction and will be one story high. The foundation will be of masonry. The floor will be a concrete slab. The walls will be brick with reinforced columns and a reinforced concrete collar beam. The roof will consist of wood or metal rafters and galvanized roof sheeting. Electrical and plumbing hardware will be of the quality locally available which is imported from either Kenya or from European countries (EEC).

Although, the site of this building has not been selected, utilities such as electricity and water services are available since the building will be located within the town of Ruhengeri.

Estimated Cost for this Building:

1.	Building 360 m2 at $350/m2	$126,000
2.	Contingencies at 10%	12,600
	SubTotal	138,600
	Rounded to:	$140,000

D. Construction of Two Interpretive Centers at Nyungwe Forest and the Parc des Volcans

The goal of the conservation program is to inform the local communities about the environmental value and economic benefits of these forest areas. Two interpretive centers will be built for this purpose, one in the Nyungwe Forest Reserve and another at Kinigi Commune in the Parc des Volcans. These centers will serve as tourist centers, as well as as information centers for the surrounding communities.

These centers will be approximately 150 square meters each and will house offices, a small museum, a projection room, gift shop, reception area, toilets and a small library. The cost of these buildings is estimated at $75,000 each. USAID will contribute $50,000 to the cost of the construction of each center. In the event that the cost of these centers will exceed the amount above, the overrun construction cost will be covered by the GOR.

These centers will be one story high. The structure and the materials to be used will be similar to the office complex at Ruhengeri (see above). It is noted that electricity and water are not available at the sites. Rain water will be collected through roof catchment by gutters, fed into underground cisterns, hand pumped to an overhead tank, and fed into the buildings by gravity. Electricity could be provided by a small generator, if necessary.

The interpretive center of the Parc des Volcans will be located next to the existing buildings of the park reception center. Access could be created from the main road into the area. This land has a gentle slope and is suitable for the proposed construction.

The site for the center in the Nyungwe forest has not been selected. The following criteria should be considered for actual selection:

- Availability of flat or gently sloped land;
- Availability of an access road and nearness to a community; and
- Reduced exposure of building to wind or rain (i.e. not at the top of a hill).

Estimated Cost for these Buildings

1.	Buildings: 2 x 150 m2/each at $300/m2	$ 90,000
2.	Contingencies at 10%	10,000
		$100,000

E. Construction Plans and Specifications

The project will require four (4) structural buildings which will be a small warehouse, an office complex and two interpretive centers. For these buildings, the project will contract a local architectural firm for the design and for the preparation of technical specifications, cost estimates and tender documents. The design for all buildings will meet, as recommended by the REDSO Engineer, the minimum seismic resistence requirements. The buildings will have reinforced floor beams tying footings together, reinforced columns and reinforced ring beams. USAID/Rwanda, with REDSO engineering assistance, will approve all plans, technical specifications, tender documents and cost estimates prepared by the architectural firm,

F. Construction Methodology

The GOR and AID contracting procedures will be used to advertise, evaluate and award a contracts to undertake the above-mentioned construction activities. Because of their simplicity and size, these works and buildings can be readily constucted by local contractors.

G. Construction Supervisor

During the construction period, the GOR and AID will jointly provide support and supervision at all stages of the project activities to insure compliance with plans and technical specifications.

H. Disbursement

The GOR will prepare, based upon the supervisory work mentioned above, the progress payments due to the contractor.

AID will approve the payment request and pay directly to the contractor on behalf of the GOR. The USAID Controller Office will work out the details to insure timely disbursements against the contractor's performance.

I. Cost Estimates

Cost estimates are based on experience with similar construction by AID over the past several years in Rwanda.

1.	Marais development	$170,000
2.	Integrated Fish Culture	575,000
3.	Office Complex	140,000
4.	Two interpretive centers	100,000
	Total	$985,000

J. AID Monitoring

USAID has the in-house capacity to review and approve construction plans, technical specifications, and cost and tender documents for these construction activities. All the construction will be monitored by USAID through its PSC Engineer. The REDSO/ESA Engineer will also be available to provide support to the USAID Engineer at all stages of construction.

K. 611(A) Determination

USAID will employ all applicable procurement procedures for all works and facilities, including the construction of irrigation works, a small warehouse, animal shelters, and buildings, that are to be built and funded under this project. USAID believes that more than adequate experience exists in the GOR agencies for this type of construction, and thus it can be carried out in a smooth and timely fashion.

The USAID/Rwanda and REDSO/ESA review of the construction requirements and procedures to be used, together with the estimated construction costs, conclude that the requirements of section 611(A) of the FAA Act of 1961 as amended are met.

ANNEX L - BIBLIOGRAPHY

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ATTACHMENT 1

UNCLASSIFIED STATE 160833/01

ACTION: AID INFO: AMB DCM

VZCZCXXK452
PP RUEHLGE
DE RUEHC #0833/01 1400450
ZNR UUUUU ZZH
P R 190443Z MAY 88
FM SECSTATE WASHDC
TO RUEHLGE/AMEMBASSY KIGALI PRIORITY 8047
INFO RUEHNR/AMEMBASSY NAIROBI 0320

LOC: 09 116
19 MAY 88 0557
CN: 09711
CHRG: AID
DIST: AID

UNCLAS SECTION 01 OF 02 STATE 160833

AIDAC, NAIROBI FOR REDSO/ESA

E.O. 12356: N/A

SUBJECT: ECPR GUIDANCE CABLE - RWANDA NATURAL RESOURCE MANAGEMENT PID (696-0129)

REF: STATE 145111

1. THE SUBJECT PID WAS APPROVED AT THE ECPR CHAIRED BY AFR/70$ CAROL PEASLEY ON MAY 4, 1988 AND ATTENDED BY AFR/PD, AFR/DP, AFR/EA, AFR/TR/ARD, AFR/DP/PAB, S AND T/FENR, BIFAD, GC/AFR AND EDWARD ROBINS OF OAR/RWANDA. THE FOLLOWING GUIDANCE IS PROVIDED FOR THE PP DESIGN.

2. ASSISTANCE MODE: ECPR BELIEVES THE SUBJECT PROJECT IS AN INSTITUTION BUILDING PROJECT WITH CERTAIN INSTITUTIONAL DEVELOPMENT REFORMS PROPOSED IN THE FORM OF CPS TO DISBURSEMENT OF DOLS 2.5 MILLION FUND. THE PROJECT PAPER SHOULD BE DESIGNED AS A TRADITIONAL PROJECT ACTIVITY WITH NO PROGRAM GRANT COMPONENT. MISSION IS ENCOURAGED TO PURSUE POLICY DIALOGUE WITH THE GOVERNMENT OF RWANDA (GOR) WITHIN THE CONTEXT OF THIS PROJECT. SUCH A POLICY DIALOGUE COULD BE PURSUED ON AN ON-GOING BASIS AND PROJECT COVENANTS COULD PROVIDE FOR ESTABLISHMENT OF A SPECIFIC FORUM AND/OR ISSUES TO BE EXAMINED. IN THIS REGARD, MISSION MIGHT CONSIDER ENGAGING SHORT-TERM TECHNICAL ASSISTANCE UNDER THE PROJECT TO CONDUCT A SECTOR ASSESSMENT OF THE GOR NATURAL RESOURCE MANAGEMENT POLICY CONSTRAINTS WHICH COULD BE USED AS THE BASIS FOR POSSIBLE FUTURE SECTOR GRANT ACTIVITIES.

THE DOLS 2.5 MILLION SET ASIDE FORMERLY FOR A PROGRAM GRANT SHOULD BE PROJECTIZED AND USED TO ESTABLISH A FUND, WHICH IN EFFECT, COULD BE TREATED IN PP SIMILAR TO AN INTERMEDIATE CREDIT INSTITUTION (ICI) ACTIVITY. THEREFORE, NOT ALL PROPOSED ACTIVITIES WOULD NEED TO BE DESCRIBED AND COSTEDOUT IN THE PP, BUT AN ILLUSTRATIVE SET OF ACTIVITIES AND SELECTION CRITERIA WOULD NEED TO BE ELABORATED IN PP. THE PP SHOULD ALSO DESCRIBE CLEARLY HOW FUND WILL OPERATE AND WHO WILL BE THE RESPONSIBLE PARTIES FOR MANAGING THE FUND.

DATE RECD 05/19/88
REPLY DUE 05/20/88
ACTION TO FRMD

	INFO
REP	
PRM	
PDO	
ADO	✓
HPNO	
TRG	
ACC	
MGT	
FFP	
LIB/C+R	
SEC	
RF	✓
CHRON	✓
ER	✓

ACTION COPY
Action taken NAN
No action necessary
Rd 5/19
(Initials) (DATE)

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3. BIOLOGICAL DIVERSITY: AS RWANDA IS A GROUP I NRM COUNTRY MISSION MUST ADDRESS BIODIVERSITY CONCERNS IN MORE DETAIL IN THE PP. IF THE PP DESIGN TEAM AND MISSION CONCLUDE THAT BIODIVERSITY SHOULD NOT BE ADDRESSED UNDER THIS PROJECT, THE BURDEN OF PROOF WILL BE ON THE MISSION TO EXPLAIN . WHILE THE ULTIMATE DECISION ON THE INCLUSION OF BIODIVERSITY ACTIVITIES UNDER THIS PROJECT RESTS WITH THE MISSION, THE ECPR ENCOURAGES MISSION TO CONSIDER AT LEAST MODEST FUNDING FOR SUCH ACTIVITY. APPROPRIATE AREAS OF SUPPORT MIGHT INCLUDE FUNDING FOR RESEARCH INTO HIGHLAND FOREST WATERSHEDS, TRAINING, OR SHORT-TERM TECHNICAL ASSISTANCE IN NATURAL FOREST MANAGEMENT. ECPR RECOMMENDED EXAMINATION OF NATURAL RESOURCE ASPECTS OF DEVELOPING THE SMALL MARAIS BOTTOMLAND AND HIGHLAND NATURAL FORESTS. ALTHOUGH THE WORLD BANK AS WELL AS OTHER INSTITUTIONS ARE WORKING IN THE LARGER MARAIS, THEIR INVOLVEMENT IN THESE AREAS OF NATURAL RESOURCE MANAGEMENT MIGHT BENEFIT FROM SUPPLEMENTARY A.I.D. ASSISTANCE. BUREAU UNDERSTANDS MISSION HAS RECEIVED THREE UNSOLICITED BIODIVERSITY PROPOSALS WHICH MISSION HAD HOPED WOULD BE CENTRALLY FUNDED OR PURSUED BY PVOS. MISSION CANNOT ASSUME THAT ANY OF THE UNSOLICITED PROPOSALS WILL BE CENTRALLY-FUNDED AS NO FUNDING SOURCE HAS BEEN IDENTIFIED AT THIS TIME. THEREFORE, MISSION MIGHT WISH TO INCORPORATE THESE PROPOSALS INTO THE PROJECT IF THEY ARE APPROPRIATELY LINKED TO THE PURPOSE OF THE PROJECT.

4. PRIVATE VOLUNTARY ORGANIZATIONS (PVOS): THE ECPR RECOMMENDED THAT PVOS BE USED TO THE MAXIMUM EXTENT POSSIBLE. MISSION IS ENCOURAGED TO ESTABLISH A PVO COMPONENT UNDER THE PROJECT WHICH COULD BE FINANCED FROM THE MISSION'S REDEFINITION OF THE CRITERIA FOR USE OF THE DOLS 2.5 MILLION. MISSION IS URGED TO SEEK CREATIVE ROLE FOR PVOS WHICH WOULD COMPLEMENT OTHER POTENTIAL PRIVATE SECTOR ACTIVITIES SUCH AS YOUR CURRENT CARE FORESTRY GRANT IN WHICH CARE IS HELPING TO BUILD AND STRENGTHEN PRIVATE SECTOR FORESTRY ACTIVITIES. AS A MANAGEMENT MECHANISM, THE MISSION MIGHT WISH TO CONSIDER USING A PVO TO SERVE AS AN UMBRELLA FOR IMPLEMENTING ACTIVITIES UNDER THE PROJECT. MISSION SHOULD ALSO ATTEMPT TO REGISTER RWANDAN NON-GOVERNMENTAL ORGANIZATIONS (NGOS) THAT COULD QUALIFY TO RECEIVE ASSISTANCE UNDER THE FUND.

5. MANAGEMENT: THE PP SHOULD ENSURE THAT THE GROUPE TECHNIQUE (GT) WILL HAVE SUFFICIENT CAPACITY, RESOURCES AND INFLUENCE TO EFFECTIVELY MANAGE THIS PROJECT. HOWEVER, GT AUTHORITY TO DETERMINE WHAT THE NATIONAL NATURAL RESOURCE MANAGEMENT PRIORITIES WILL BE IS
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UNCLAS. WHILE PID PROPOSES THAT THE GT BECOME THE NEW COORDINATOR FOR GCR OVER TIME, THE PID MAKES NO REFERENCE TO ANALYSES THAT CONFIRM THAT THE GOR HAS THOUGHT THROUGH ITS PLANNING AND COORDINATION NEEDS OVER THE LONG HAUL, NEITHER HAS THE GOR DESIGNATED THE MINISTRY OF AGRICULTURE IN GENERAL, AND THE GT IN PARTICULAR, AS THE QUOTE CZARS UNQUOTE OF NATURAL RESOURCE MANAGEMENT IN RWANDA. ESTABLISHMENT OF A PERMANENT INTER-MINISTRY AGENCY TO COORDINATE, MANAGE AND MAKE DECISIONS FOR THIS PROJECT MIGHT BE REQUIRED. SINCE THE PROJECT HAS INSTITUTIONAL OBJECTIVES, ECPR RECOMMENDS THAT THE MISSION EXAMINE LONG TERM INSTITUTIONAL RELATIONSHIPS, RESPONSIBILITIES AND RECURRENT COST IMPLICATIONS. MISSION ALSO MIGHT WISH TO EXPLORE POSSIBLE COORDINATION WITH OTHER DONORS, SUCH AS THE WORLD BANK'S NEW EFFORT IN THE ENVIRONMENT AND NATURAL RESOURCE SECTORS. THE PP'S INSTITUTIONAL ANALYSIS SECTION SHOULD EXPLORE OTHER INSTITUTIONAL OPTIONS WHICH MIGHT BECOME ALTERNATIVE LONG TERM POLICY MAKING MECHANISMS.

6. PRIVATE SECTOR INVOLVEMENT: ECPR VIEWS THE PROJECT AS AN OPPORTUNITY FOR MORE PRIVATE SECTOR INVOLVEMENT. THE ROLE OF THIS SECTOR SHOULD BE FULLY EXPLORED IN THE PP. IN THIS REGARD, A MEMORANDUM PREPARED BY S AND T/PRIVE ON OPPORTUNITIES FOR INTEGRATING PRIVATE

ENTERPRISE AND FOR-PROFIT INITIATIVE HAS BEEN POUCHED TO THE MISSION.

7. IIED INPUT: BECAUSE OF THE ISSUES ARISING OUT OF THE ECPR, THE ORIGINAL STATEMENT OF WORK (SOW) FOR THE IIED INPUT INTO THE PP DESIGN NEEDED MODIFICATION. EXTENSIVE IIED TECHNICAL ANALYSES ARE NOW CALLED FOR IN RECENTLY MODIFIED SOW. ECPR RECOMMENDS THESE ANALYSES BE COMPLETED AND REVIEWED PRIOR TO FINAL PP DESIGN.

8. DELEGATION OF AUTHORITY: AS THIS IS PLANNED AS AN FY 89 PROJECT, MISSION SHOULD TAKE MAXIMUM ADVANTAGE OF CURRENT STAFF KNOWLEDGE, BUT NOT ATTEMPT TO COMPLETE PP UNTIL FIRST QUARTER OF FY 1989 WHEN PROJECT MAY BE AUTHORIZED UNDER DOA 551 ASSUMING FULL CORE STAFF ON BOARD. SHULTZ
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ATTACHMENT 2

Kigali, le .....

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TRES URGENT

MINISTERE DES AFFAIRES ETRANGERES ET
DE LA COOPERATION INTERNATIONALE
B.P. 179 KIGALI

Réf. :

Annexe :

Objet :

Le Ministère des Affaires Etrangères et de la Coopération Internationale de la République Rwandaise présente ses compliments à l'Ambassade des Etats-Unis d'Amérique à Kigali et a l'honneur d'accuser réception de la lettre de l'USAID/Kigali n° AID-172/89 du 18 avril 1989 relative à la transmission de la version provisoire de l'Accord de subvention du Projet d'Aménagement des Ressources Naturelles (696-0129).

DATE REC'D 5/11/89
REPLY DUE 5/19/89
ACTION TO BDH
INFO
REP ✓
PRM
PDO ✓
ADO ✓
EFFO
TRG
ACC
MGT
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[illegible]
SRC
RF ✓
CHRON ✓

A ce sujet, le Ministère aimerait informer l'Ambassade que la contre-proposition de la Partie Rwandaise au projet d'Accord de subvention lui parviendra incessamment.

Par la présente, le Ministère des Affaires Etrangères et de la Coopération Internationale voudrait remercier vivement le Gouvernement américain pour son intérêt à l'aménagement des ressources naturelles du Rwanda et saisit cette opportunité pour signaler à l'Ambassade des Etats-Unis à Kigali, l'importance que le Gouvernement rwandais attache au financement qu'il sollicite auprès de la Partie Américaine en faveur du projet susmentionné qui revêt une importance de choix dans la stratégie de développement du Rwanda.

Le Ministère des Affaires Etrangères et de la Coopération Internationale de la République Rwandaise saisit cette occasion pour renouveler à l'Ambassade des Etats-Unis à Kigali, l'assurance de sa haute considération.

Kigali, le 11 MAI 1989

AMBASSADE DES ETATS-UNIS
D'AMERIQUE
KIGALI

ACTION COPY
Action taken .....
.....
No action necessary

REPUBLIQUE RWANDAISE
Ministère des Affaires Etrangères et de la Coopération Internationale

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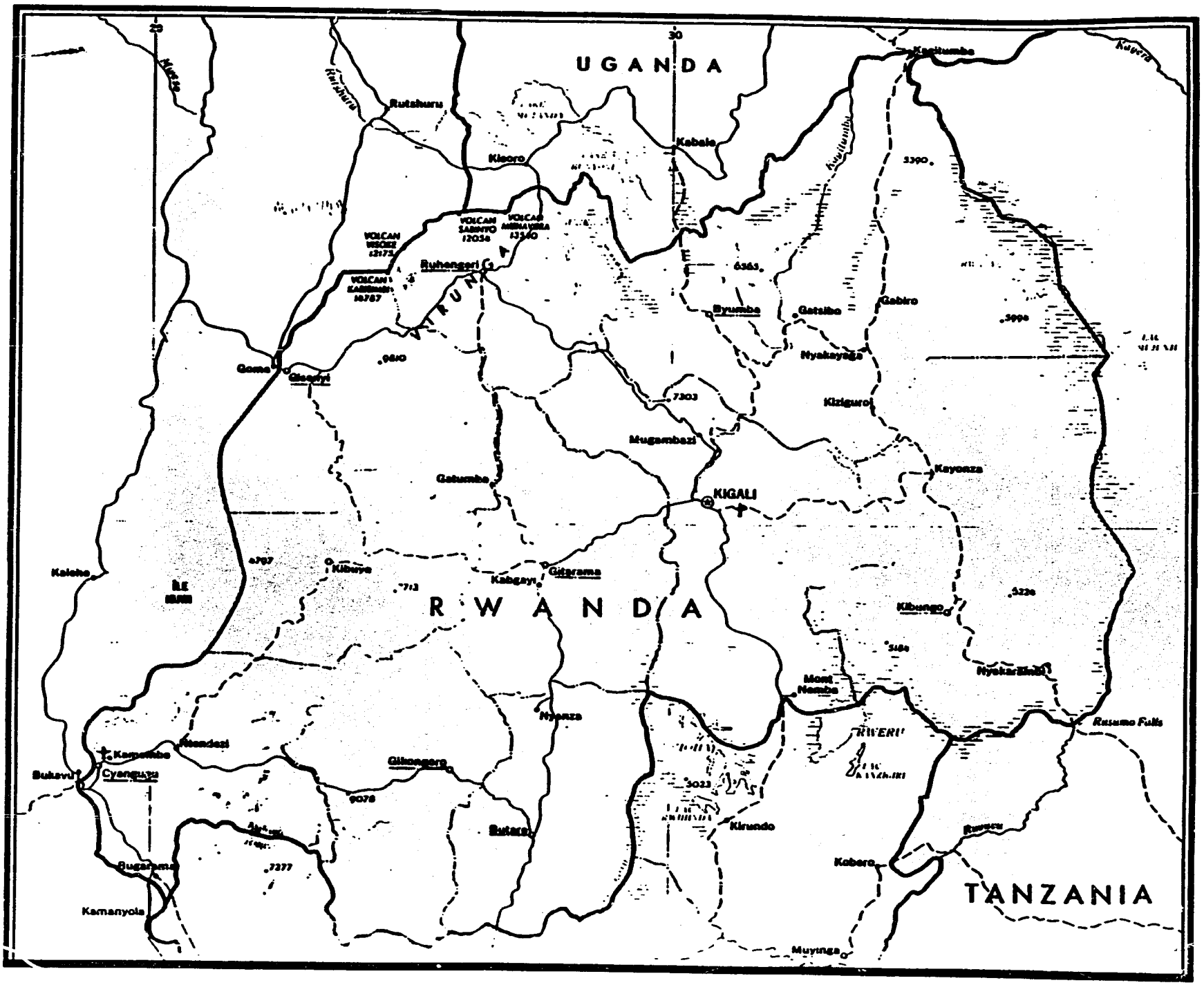

ATTACHMENT 3

5C(1) - COUNTRY CHECKLIST

Listed below are statutory criteria applicable to: (A) FAA funds generally; (B)(1) Development Assistance funds only; or (B)(2) the Economic Support Fund only.

A. GENERAL CRITERIA FOR COUNTRY ELIGIBILITY

1. FY 1989 Appropriations Act Sec. 578(b). Has the President certified to the Congress that the government of the recipient country is failing to take adequate measures to prevent narcotic drugs or other controlled substances which are cultivated, produced or processed illicitly, in whole or in part, in such country or transported through such country, from being sold illegally within the jurisdiction of such country to United States Government personnel or their dependents or from entering the United States unlawfully? No

2. FAA Sec. 481(h); FY 1989 Appropriations Act Sec. 578; 1988 Drug Act Secs. 4405-07. (These provisions apply to assistance of any kind provided by grant, sale, loan, lease, credit, guaranty, or insurance, except assistance from the Child Survival Fund or relating to international narcotics control, disaster and refugee relief, narcotics education and awareness, or the provision of food or medicine.) If the recipient is a "major illicit drug producing country" (defined as a country producing during a fiscal year at least five metric tons of opium or 500 metric tons of coca or marijuana) or a "major drug-transit country" (defined as a country that is a significant direct source of illicit drugs significantly affecting the United States, through which such drugs are transported, or through which significant sums of drug-related profits are

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laundered with the knowledge or complicity of the government? (a) Does the country have in place a bilateral narcotics agreement with the United States, or a multilateral narcotics agreement? and (b) Has the President in the March 1 International Narcotics Control Strategy Report (INSCR) determined and certified to the Congress (without Congressional enactment, within 45 days of continuous session, of a resolution disapproving such a certification), or has the President determined and certified to the Congress on any other date (with enactment by Congress of a resolution approving such certification), that (1) during the previous year the country has cooperated fully with the United States or taken adequate steps on its own to satisfy the goals agreed to in a bilateral narcotics agreement with the United States or in a multilateral agreement, to prevent illicit drugs produced or processed in or transported through such country from being transported into the United States, to prevent and punish drug profit laundering in the country, and to prevent and punish bribery and other forms of public corruption which facilitate production or shipment of illicit drugs or discourage prosecution of such acts, or that (2) the vital national interests of the United States require the provision of such assistance? N/A

3. <u>1986 Drug Act Sec. 2013; 1988 Drug Act Sec. 4404</u>. (This section applies to the same categories of assistance subject to the restrictions in FAA Sec. 481(h), above.) If recipient country is a "major illicit drug producing country" or "major drug-transit country" (as defined for the purpose of FAA Sec 481(h)), has the President submitted a report to Congress listing such country as one (a) which, as a matter of government policy, encourages or facilitates the production or distribution of illicit drugs; (b) in which any senior official of the N/A

government engages in, encourages or facilitates the production or distribution of illegal drugs; (c) in which any member of a U.S. Government agency has suffered or been threatened with violence inflicted by or with the complicity of any government officer; or (d) which fails to provide reasonable cooperation to lawful activities of U.S. drug enforcement agents, unless the President has provided the required certification to Congress pertaining to U.S. national interests and the drug control and criminal prosecution efforts of that country?

4. FAA Sec. 620(c). If assistance is to a government, is the government indebted to any U.S. citizen for goods or services furnished or ordered where (a) such citizen has exhausted available legal remedies, (b) the debt is not denied or contested by such government, or (c) the indebtedness arises under an unconditional guaranty of payment given by such government or controlled entity? NO

5. FAA Sec. 620(e)(1). If assistance is to a government, has it (including any government agencies or subdivisions) taken any action which has the effect of nationalizing, expropriating, or otherwise seizing ownership or control of property of U.S. citizens or entities beneficially owned by them without taking steps to discharge its obligations toward such citizens or entities? NO

6. FAA Secs. 620(a), 620(f), 620D; FY 1989 Appropriations Act Secs. 512, 550, 592. Is recipient country a Communist country? If so, has the President determined that assistance to the country is vital to the security of the United States, that the recipient country is not controlled by the international Communist conspiracy, and that such assistance will further promote the independence of the recipient country from international communism? Will assistance be provided NO

either directly or indirectly to Angola, Cambodia, Cuba, Iraq, Libya, Vietnam, South Yemen, Iran or Syria? Will assistance be provided to Afghanistan without a certification, or will assistance be provided inside Afghanistan through the Soviet-controlled government of Afghanistan?

7. FAA Sec. 620(j). Has the country permitted, or failed to take adequate measures to prevent, damage or destruction by mob action of U.S. property? — No

8. FAA Sec. 620(l). Has the country failed to enter into an investment guaranty agreement with OPIC? — Rwanda has such an agreement

9. FAA Sec. 620(o); Fishermen's Protective Act of 1967 (as amended) Sec. 5. (a) Has the country seized, or imposed any penalty or sanction against, any U.S. fishing vessel because of fishing activities in international waters? (b) If so, has any deduction required by the Fishermen's Protective Act been made? — No

10. FAA Sec. 620(q); FY 1989 Appropriations Act Sec. 518. (a) Has the government of the recipient country been in default for more than six months on interest or principal of any loan to the country under the FAA? (b) Has the country been in default for more than one year on interest or principal on any U.S. loan under a program for which the FY 1989 Appropriations Act appropriates funds? — No

11. FAA Sec. 620(s). If contemplated assistance is development loan or to come from Economic Support Fund, has the Administrator taken into account the percentage of the country's budget and amount of the country's foreign exchange or other resources spent on military equipment? (Reference may be made to the annual "Taking Into Consideration" memo: "Yes, taken into account by the Administrator at time of approval of — N/A

Agency OYB. This approval by the Administrator of the Operational Year Budget can be the basis for an affirmative answer during the fiscal year unless significant changes in circumstances occur.)

12. FAA Sec. 620(t). Has the country severed diplomatic relations with the United States? If so, have relations been resumed and have new bilateral assistance agreements been negotiated and entered into since such resumption? — No

13. FAA Sec. 620(u). What is the payment status of the country's U.N. obligations? If the country is in arrears, were such arrearages taken into account by the A.I.D. Administrator in determining the current A.I.D. Operational Year Budget? (Reference may be made to the "Taking into Consideration" memo.) — Rwanda is not in arrears

14. FAA Sec. 620A. Has the President determined that the recipient country grants sanctuary from prosecution to any individual or group which has committed an act of international terrorism or otherwise supports international terrorism? — No

15. FY 1989 Appropriations Act Sec. 568. Has the country been placed on the list provided for in Section 6(j) of the Export Administration Act of 1979 (currently Libya, Iran, South Yemen, Syria, Cuba, or North Korea)? — No

16. ISDCA of 1985 Sec. 552(b). Has the Secretary of State determined that the country is a high terrorist threat country after the Secretary of Transportation has determined, pursuant to section 1115(e)(2) of the Federal Aviation Act of 1958, that an airport in the country does not maintain and administer effective security measures? — No

17. FAA Sec. 666(b). Does the country object, on the basis of race, religion, national origin or sex, to the presence of any officer or employee of the U.S. who is present in such country to carry out economic development programs under the FAA? — No

18. FAA Secs. 669, 670. Has the country, after August 3, 1977, delivered to any other country or received nuclear enrichment or reprocessing equipment, materials, or technology, without specified arrangements or safeguards, and without special certification by the President? Has it transferred a nuclear explosive device to a non-nuclear weapon state, or if such a state, either received or detonated a nuclear explosive device? (FAA Sec. 620E permits a special waiver of Sec. 669 for Pakistan.) — No

19. FAA Sec. 670. If the country is a non-nuclear weapon state, has it, on or after August 8, 1985, exported (or attempted to export) illegally from the United States any material, equipment, or technology which would contribute significantly to the ability of a country to manufacture a nuclear explosive device? — No

20. ISDCA of 1981 Sec. 720. Was the country represented at the Meeting of Ministers of Foreign Affairs and Heads of Delegations of the Non-Aligned Countries to the 36th General Assembly of the U.N. on Sept. 25 and 28, 1981, and did it fail to disassociate itself from the communique issued? If so, has the President taken it into account? (Reference may be made to the "Taking into Consideration" memo.) — While Rwanda was represented and failed to disassociate itself, this was taken into consideration by the Administrator in the FY88 "Taking into consideration" Memorandum dated January 26, 1988.

21. FY 1989 Appropriations Act Sec. 527. Has the recipient country been determined by the President to have engaged in a consistent pattern of opposition to the foreign policy of the United States? — No

22. FY 1989 Appropriations Act Sec. 513. Has the duly elected Head of Government of the country been deposed by military coup or decree? If assistance has been terminated, has the President notified Congress that a democratically elected government has taken office prior to the resumption of assistance? No

23. FY 1989 Appropriations Act Sec. 540. Does the recipient country fully cooperate with the international refugee assistance organizations, the United States, and other governments in facilitating lasting solutions to refugee situations, including resettlement without respect to race, sex, religion, or national origin? Yes

B FUNDING SOURCE CRITERIA FOR COUNTRY ELIGIBILITY

1. Development Assistance Country Criteria

FAA Sec. 116. Has the Department of State determined that this government has engaged in a consistent pattern of gross violations of internationally recognized human rights? If so, can it be demonstrated that contemplated assistance will directly benefit the needy? — No

FY 1989 Appropriations Act Sec. 536. Has the President certified that use of DA funds by this country would violate any of the prohibitions against use of funds to pay for the performance of abortions as a method of family planning, to motivate or coerce any person to practice abortions, to pay for the performance of involuntary sterilization as a method of family planning, to coerce or provide any financial incentive to any person to undergo sterilizations, to pay for any biomedical research which relates, in whole or in part, to methods of, or the performance of, abortions or involuntary sterilization as a means of family planning? — No

2. Economic Support Fund Country Criteria

FAA Sec. 502B. Has it been determined that the country has engaged in a consistent pattern of gross violations of internationally recognized human rights? If so, has the President found that the country made such significant improvement in its human rights record that furnishing such assistance is in the U.S. national interest? — No

FY 1989 Appropriations Act Sec. 578(d). Has this country met its drug eradication targets or otherwise taken significant steps to halt illicit drug production or trafficking? — N/A

5C(2) - PROJECT CHECKLIST

Listed below are statutory criteria applicable to projects. This section is divided into two parts. Part A includes criteria applicable to all projects. Part B applies to projects funded from specific sources only: B(1) applies to all projects funded with Development Assistance; B(2) applies to projects funded with Development Assistance loans; and B(3) applies to projects funded from ESF.

CROSS REFERENCES: IS COUNTRY CHECKLIST UP TO DATE? HAS STANDARD ITEM CHECKLIST BEEN REVIEWED FOR THIS PROJECT?

A. GENERAL CRITERIA FOR PROJECT

1. FY 1989 Appropriations Act Sec. 523; FAA Sec. 634A. If money is sought to obligated for an activity not previously justified to Congress, or for an amount in excess of amount previously justified to Congress, has Congress been properly notified? — No

2. FAA Sec. 611(a)(1)... Prior to an obligation in excess of $500,000, will there be (a) engineering, financial or other plans necessary to carry out the assistance, and (b) a reasonably firm estimate of the cost to the U.S. of the assistance? — Yes

3. FAA Sec. 611(a)(2). If legislative action is required within recipient country, what is the basis for a reasonable expectation that such action will be completed in time to permit orderly accomplishment of the purpose of the assistance? — No legislative action is required.

4.	FAA Sec. 611(b); FY 1989 Appropriations Act Sec. 501 If project is for water or water-related land resource construction have benefits and costs been computed to the extent practicable in accordance with the principles, standards, and procedures established pursuant to the Water Resources Planning Act (42 U.S.C. 1962, et seq.)? (See A.I.D. Handbook 3 for guidelines.)	N/A
5.	FAA Sec. 611(e). If project is capital assistance (e.g., construction), and total U.S. assistance for it will exceed $1 million, has Mission Director certified and Regional Assistant Administrator taken into consideration the country's capability to maintain and utilize the project effectively?	N/A
6.	FAA Sec. 209. Is project susceptible to execution as part of regional or multilateral project? If so, why is project not so executed? Information and conclusion whether assistance will encourage regional development programs.	Although project is not susceptible to execution as part of a regional or multilateral project. Project will rely on technical assistance from regional projects, to maximum extent possible.
7.	FAA Sec. 601(a). Information and conclusions on whether projects will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition; (c) encourage development and use of cooperatives, credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture and commerce; and (f) strengthen free labor unions.	The project is not designated to directly promote international trade. However, procurement of project goods and services will be be from U.S. sources and U.S. institutions will be heavily involved in project implementation.
8.	FAA Sec. 601(b). Information and conclusions on how project will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).	The project will finance technical services by a U.S. institution, training in U.S. institutions, and commodities from the U.S. The project will rely on U.S. Private Voluntary Organizations to implement a portion of the project.

9. FAA Secs. 612(b); 636(h). Describe steps taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the U.S. are utilized in lieu of dollars.

The U.S. owns no Rwandan currencies.

10. FAA Sec. 612(d). Does the U.S. own excess foreign currency of the country and, if so, what arrangements have been made for its release?

No

11. FY 1989 Appropriations Act Sec. 521. If assistance is for the production of any commodity for export, is the commodity likely to be in surplus on world markets at the time the resulting productive capacity becomes operative, and is such assistance likely to cause substantial injury to U.S. producers of the same, similar or competing commodity?

N/A

12. FY 1989 Appropriations Act Sec. 549. Will the assistance (except for programs in Caribbean Basin Initiative countries under U.S. Tariff Schedule "Section 807," which allows reduced tariffs on articles assembled abroad from U.S.-made components) be used directly to procure feasibility studies, prefeasibility studies, or project profiles of potential investment in, or to assist the establishment of facilities specifically designed for, the manufacture for export to the United States or to third country markets in direct competition with U.S. exports, of textiles, apparel, footwear, handbags, flat goods (such as wallets or coin purses worn on the person), work gloves or leather wearing apparel?

No

13. FAA Sec. 119(g)(4)-(6) & (10). Will the assistance (a) support training and education efforts which improve the capacity of recipient countries to prevent loss of biological diversity; (b) be provided under a long-term agreement in which the recipient country agrees to protect ecosystems or other

The project will suppor research training and conservation education to protect the biological diversity of the Afromontane forests in Rwanda.

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wildlife habitats; (c) support efforts to identify and survey ecosystems in recipient countries worthy of protection; or (d) by any direct or indirect means significantly degrade national parks or similar protected areas or introduce exotic plants or animals into such areas?

14. FAA Sec. 121(d). If a Sahel project, has a determination bren made that the host government has an adequate system for accounting for and controlling receipt and expenditure of project funds (either dollars or local currency generated therefrom)? — N/A

15. FY 1989 Appropriations Act. If assistance is to be made to a United States PVO (other than a cooperative development organization), does it obtain at least 20 percent of its total annual funding for international activities from sources other than the United States Government? — This criterion will be applied to any U.S. PVO selected to receive assistance under the project.

16. FY 1989 Appropriations Act Sec. 538. If assistance is being made available to a PVO, has that organization provided upon timely request any document, file, or record necessary to the auditing requirements of A.I.D., and is the PVO registered with A.I.D.? — These requirements will be applied to any PVO selected to receive assistance under the project.

17. FY 1989 Appropriations Act Sec. 514. If funds are being obligated under an appropriation account to which they were not appropriated, has prior approval of the Appropriations Committees of Congress been obtained? — N/A

18. State Authorization Sec. 139 (as interpreted by conference report). Has confirmation of the date of signing of the project agreement, including the amount involved, been cabled to State L/T and A.I.D. LEG within 60 days of the agreement's entry into force with respect to the United States, and has the full text of the agreement been pouched to those same offices? (See Handbook 3, Appendix 6G for agreements covered by this provision). — The project Agreement for this project will be below the minimum necessary for the application of this position.

B. FUNDING CRITERIA FOR PROJECT

Development Assistance Project Criteria

a.	FY 1989 Appropriations Act Sec. 548 (as interpreted by conference report for original enactment). If assistance is for agricultural development activities (specifically any testing or breeding feasibility study, variety improvement or introduction, consultancy, publication, conference, or training), are such activities (a) specifically and principally designed to increase agricultural exports by the host country to a country other than the United States, where the export would lead to direct competition in that third country with exports of a similar commodity grown or produced in the United States, and can the activities reasonably be expected to cause substantial injury to U.S. exporters of a similar agricultural commodity; or (b) in support of research that is intended primarily to benefit U.S. producers?	No
b.	FAA Secs. 102(b), 111, 113, 281(a). Describe extent to which activity will (a) effectively involve the poor in development by extending access to economy at local level, increasing labor-intensive production and the use of appropriate technology, dispersing investment from cities to small towns and rural areas, and ensuring wide participation of the poor in the benefits of development on a sustained basis, using appropriate U.S. institutions; (b) help develop cooperatives, especially by technical assistance, to assist rural and urban poor to help themselves toward a better life, and otherwise encourage democratic private and local governmental	(a) The project will expand the use of improved agro-forestry and soil conservation techniques and promote fish culture in the rural areas, where the majority of Rwandans live. (b) The project will provide technical assistance through PVOs at the commune level to work with the rural poor. (c) The project will promote food self-sufficiency by improving the farmess knowledge and use of improved agricultural methods.

institutions; (c) support the self-help efforts of developing countries; (d) promote the participation of women in the national economies of developing countries and the improvement of women's status; and (e) utilize and encourage regional cooperation by developing countries.

(d) Women comprise a signification portion of the farming population in Rwanda and thus will be among the project's primary beneficiaries.

(e) The project will include support for a regional agroforestry research program (involving Rwanda, Burundi, Uganda, and Zaire).

c. FAA Secs. 103, 103A, 104, 105, 106, 120-21; FY 1989 Appropriations Act (Development Fund for Africa). Does the project fit the criteria for the source of funds (functional account) being used? — Yes

d. FAA Sec. 107. Is emphasis placed on use of appropriate technology (relatively smaller, cost-saving, labor-using technologies that are generally most appropriate for the small farms, small businesses, and small incomes of the poor)? — Yes

e. FAA Secs. 110, 124(d). Will the recipient country provide at least 25 percent of the costs of the program, project, or activity with respect to which the assistance is to be furnished (or is the latter cost-sharing requirement being waived for a "relatively least developed" country)? — Yes

f. FAA Sec. 128(b). If the activity attempts to increase the institutional capabilities of private organizations or the government of the country, or if it attempts to stimulate scientific and technological research, has it been designed and will it be monitored to ensure that the ultimate beneficiaries are the poor majority? — Yes. The project has been desiganted to improve the institutional capability of the Government. It will be implemented by the Government and by the Private Sector and will be monitored to ensure that the ultimate beneficiaries are the poor majority.

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g. FAA Sec. 281(b). Describe extent to which program recognizes the particular needs, desires, and capacities of the people of the country; utilizes the country's intellectual resources to encourage institutional development; and supports civil education and training in skills required for effective participation in governmental processes essential to self-government.

The project will develop and expand the use of effective natural resource management techniques including agroforestry and soil conservation and improved management of wetlands and forests. The project will train Rwandans to undertake research and manage the country's natural resources.

h. FY 1989 Appropriations Act Sec. 536. Are any of the funds to be used for the performance of abortions as a method of family planning or to motivate or coerce any person to practice abortions?

No

Are any of the funds to be used to pay for the performance of involuntary sterilization as a method of family planning or to coerce or provide any financial incentive to any person to undergo sterilizations?

No

Are any of the funds to be used to pay for any biomedical research which relates, in whole or in part, to methods of, or the performance of, abortions or involuntary sterilization as a means of family planning?

No

i. FY 1989 Appropriations Act. Is the assistance being made available to any organization or program which has been determined to support or participate in the management of a program of coercive abortion or involuntary sterilization?

No

If assistance is from the population functional account, are any of the funds to be made available to voluntary family planning projects which do not offer, either directly or through referral to or information about access to, a broad range of family planning methods and services?

No

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j. FAA Sec. 601(e). Will the project utilize competitive selection procedures for the awarding of contracts, except where applicable procurement rules allow otherwise?	Yes
k. FY 1989 Appropriations Act. What portion of the funds will be available only for activities of economically and socially disadvantaged enterprises, historically black colleges and universities, colleges and universities having a student body in which more than 40 percent of the students are Hispanic Americans, and private and voluntary organizations which are controlled by individuals who are black Americans, Hispanic Americans, or Native Americans, or who are economically or socially disadvantaged (including women)?	Socially disadvantaged enterprises and PVOs and historically black colleges and universities may respond may respond to the request for proposals for the principal technical assistance contract for this project. However, given the nature of the project, the Mission wishes to have the widest possible competition in contracting for this project.
l. FAA Sec. 118(c). Does the assistance comply with the environmental procedures set forth in A.I.D. Regulation 16? Does the assistance place a high priority on conservation and sustainable management of tropical forests? Specifically, does the assistance, to the fullest extent feasible: (a) stress the importance of conserving and sustainably managing forest resources; (b) support activities which offer employment and income alternatives to those who otherwise would cause destruction and loss of forests, and help countries identify and implement alternatives to colonizing forested areas; (c) support training programs, educational efforts, and the establishment or strengthening of institutions to improve forest management; (d) help end destructive slash-and-burn agriculture by supporting stable and productive farming practices; (e) help conserve forests which have not yet been degraded by helping to increase	Yes. The project is compliance with Regulation 15. This is a natural resources management project which aims to increase Rwandans, awareness, education, and management skills in managing and conserving their natural resources.

production on lands already cleared or degraded; (f) conserve forested watersheds and rehabilitate those which have been deforested; (g) support training, research, and other actions which lead to sustainable and more environmentally sound practices for timber harvesting, removal, and processing; (h) support research to expand knowledge of tropical forests and identify alternatives which will prevent forest destruction, loss, or degradation; (i) conserve biological diversity in forest areas by supporting efforts to identify, establish, and maintain a representative network of protected tropical forest ecosystems on a worldwide basis, by making the establishment of protected areas a condition of support for activities involving forest clearance or degradation, and by helping to identify tropical forest ecosystems and species in need of protection and establish and maintain appropriate protected areas; (j) seek to increase the awareness of U.S. government agencies and other donors of the immediate and long-term value of tropical forests; and (k)/utilize the resources and abilities of all relevant U.S. government agencies?

m. FAA Sec. 118(c)(13). If the assistance will support a program or project significantly affecting tropical forests (including projects involving the planting of exotic plant species), will the program or project (a) be based upon careful analysis of the alternatives available to achieve the best sustainable use of the land, and (b)/take full account of the environmental impacts of the proposed activities on biological diversity?

Yes. The project aims to preserve the biological diversity of Rwanda's natural forests. An appropriate environmental assessment has been undertaken.

n. FAA Sec. 118(c)(14). Will assistance be used for (a) the procurement or use of logging equipment, unless an environmental assessment indicates that all timber harvesting operations involved will be conducted in an environmentally sound manner and that the proposed activity will produce positive economic benefits and sustainable forest management systems; or (b) actions which will significantly degrade national parks or similar protected areas which contain tropical forests, or introduce exotic plants or animals into such areas? No

o. FAA Sec. 118(c)(15). Will assistance be used for (a) activities which would result in the conversion of forest lands to the rearing of livestock; (b) the construction, upgrading, or maintenance of roads (including temporary haul roads for logging or other extractive industries) which pass through relatively undegraded forest lands; (c) the colonization of forest lands; or (d) the construction of dams or other water control structures which flood relatively undegraded forest lands, unless with respect to each such activity an environmental assessment indicates that the activity will contribute significantly and directly to improving the livelihood of the rural poor and will be conducted in an environmentally sound manner which supports sustainable development? No

p. FY 1989 Appropriations Act. If assistance will come from the Sub-Saharan Africa DA account, is it (a) to be used to help the poor majority in Sub-Saharan Africa through a process of long-term development and economic growth that is equitable, participatory, environmentally sustainable, and self-reliant; (b) being provided in accordance with the policies contained in section 102 of the FAA; Yes

(c) being provided, when conistent with the objectives of such assistance, through African, United States and other PVOs that have demonstrated effectiveness in the promotion of local grassroots activities on behalf of long-term development in Sub-Saharan Africa;	Yes. The project will be implemented, to a large extent, by PVOs.
(d) being used to help overcome shorter-term constraints to long-term development, to promote reform of sectoral economic policies, to support the critical sector priorities of agricultural production and natural resources, health, voluntary family planning services, education, and income generating opportunities, to bring about appropriate sectoral restructuring of the Sub-Saharan African economies, to support reform in public administration and finances and to establish a favorable environment for individual enterprise and self-sustaining development, and to take into account, in assisted policy reforms, the need to protect vulnerable groups;	Yes. The project will promote soil conservation and agroforestry techniques to improve long term agricultural production.
(e) being used to increase agricultural production in ways that protect and restore the natural resource base, especially food production, to maintain and improve basic transportation and communication networks, to maintain and restore the renewable natural resource base in ways that increase agricultural production, to improve health conditions with special emphasis on meeting the health needs of mothers and children, including the establishment of self-sustaining primary health care systems that give priority to preventive care, to provide increased access to voluntary family planning services, to improve basic literacy and mathematics especially to those outside the formal educational system and to improve primary education, and to develop income-generating opportunities for the unemployed and underemployed in urban and rural areas?	Yes

q. FY 1989 Appropriations Act Section: If deob/reob authority is sought to be exercised in the provision of DA assistance, are the funds being obligated for the same general purpose, and for countries within the same general region as originally obligated, and have the Appropriations Committees of both Houses of Congress been properly notified? N/A

2. Development Assistance Project Criteria (Loans Only)

a. FAA Sec. 122(b). Information and conclusion on capacity of the country to repay the loan at a reasonable rate of interest. N/A

b. FAA Sec. 620(d). If assistance is for any productive enterprise which will compete with U.S. enterprises, is there an agreement by the recipient country to prevent export to the U.S. of more than 20 percent of the enterprise's annual production during the life of the loan, or has the requirement to enter into such an agreement been waived by the President because of a national security interest? N/A

c. FAA Sec. 122(b). Does the activity give reasonable promise of assisting long-range plans and programs designed to develop economic resources and increase productive capacities? N/A

3. Economic Support Fund Project Criteria

a. FAA Sec. 531(a). Will this assistance promote economic and political stability? To the maximum extent feasible, is this assistance consistent with the policy directions, purposes, and programs of Part I of the FAA? N/A

b. FAA Sec. 531(e). Will this assistance be used for military or paramilitary purposes? N/A

c. FAA Sec. 609. If commodities are to be granted so that sale proceeds will accrue to the recipient country, have Special Account (counterpart) arrangements been made? N/A

5C(3) - STANDARD ITEM CHECKLIST

Listed below are the statutory items which normally will be covered routinely in those provisions of an assistance agreement dealing with its implementation, or covered in the agreement by imposing limits on certain uses of funds.

These items are arranged under the general headings of (A) Procurement, (B) Construction, and (C) Other Restrictions.

A. PROCUREMENT

1. FAA Sec. 602(a). Are there arrangements to permit U.S. small business to participate equitably in the furnishing of commodities and services financed?	Yes. All contract awards will observe AID's competitive procurement rules.
2. FAA Sec. 604(a). Will all procurement be from the U.S. except as otherwise determined by the President or determined under delegation from him?	Yes
3. FAA Sec. 604(d). If the cooperating country discriminates against marine insurance companies authorized to do business in the U.S., will commodities be insured in the United States against marine risk with such a company?	N/A
4. FAA Sec. 604(e); ISDCA of 1980 Sec. 705(a). If non-U.S. procurement of agricultural commodity or product thereof is to be financed, is there provision against such procurement when the domestic price of such commodity is less than parity? (Exception where commodity financed could not reasonably be procured in U.S.)	N/A

5.	FAA Sec. 604(g). Will construction or engineering services be procured from firms of advanced developing countries which are otherwise eligible under Code 941 and which have attained a competitive capability in international markets in one of these areas? (Exception for those countries which receive direct economic assistance under the FAA and permit United States firms to compete for construction or engineering services financed from assistance programs of these countries.)	No
6.	FAA Sec. 603. Is the shipping excluded from compliance with the requirement in section 901(b) of the Merchant Marine Act of 1936, as amended, that at least 50 percent of the gross tonnage of commodities (computed separately for dry bulk carriers, dry cargo liners, and tankers) financed shall be transported on privately owned U.S. flag commercial vessels to the extent such vessels are available at fair and reasonable rates?	No
7.	FAA Sec. 621(a). If technical assistance is financed, will such assistance be furnished by private enterprise on a contract basis to the fullest extent practicable? Will the facilities and resources of other Federal agencies be utilized, when they are particularly suitable, not competitive with private enterprise, and made available without undue interference with domestic programs?	Yes. Use of the facilities and resources of other Federal Agencies is not anticipated.
8.	International Air Transportation Fair Competitive Practices Act, 1974. If air transportation of persons or property is financed on grant basis, will U.S. carriers be used to the extent such service is available?	Yes
9.	FY 1989 Appropriations Act Sec. 504. If the U.S. Government is a party to a contract for procurement, does the contract contain a provision authorizing termination of such contract for the convenience of the United States?	Yes. All contracts entered into under the project will conform to this Standard Procurement Provision.

10. FY 1989 Appropriations Act Sec. 524. If assistance is for consulting service through procurement contract pursuant to 5 U.S.C. 3109, are contract expenditures a matter of public record and available for public inspection (unless otherwise provided by law or Executive order)? Yes

B. CONSTRUCTION

1. FAA Sec. 601(d). If capital (e.g., construction) project, will U.S. engineering and professional services be used? N/A

2. FAA Sec. 611(c). If contracts for construction are to be financed, will they be let on a competitive basis to maximum extent practicable? Yes

3. FAA Sec. 620(k). If for construction of productive enterprise, will aggregate value of assistance to be furnished by the U.S. not exceed $100 million (except for productive enterprises in Egypt that were described in the CP), or does assistance have the express approval of Congress? N/A

C. OTHER RESTRICTIONS

1. FAA Sec. 122(b). If development loan repayable in dollars, is interest rate at least 2 percent per annum during a grace period which is not to exceed ten years, and at least 3 percent per annum thereafter? N/A

2. FAA Sec. 301(d). If fund is established solely by U.S. contributions and administered by an international organization, does Comptroller General have audit rights? N/A

3. FAA Sec. 620(h). Do arrangements exist to insure that United States foreign aid is not used in a manner which, contrary to the best interests of the United States, promotes or assists the foreign aid projects or activities of the Communist-bloc countries? Yes

4. Will arrangements preclude use of financing:

a. FAA Sec. 104(f); FY 1989 Appropriations Act Secs. 525, 536. (1) To pay for performance of abortions as a method of family planning or to motivate or coerce persons to practice abortions; (2) to pay for performance of involuntary sterilization as method of family planning, or to coerce or provide financial incentive to any person to undergo sterilization; (3) to pay for any biomedical research which relates, in whole or part, to methods or the performance of abortions or involuntary sterilizations as a means of family planning; or (4) to lobby for abortion? Yes

b. FAA Sec. 483. To make reimbursements, in the form of cash payments, to persons whose illicit drug crops are eradicated? Yes

c. FAA Sec. 620(g). To compensate owners for expropriated or nationalized property, except to compensate foreign nationals in accordance with a land reform program certified by the President? Yes

d. FAA Sec. 660. To provide training, advice, or any financial support for police, prisons, or other law enforcement forces, except for narcotics programs? Yes

e. FAA Sec. 662. For CIA activities? Yes

f.	FAA Sec. 636(i). For purchase, sale, long-term lease, exchange or guaranty of the sale of motor vehicles manufactured outside U.S., unless a waiver is obtained?	Procurement actions will conform to the requirements of the authorizing legislation of the Development Fund for Africa.
g.	FY 1989 Appropriations Act Sec. 503. To pay pensions, annuities, retirement pay, or adjusted service compensation for prior or current military personnel?	Yes
h.	FY 1989 Appropriations Act Sec. 505. To pay U.N. assessments, arrearages or dues?	Yes
i.	FY 1989 Appropriations Act Sec. 506. To carry out provisions of FAA section 209(d) (transfer of FAA funds to multilateral organizations for lending)?	Yes
j.	FY 1989 Appropriations Act Sec. 510. To finance the export of nuclear equipment, fuel, or technology?	Yes
k.	FY 1989 Appropriations Act Sec. 511. For the purpose of aiding the efforts of the government of such country to repress the legitimate rights of the population of such country contrary to the Universal Declaration of Human Rights?	Yes
l.	FY 1989 Appropriations Act Sec. 516; State Authorization Sec. 109. To be used for publicity or propaganda purposes designed to support or defeat legislation pending before Congress, to influence in any way the outcome of a political election in the United States, or for any publicity or propaganda purposes not authorized by Congress?	Yes

5. FY 1989 Appropriations Act Sec. 584. Will any A.I.D. contract and solicitation, and subcontract entered into under such contract, include a clause requiring that U.S. marine insurance companies have a fair opportunity to bid for marine insurance when such insurance is necessary or appropriate? — Yes

ATTACHMENT 5

POSITION DESCRIPTIONS

PROJECT COORDINATOR

The NRMP will finance a long-term technical advisor who, together with the Rwandan Project Director from MINAGRI, will be responsible for the overall supervision of the project. The duties of this advisor will include:

a) monitoring the progress of the project towards the achievement of its goals;

b) identifying and resolving implementation problems as they arise;

c) ensuring that the activities of the various implementing agencies (e.g. PVOs, communes, MINAGRI, centrally-funded TA,) under the separate components of the project are coordinated;

d) ensuring that the activities of the project are linked to, and coordinated with, the GOR's agricultural research and extension programs;

e) reviewing and making recommendations with respect to work plans submitted by the various participating institutions.

f) setting objectives and coordinating data collection for measurement of project impact;

g) interfacing between USAID and the GOR and reporting to USAID on project implementation (i.e. work plans and financial reports);

h) identifying short-term TA needs, assisting in the recruitment of appropriate technical advisors, and providing them with logistical support; and

i) identifying training needs and coordinating in-country, third country and U.S. training.

This individual will not have a specific technical assignment. Nevertheless, he will be involved in setting objectives and monitoring progress for all five project components. Therefore, this individual should have an advanced degree in natural resources management or some other environmentally-related discipline, and should have substantial experience in the management of natural resources projects in developing countries.

ENVIRONMENTAL PLANNING ADVISOR FOR THE MINISTRY OF PLAN

MINIPLAN has requested USAID assistance to fund a long-term resident advisor to assist MINIPLAN in a number of areas. The advisor would provide:

a. Technical assistance related to the follow-up and implementation of the Strategy and Action Plan (including recommendations of the seminar and donor's round table);

b. Technical assistance in organizing an administration unit in MINIPLAN which would be capable of fulfilling the environmental mandate of MINIPLAN, and in identifying the institutional mechanisms which need to be put into place in order for MINIPLAN to carry out this mandate.

c. Technical and scientific support to MINIPLAN in their review of ongoing and proposed development activities with respect to their possible environmental impacts and relationship to environmental problems in Rwanda; and

d. Support to technical departments in developing their own capability to assess the environmental implications of their programs, and support to coordinate the programs and activities of the various government agencies involved in land use planning, natural resource management, environmental conservation and protection.

USAID would fund this advisor for a two-year period (approximately December 1989 to December 1991. USAID would also provide funds for the procurement of a vehicle, and a computer and other office equipment. In addition, funds are provided for logistical support and report publication, and for short-term and in-country training workshops and seminars. The GOR will provide a counterpart for this long-term advisor.