

PN-ARI 892

12970

**PHASE II ENVIRONMENTAL PROFILES**

**IN SELECTED AFRICAN COUNTRIES**

**Report of an exploratory mission to  
Niger, Senegal, Rwanda, and Cameroon**

**Prepared by John T. Major, Ph.D., Team Leader**

**Team Members:**

**A. William Weber**

**Paul R. Brace**

**July 22, 1984**

**Conducted under the auspices of:**

**United States Agency for International Development:**

**The Environmental Planning and Management Project**

**International Institute for Environment and Development  
1717 Massachusetts Avenue, N.W. #302  
Washington, D.C. 20036**

**Joint Environmental Service Contract 22A-AFR**

## EXECUTIVE SUMMARY

The International Institute for Environment and Development, through its Joint Environmental Service with the International Union for the Conservation of Nature (IUCN), contracted for the services of three consultants specializing in natural resources and environmental planning and management to assist U.S. Agency for International Development (USAID) Missions in Africa with planning an approach and strategy for addressing environmental concerns. This assistance was provided under the centrally funded Environmental Planning and Management project administered by the Science and Technology Bureau of AID/Washington. The consultants visited Niger, Senegal, Rwanda, and Cameroon for approximately one month per country beginning in mid-February, 1984. Their activities revolved around specific assistance as requested by the USAID Missions and host-country governments in each country, but all related to exploring the application of the Phase II Country Environmental Profile (CEP) process to improving natural resource and environmental planning and management. The CEP is a process for inventory and analysis of resources, government and other institutional structures and relationships, relevant legislation, economic relationships, and other factors helping to identify natural resource supply and demand or environmental problems.

The team interviewed numerous persons, reviewed documents, and visited field sites to become familiar with issues and topics of concern in each country. They then custom-tailored an approach

for each country designed to help meet these needs while at the same time making a contribution toward a comprehensive, long-term planning and management strategy such as that promoted by the CEP process. These suggestions were designed to support, rather than compete with, present and planned programs. This integral approach is believed to be more viable in receiving the continued support of the agencies involved. Follow-up activities were identified for each country, and ranged from translating the team's report and discussing their recommendations with the host-country agencies to the implementation of a redesigned project or outline for a project design highlighting environmental components of agricultural productivity.

Several common needs in the area of environmental planning and management were evident. These included: increased technical support for Mission personnel, especially the Environmental Officers; increased opportunity for advanced technical training for host-country nationals; greater public education and extension efforts; development of longer term, more comprehensive policies; more clear definition of institutional roles and responsibilities; universal need for basic data collation, organization, and analysis; and identification of alternative actions and establishment of priorities.

Sustainable development depends on a clear understanding of the environmental and natural resource factors involved in supporting basic human needs and the ecosystem in which man lives. Phase II

Country Environmental Profiles and related activities provide a workable mechanism for developing and making accessible this information. The approach is an evolutionary one, with progress measured by incremental steps toward a more global ideal. This exploratory mission has attempted to assess the current situation in each of the countries visited, and suggests a feasible route toward environmentally sound, sustainable development through the concepts embodied in the CEP process.

## INTRODUCTION

The United States Agency for International Development (USAID) is developing an increased awareness of the importance of environmental issues in planning for sound, sustainable development. To adequately incorporate these issues into the USAID's development programs and plans requires the availability of accurate, comprehensive information on resource inventories and assessments, government and other institutional structures and relationships, environmental and natural resource legislation, economic relationships, and other factors helping to identify natural resource supply and demand or environmental problems. One approach to meeting this need for information has been the development of environmental profiles for each of the countries in which USAID has activities. Phase I profiles have been completed for 47 countries. These studies were essentially literature reviews using materials available in the United States. In recognition of the limited, though significant, usefulness of such documents, plans were formulated to follow each of these with a Phase II profile to be conducted in-country and making maximum use of locally available expertise and materials. The Phase I profiles were to provide a starting point, and information contained therein would be verified, updated, and expanded. An important component of the Phase II profiles is also to strengthen the capacity of host country institutions through hands-on training and experience.

AID/W expressed support for the Phase II Country Environmental Profile (CEP) process and encouraged missions to formulate plans for developing CEP's through a cable from AID Administrator McPherson (83 State 321072). The Africa Bureau, AFR/TR/SDP, followed with an offer to provide technical assistance for preliminary planning at no cost to the missions as an incentive for identifying and outlining an appropriate approach (83 State 336810). Positive responses were received from Niger, Senegal, and Cameroon. Africa Bureau Environmental Advisor James Sherburne visited these countries January 10-28, 1984 to discuss specific mission needs and interests and to lay the groundwork for a 2-man CEP team visit of approximately one month duration in each country (cf. Trip Report/Sherburne AFR/TR/SDP files). Each of these missions agreed to host the CEP team visit, but clearly communicated their desire that this assistance address their priority needs and provide practical results useful in the Missions' operations. Later, Rwanda expressed interest in hosting the CEP team for assistance in environmental and natural resources planning and management.

The International Institute for Environment and Development (IIED) contracted for the services of 3 consultants to be fielded under the Environmental Planning and Management (EPM) Project to accomplish this task. John Major, wildlife biologist, served as team leader and coordinated the team's efforts throughout all 4 countries. His colleagues were A. William Weber, experienced in social aspects of natural resources development, and Paul Brace,

an urban planner. The team consisted of Major and Weber in Niger, Senegal, and Rwanda, and Major and Brace in Cameroon.

Individual reports detailing the team's efforts were prepared and submitted to both AID/W and the USAID missions in each country and are attached hereto as appendices. The present report is an overview of the team's activities, relates the activities to the CEP concept, and provides retrospective insight and analysis. It is hoped that this information will be useful to the missions and AID/W in their continuing efforts in designing environmentally sound, sustainable development strategies.

#### ACKNOWLEDGEMENTS

This work was conducted under the Joint Environmental Service, a collaborative program between the International Institute for Environment and Development (IIED) and the International Union for the Conservation of Nature (IUCN).

The CEP team wishes to extend its sincere thanks for the support and assistance given by many people, including: Jim Sherburne, Africa Bureau Environmental Advisor; Bessie Boyd, Africa Bureau Environmental Officer; Mark Ward, Chief AFR/TR/SDP; Molly Kux and Ming Ivory, S&T/FNR; Diane Wood, Steve Berwick, Dave Runnalls, and Faith Clow of IIED; and the Mission Directors, Environmental Officers, Project Managers, and staffs of the USAID Missions and host country government agencies.

## GOAL

The goal of the CEP mission was, simply stated, to increase USAID Mission awareness of the value and usefulness of environmental and natural resource planning in the country development strategies. The team hoped to serve as a catalyst in this process, and open lines of communication between AID/W and the USAID Missions, and between the host-country governments and USAID; to identify priority issues and concerns of the principal parties; and to identify needs and suggest ways of addressing these needs.

## APPROACH

Although properly executed Phase II CEP's would be expected to satisfy the above stated goal, it was evident from preliminary discussions and cables that the idea of developing Phase II CEP's received, at best, a lukewarm reception from the Missions. Resistance to the profiles encompassed a variety of points, including: a misunderstanding of what a Phase II CEP is; lack of appreciation of any value of a CEP to the Mission; perception of the CEP as a pointless duplication of the effort already expended in meeting the Initial Environmental Examinations and Environmental Assessments required by Agency policy and procedures; not a priority issue with the Mission or the host-country government; no funding available; already over-worked staff; no technical expertise; unwillingness to design new, or small-scale projects; not included in the CDSS; static "snapshot"

document of little use; short on analysis and recommendations; the phase I was of little use or otherwise criticized; too major an undertaking for the Mission or the government; lack of perception of AID/W support of environmental issues as priority; and others. In short, the team initially received less than enthusiastic support for developing a Phase II CEP. However, this was not unexpected, and much effort was made to overcome these objections. Essentially, the team's approach was not to hard-sell the Phase II CEP's under that label, but rather to suggest a custom-tailored approach for each country based on developing an appreciation for host-country government and Mission priority issues and needs, opportunities available, and taking an incremental approach through identification of feasible steps to attaining the goal. Emphasis was placed on identifying an approach or project that could truly be viewed by the host-country government and the USAID Mission as useful and addressing a priority need in order to ensure continuing, long-term interest and support. An integral component of the approach was demonstrating the benefits to the Missions of incorporating environmental considerations as part of project design and implementation.

## ACTIVITIES

An overview of the team's activities in each country is provided here. For additional, specific details the reader is referred to the appendices.

## Niger

The Mission had prepared an agenda for the team's visit, and allocated time for each of three projects: the Niger Basin Authority, an institution building project involving the multi-national planning commission responsible for development of the Niger River Basin; Forestry and Land Use Planning Project, which is addressing the problem of fuelwood availability and management of forests; and, the Integrated Livestock Project, a broad-based project aimed at the herders of the Tahoua-Agadez region in north-central Niger. In addition to the requested project-specific assistance, we were asked to review environmental aspects of the USAID/Niger development assistance program with a view toward identifying linkages among projects and also identifying any apparent "gaps" or problems not addressed by the Mission. The Mission expressed strong interest in developing a comprehensive, coordinated environmental component to their program to increase efficiency, allow for better long-term planning, and avoid reactionary "crisis-management". They further advised that our recommendations should have as direct a tie-in as possible to current projects because of their need to limit the number of projects on an already understaffed Mission. It was also clear that while the Mission staff had an environmental consciousness on an individual level, the burden of proof was on us to justify any recommendations in terms of the Country Development Strategy Statement (CDSS) and how such recommendations would be of value in achieving the goals of the CDSS.

The Niger Basin Authority project posed the most complex resource management issues of all the USAID/Niger actions considered by the CEP team. We believe that the intention to develop an integrated environmental data base, as well as a dynamic river model, prior to planning interventions is a positive indication of USAID's awareness of this complexity. Of particular interest to the Country Environmental Profile process is the Stage I Environmental Inventory, which is designed to collect data and prepare an inventory that will serve as a basis for the Stage II Assessment. This is precisely the type of activity envisioned in the development of a Phase II CEP, that of collecting and reviewing all available data upon which to judge information needs and provide a sound base for decisions affecting the environment and natural resources. Because of the breadth of issues and areas of interest to the NBA and USAID/Niger, this activity provides an opportunity for developing a comprehensive, integrative approach for incorporating environmental planning and management into the Mission's program.

The Forestry and Land Use Planning project, as we discussed in the country report (Appendix I), has been involved in promoting an approach to natural resource planning and management that we believe could be profitably expanded if resources permitted. Under present conditions, however, its scope is relatively narrow to avoid over-extension. This project can serve a valuable function in providing Nigerian counterparts with the technical skills necessary for continued involvement in this area. Again,

the approach to information collection and assessment (including the use of aerial photography and remote sensing, field biomass estimation and sampling techniques, literature survey and the creation of a documentation center) is very supportive of the needs and approach of a CEP. We also investigated the situation in Park W as it related to the FLUP project and USAID interests.

The Integrated Livestock Project is apparently no longer considering the experimental grazing patterns that were identified for our review initially. The project is more geared toward developing literacy and social organization of the herders through cooperatives than direct livestock interventions.

However, we communicated our concern that the herders will take advantage of any project interventions that enhance productivity to further their traditional strategy of numerical maximization, without concurrent acceptance of mechanisms for reducing herd size through marketing excess animals. This could lead to exceeding the carrying capacity of the range, and we recommended that project personnel monitor closely the relationship between livestock numbers and range capacity to prevent overgrazing and possible degradation of the range. We also discussed the relevance of some wildlife issues to the project with project personnel and a Peace Corps Volunteer, and suggested possible orientation for further development of these ideas.

We presented our findings and recommendations to the mission at a meeting with Jesse Snyder, Acting Director, Abbe Fessenden,

Project Development Officer, and Mike Gould, General Development Office and Environmental Officer. The report was well received, and we were told that our analysis and recommendations placed the environmental issues in a light that was clearly germane to the Mission's activities. Although no specific commitment was made regarding the need for a comprehensive management plan for Park W and the surrounding area, especially in view of the relationship between the park and the Mission's involvement in the Niger Basin Authority and the Forestry and Land Use Planning projects, and phosphate deposits and USAID's emphasis on agriculture and any related role of phosphate development for fertilizer, we were left with the clear impression that the Mission had an appreciation of the issues involved and no longer viewed the Park as merely "nice, but outside AID's realm." Jesse Snyder requested that Mike Gould prepare a two-year plan of action on his activities as environmental officer as a first step. The Mission also indicated its interest in translating our report and following up with discussions with appropriate government officials. We were told that our visit was very useful and productive for the Mission, and that the Mission looked forward to follow-up visits for AID/W on a periodic basis.

## Senegal

In contrast to the Mission-wide review engaged in by the team in Niger, USAID/Senegal requested assistance from the team in working with a committee formed by USAID with representatives

from SODEVA, a parastatal involved with rural agricultural extension and education; ISRA, the agricultural research agency; Eaux et Forets, traditionally charged with management and protection of classified forests and reforestation; as well as the USAID Cereals II Project. The committee was formed to address the problem of soil degradation in the Groundnut Basin, and had met only a couple of times prior to our arrival. We were asked to help the committee identify specific, discrete activities that could be begun this planting season (June).

We made extensive field trips to the Groundnut Basin and met with field agents and farmers as well as high-level government officials in Dakar. We viewed a variety of demonstration sites, including: reforestation projects; visited villagers attempting to restore organic matter content through plowing practices, manure, compost, and organic matter additions; agro-forestry actions, such as planting or protection of Acacia albida or cad, windbreaks, and live-fences; and visited several nurseries. We also visited the Pout Training Center for SODEVA agents and the production of audio-visual materials.

There is no easy solution to the problems of the Groundnut Basin. Our suggested approach (Appendix II) revolves about continuing support and implementation of those practices which seem to work, especially some of the agroforestry techniques, while at the same time tackling some of the more difficult problems requiring time, such as improving institutional structures and relationships and conducting basic and applied research. One very important

recommendation pointed out the need for a more systems-oriented view of addressing the problems of the Groundnut Basin. We were particularly concerned about land use practices outside the basin for fuelwood and charcoal production, and conversion of forest to farm land, that did not apply good conservation techniques and threaten to expand the scope of the problems of "the Groundnut Basin" to adjacent and outlying areas.

Although our assignment in Senegal was not as global geographically or sectorally as in some other countries or in what might be traditionally viewed as the realm of a CEP, it was an effort specifically addressing environmental problems of very high priority and recognized by both the USAID Mission and the Government of Senegal. A country-wide CEP for Senegal could comprise a detailed analysis of the Groundnut Basin as well as incorporating the environmental components of the major river basin development projects with which AID is also involved. Although both the Government and USAID indicated their interest in implementing an "action-oriented" program, the inventory and assessment work that should logically precede such implementation provides an excellent opportunity for the basis of a CEP.

#### Rwanda

Rwanda responded to the offer for assistance with Phase II Profiles by indicating that profiles were not a priority item with the Mission, however they later requested assistance in

revising the environmentally oriented Cooperative Regional Demonstration Project (CRDP) planned for the Ruhengeri Prefecture under the regionally-funded Environmental Training and Management in Africa (ETMA) project. In meeting with the REDSO/ESA office in Nairobi prior to visiting Rwanda, we were told that our mission was viewed by the AID Mission (technically referred to as OAR/R) as a last chance effort to get the CRDP project off the ground and that the Mission was unclear as to any relationship between a Phase II CEP and the CRDP proposal. Team member Weber had been involved with the original CRDP design team. We met with Gene Chiavaroli, who outlined his views for our visit. In view of communications indicating the availability of \$500,000 in regional funds for FY 85, we were to revise the CRDP to a realistically manageable project in line with funds available. We subsequently learned that the project had a great deal of Mission support, and that OAR/R was planning on identifying a second phase to the project for FY 86 bilateral funding. The Mission's expectations for the project were that it would provide an opportunity for GOR institution building, and that the document produced would be an inventory and assessment useful to donors in planning future projects. The Ruhengeri Prefecture was singled out by both GOR and OAR/R as a model site because of the combination of representative environmental problems and the existence of ongoing projects. OAR/R was also emphatic in the need for a prefectural coordinator who would oversee all USAID projects in the area, and this concern was incorporated in the project proposal (Appendix III).

The timing of our visit was fortuitous in that a recent revision of the forest law provides for the establishment of Prefectural Commissions on Forests and Environment, these bodies providing an ideal institution for the focus of the project. In addition, the GOZ welcomed the prospect of donor support of the PCFE's in their critical formative stage.

We retained much of the CRDP proposal as a basis for the redesign. However, its focus was narrowed to a more discrete 18 month activity and the budget revised to \$498,000. The original design also incorporated an expectation for multi-donor activities. Although we endorse the concept heartily, it was our belief that retaining this aspect within the project itself would lead to unacceptable delays and complications beyond the scope of what could be resolved by a project of this scale. We suggest that a more appropriate mechanism might be through a workshop format involving multi-donor discussion and coordination, such as recently sponsored by REDSO/ESA.

Another significant change is the separation of the project into 2 phases. The first is essentially an inventory and assessment of the environment and natural resources, leading to recommendations for interventions. The second phase follow-up, to be bilaterally funded, continues the training initiated by the first phase and also implements demonstration projects of interventions identified by the first phase. The revised project is now referred to as the Ruhengeri Environmental Management (REM)

activity.

The REM proposal was hand-carried to REDSO and ETMA offices in Nairobi with comments on the draft version by OAR/R; comments from Nairobi were then sent back to Kigali for incorporation into the revised document.

Weber discussed the revised proposal with Val Mahan of the Regional Affairs office in AID/W upon his return to the U.S.

#### Cameroon

The activities of the team in Cameroon were the most difficult of any on the trip because of apparently changing, and somewhat conflicting, expressions of expectations for the team's efforts. As identified by Sherburne's January visit, the team had a very specific charge to develop a 1 year program to develop an environmental conservation and management strategy. Subsequently, a cable was sent from USAID/Cameroon specifically identifying urbanization as the priority focus of the team's efforts and requesting an appropriate technical expert on the team. However, upon our arrival in-country and assignment to work with Government of the United Republic of Cameroon (GURC) counterparts in the Ministry of Urbanism and Habitat (MINUH), we learned that an inter-ministerial committee had developed an ambitious terms of reference for a four week consultancy designed to provide an

environmental assessment for the country.

Although we attempted to provide as much assistance as possible in the shortened 3-week time frame, and addressed the most important issues in the final report, we tried to make it clear that in our opinion, it was neither realistic nor particularly advantageous in the long term for 2 outside consultants to write such an all encompassing assessment. We discussed several alternatives for best meeting the Cameroon government's objectives using available resources. The recommended approach, as outlined in the report (Appendix IV), suggests for MINUH the role of coordination and facilitation while each of the other ministries having direct or indirect impact on, or impacted by the environment retaining the role of technical expertise and preparing a "state of the environment" report from their own points of view. The assemblage of these reports would then constitute a comprehensive, national profile. It is intended that these reports function as working documents, to be revised yearly reflecting annual changes. Such a format should be advantageous in supporting other reporting requirements, provide good background for the 5-year planning process, and provide a coordinated mechanism for identifying priority environmental issues for government or donor intervention.

An appropriate role for USAID/Cameroon in support of this process would be to arrange for a multi-disciplinary team of technical experts who would work with GURC counterparts to review and

assess the reports thus prepared, and to assist in making this information available to the donor community. The Mission indicated its willingness for continued participation in this profiling process, but emphasized its dependence on central funding and the need for someone outside the Mission to handle coordination and planning so as not to overburden their environmental officer.

We believe that this suggested approach follows very closely the original concept of the Phase II profile process, and recommend that AID/W support follow-up actions to ensure that this initiative proceeds. AID should be aware, however, that lead environmental responsibility has only recently been assigned to MINUH by Presidential decree, and that institutional roles and responsibilities may still be in a state of flux for sometime to come. Central to this issue is the distinction between policy and planning questions as compared to technical expertise and management issues. All ministries contacted expressed interest and concern with environmental issues, and the suggested lines of action should serve as a vehicle for cooperation rather than fostering competition.

## CONCLUSIONS

Environmental issues are very much an integral part of the U.S. Agency for International Development's programs and activities. Many of AID's projects attempt to improve the plight of people

dependent on a fragile or degraded natural resource base to support their basic human needs. The USAID Missions are becoming increasingly aware of this relationship, and are interested in a means to better incorporate knowledge about the relationship into their project planning and execution. Host-country governments are also searching for ways to best address the demands of growing populations on a limited resource base.

We believe that the process and activities involved in the Phase II Country Environmental Profile provide a partial answer to these needs. There is an element of confusion and perhaps prejudice against the "Phase II CEP" resulting from incomplete knowledge of what the concept embodies. We use the term to refer to a broadly encompassing process, and emphasize the process rather than the product of a mere document. It is an environmental planning and management tool most useful if viewed as a dynamic entity as opposed to a static "snapshot". It provides opportunity for education and training of technical experts, and serves an important institution building role. Further, we recognize the importance of tailoring the approach to CEP development to the needs and capabilities of each individual country, just as the IUCN recognizes the individual approach in its program of National Conservation Strategies. The CEP should be viewed, in our opinion, as a long-term evolutionary process rather than as a one-shot effort of whatever scale. It may be tied to several or a series of activities designed to meet more immediate, discrete needs. The important thing is that these

achieve some degree of progress toward the more comprehensive, longer term goal of improved environmental and natural resource planning and management.

For the CEP process to be successful requires continued oversight and coordination to identify needs and opportunities, and support for relevant activities leading to the CEP.

Overall, we found the Missions to be receptive to incorporating the major elements of a CEP into their programs. Opportunities varied from country to country in terms of both sectoral and geographic scope viewed as priority needs. Reflecting recent policy decisions, the Missions have reduced their portfolios to a smaller number of projects geared toward a more focused zone of intervention. In some cases, certain regions of the country have been designated as the priority area for projects to prevent over-extension of available resources. In others, all projects must address some specialty sector, such as agriculture.

Therefore, our scope of consideration had to incorporate these policy considerations in our recommendations in order to be consistent with the Missions' programs. Upon their successful completion, such focused activities can serve as a model or base for broadening to include other sectors or larger geographic areas, or may tie-in with activities supported by other donors and agencies in building toward a comprehensive, national CEP.

Several obstacles to the CEP must be recognized and overcome to produce optimum chances of success. First, is a lack of Mission

field personnel with formal training in the environmental and natural resource sciences. Technical support must be available to the Missions for them to successfully incorporate environmental issues into existing and planned projects. In East Africa, the REDSO office offers a cadre of regional environmental officers who provide service in this regard. Similar support in West Africa has been absent for the past year following the re-assignment of the former incumbent, and it is only in the upcoming month that this position will again be filled. Consideration should be given to some mechanism for providing effective support, either through upgrading the staffs of the Missions or regional offices, or through a more active centrally-funded program available upon request.

Secondly, the high rate of personnel turnover at the USAID Missions produces very short institutional memory. This undermines any sort of longer-term project, particularly if it involves multi-sectoral issues. Key positions, such as the Mission Director, strongly influence the direction of Mission programs, and turnover at this level may result in uncertainties or significant shifts in mission programs. Stability is introduced by adherence to formal agency policy and Mission planning documents such as the Country Development Strategy Statements. It is, therefore, important that these key documents be carefully written to provide the support for continuity of longer-term issues and problems. In a related manner is the question of training and reference materials. It is unrealistic

to expect Mission personnel to be thoroughly familiar with all relevant documents, communications, and events occurring before their tenure, which leads us to suggest a system of summarizing the most important of these into a handbook that may serve as a reference. Specifically, this should include information on available resources and personnel who may provide assistance to the Mission on environmental matters, including forestry and soils.

Third, Mission priorities must be recognized and understood. "Environment" seems to conjure up images of snail darters, lawsuits, and hurdles to jump during the course of business. Missions need to become aware of how their programs and priority needs depend upon environmental and natural resource factors, and in this way come to accept environmental and natural resource planning and management as a tool useful in attaining their goals.

## RECOMMENDATIONS

Many recommendations have been made by reference to the appropriate point throughout this report. These may be repeated here, and the intent is to present them in an action-oriented context for consideration as logical follow-up activities.

1. First and foremost, the momentum and dialogue initiated during this exploratory mission must be maintained by appropriate

follow-up activities. In each country, some specific next action or actions were expressed or implied.

a. Niger

- i. Contact should be made with USAID/Niger to determine if the team's report was translated and presented to the government, and if so, the response received.
- ii. Has a 2-year plan of action for the environmental officer at USAID/Niger been completed.
- iii. Is the Mission interested in any particular follow-up assistance?
- iv. Has an environmental/natural resources specialist been incorporated into the phosphate development feasibility study team?

b. Senegal

- i. The team's draft report, including list of references, was to be entered on the WANG and sent to Washington for editorial review and revision, including the appending of a list of persons contacted. This has not been seen, and inquiry should be made.
- ii. The Mission and committee expressed their desire for technical assistance by soils scientists. The S&T/FNR soils support project should contact them with information on available assistance.
- iii. There was an expression of interest in developing a major new project in the area of forestry/soils regeneration in the Groundnut Basin. The project design team should develop some sort of environmental profile

upon which they could base their proposed intervention.

iv. Have any of the specific recommendations made in the draft report been acted upon?

c. Rwanda

i. Has the proposed REM activity for FY85 been accepted and preparations for implementation begun? If not, can the Bureau provide support and encouragement to realizing the proposal?

d. Cameroon

i. Final team report is being sent to the Mission for translation and presentation to GURC.

ii. Is MINUH actively promoting the concept of the state of the environment report and obtaining the required approval? Has a timetable been developed?

iii. Can AID/W discuss Mission needs for centrally funded follow-up team as recommended in the report and convey decision to the Mission?

2. Rate of contact with Missions by technically qualified support personnel should be increased. There is a real need for review and comment on need and opportunity for environmental consideration in Mission programs over and above routine consideration of project environmental impact assessment.

3. Information and Education materials should be developed geared to several specific target audiences raising the awareness of the importance of environmental planning and management in sustainable development. Opportunities for presentation and dissemination of this material should be explored.

4. There is a critical need for, and interest expressed for

assistance in, training of host-country nationals in environmental training and management. Strong support for the ETMA project was expressed in Cameroon and Rwanda, and dismay was voiced at its demise. Consideration should be given to providing assistance in fulfilling this need. A lack of trained technical personnel was frequently cited as an obstacle to government involvement in environmental matters.

5. High level policy statements should clearly communicate a dedication to environmental and natural resource issues as germane to, and important in the success of, AID's development assistance strategies. Missions should be strongly encouraged to pursue strengthening the environmental component of their portfolios.

6. Although the first responsibility for follow-up activities should be aimed at realizing potential for success in the four Missions visited, AID/W should be prepared to provide similar exploratory missions to additional countries. The following recommendations are based on the present team's experience:

a. Two-man CEP team is appropriate, allows discussion of alternative points of view and provides a more balanced and complementary mix of skills than a single consultant. Larger, more specialized teams are probably useful in follow-up to the exploratory mission once the specific needs have been more fully articulated and background preparation more thoroughly done.

b. Team members should possess formal technical background and experience in some area of natural resources planning and management; and should be generalists with the ability to delve

into multi-disciplinary issues. More specific expertise is not necessary and may be counter-productive in the initial exploratory stage.

c. Initial discussions as to the purpose of team visit with Missions and host country governments should reflect the goals stated in this report. Should provide maximum opportunity for scoping out an approach and obtaining the broad picture before request or expectations made for specialized assistance, which can follow very soon after overall approach developed.

d. At least one team member should be fluent in the foreign language; language competency in the second member is highly desirable.

e. Consultants should be well briefed on both AID/W and mission policies, priorities, programs; be able to bridge any communication gaps; be aware of differing points of view between central office and field.

f. Due to the exploratory, discussion nature of the mission, consultants should receive complete support from central funding for communications as well as secretarial and transportation support if scarce in the Mission. USAID should provide liberal time of personnel and arrange all in-country contacts, field transportation, and embassy privileges.

g. Team should emphasize means of incorporating environmental concerns into present and planned programs in an integral, supportive role rather than as an adjunct or add-on type activity.

h. Team should maintain clearly defined goal, but leave open the specific scope of work and means of best attaining the goal.

1. Response time for follow-up support be shortened by combining fewer countries on a single trip and/or by reducing amount of time spent in-country.

7. Environmental awareness on the part of the host-country governments is evolving rapidly, and structures are generally in a state of flux; AID should be cognizant of changing roles and target support to appropriate agency or agencies, should work to orchestrate cooperative, complementary inter-agency and/or multi-donor approach rather than foster competitive programs.

8. Finally, we recommend that an incremental approach be recognized and adopted. It is our belief that more benefits will be derived from the successful completion of a number of related, discrete, feasible activities than by attempting, or failing to even initiate, some large-scale, grandiose project beyond the current capabilities and resources available. It would be desirable to draft a working guideline document for each country outlining the approach and identifying the recognized activities that would lead to "a" CEP, and be updated as these activities were realized and new ones recognized.

**APPENDIX I**

**NIGER REPORTS AND MEMOS**

LIST OF PERSONS CONTACTED - NIGER

Jesse Snyder, USAID/Niger, Acting Director

Dayton Maxwell, USAID/Niger, General Development Office

Mike Gould, USAID/Niger, GDO, Environmental Officer

Patrick McDuffy, USAID/Niger, GDO

John Heermans, Forestry and Land Use Project

Steve Daus, Forestry and Land Use Project

Frank Conlon, Lutheran World Relief

Lance Jepson, USAID/Niger, Agriculture Development Office

Mark Madland, USAID/Niger, ADO

Randy Senoc, Peace Corps Volunteer

Brooke Southall, USAID/Niger

Rudolph Vigil, USAID/Niger, ADO

George Corrunaldi, USAID/Niger, Human Resources Development Office

Abbe Fessendon, USAID/Niger, Program Development Office

Maj. Terry Rice, U.S. Army Corps of Engineers

Fred Weldon, AGRIMET

B. Belding, AGRIMET

Don Hart, Peace Corps

Bruce Christenson, International Fertilizer Development Center

Alio Hammadil, Chief, Wildlife Management Service and Statistical Service, Division of Eaux et Forets, Ministry of Hydraulics and Environment

Mankala Goumandala, Chief, Forestand Environment Service, Division of Eaux et Forets, Ministry of Hydraulics and Environment

Manadou, Director, Bureau Technique Forestier

John Newby, World Wildlife Fund, Wildlife Advisor

Summary Outline  
J. Major and B. Weber  
IIED/EPM Consultants  
March 11, 1984

The success of development assistance in the agricultural and natural resource sectors requires a recognition of important environmental issues. These are especially important in Niger, where attainment of the GON's goal of food self-sufficiency is constrained by ecological factors of soil and range degradation, deforestation, water availability and persistent drought. A comprehensive approach to the management of natural resources is the key to sustainable development under such conditions. The following outline highlights our analyses and recommendations with regard to ecological aspects of USAID development assistance programs in Niger.

## I. ENVIRONMENTAL ISSUES IN SPECIFIC PROJECTS/SECTORS

### A. Integrated Livestock Project

1. Principal concern with acceptance by herders of productivity enhancing interventions without concurrent acceptance of offtake mechanisms (market outlets, advanced early warning), resulting in increasing herd sizes and range degradation.
2. Project management is rightfully wary of pressure to intensify water source development in new areas. Serious attention should be given to environmental (as well as social) problems associated with such development in comparable regions of Africa.
3. With apparent de-emphasis on centripetal grazing, proposed consultant not needed.
4. Predation/wildlife study proposed in PP could provide important information at minimal cost re: livestock losses, effects of on-going poisoning program, and general status of wildlife in project zone.

### B. Forestry and Land Use Planning

1. Inventory methodology seems valid and replicable in comparable ecological zones; question of GON technical capabilities to carry on and expand operations.
2. Guesselbodi good example of multiple use management of natural resources to attain multiple objectives of conservation and development through agroforestry.
3. Revised planning role of BTF necessary, but leaves gap at national level; Say area deforestation, Park W, and numerous other land use issues fall into this gap.

### C. Park W and Adjacent Areas

1. Need comprehensive approach which takes expanded view of relevant ecosystem to include parkland, surrounding reserves, Say buffer, human occupied/utilized zones, and local river systems.
2. Management plan needed to balance multiple uses and objectives and to integrate conservation and development interests with regard to biological diversity, natural forest values, watershed protection, tourism, agro-sylvo-pastoral potential, fuelwood demand, and possible mining interventions.

3. Linkages between Park area complex and Mission-supported activities in river basin planning, forestry and land use planning, and particularly in phosphate mining and fertilizer development would indicate advantages of Mission involvement in comprehensive management plan for park and surrounding areas.

#### D. Niger Basin Authority Project

1. Sedimentation study should continue over longer period to allow upgrading and revision of river system model to more accurately account for this critical component.
2. Data and documents required for Stage I Environmental Inventory are both incomplete and widely dispersed. Therefore suggest sufficient commitment of resources and time to complete task before moving to Stage II Assessment.
3. Background and qualifications of environmental sub-contractor are ill-defined in PP. Variety and complexity of ecological zones, development options and potential environmental impacts require depth and breadth of competency based on relevant experience in comparable area.
4. Training of NBA technicians should begin with participation in environmental inventory and assessment, followed by advanced training in environmental disciplines.
5. Given integrative skills needed at planning and management levels, interdisciplinary training in area such as water resources management (studying socio-economic as well as bio-physical systems) is of critical importance. This need is not reflected in PP.

#### E. Education/Human Resource Development

1. Recognized as weakness affecting development process by both GON and USAID/Niger.
2. Reform has considerable potential in area of natural resource conservation.
3. Requires intervention in both formal (scholastic) and non-formal (extension) education sectors to increase understanding and appreciation of general land use issues, e.g. deforestation/afforestation, desertification, range management, watershed protection, values of natural areas.
4. Multiple benefits of effective intervention:
  - better qualified pool of potential project personnel, with reduced need for additional training;
  - increased understanding of <sup>and</sup> receptivity to appropriate technological transfers;
  - increased popular awareness of and support for conservation efforts.

## II. LINKAGES

### A. Concept/Justification

The breakdown of assistance into individual projects dealing with specific sectors is necessary but also artificial. The functioning system is a complex network of interconnections and an effective approach to conservation and development requires a more comprehensive view of this dynamic system. The benefits of this would be conflict reduction, more efficient use of limited Mission resources, and the appearance of USAID as a model for more integrated approaches by the GON.

B. Examples

1. FLUP

- a. inventory methodology could help with NBA environmental inventory and assessment, also with Park W research and planning
- b. planned inventory of Tahoua region could help ILP
- c. demonstration sites useful for ILP degraded areas restoration
- d. agroforestry model for agriculture projects

2. NBA

- a. sediment monitoring to identify upstream watershed degradation, need for reforestation
- b. stage II assessment could further understanding of Park W ecosystem
- c. soils mapping relevant to irrigated agriculture plans

3. Park W

- a. research on natural forest dynamics applied to agroforestry approaches
- b. understanding of ecosystem and component species essential for complete cost-benefit analysis of phosphate mining proposals

4. Agricultural Projects

- a. positive potential to relieve pressure on other zones through more intensive use of existing arable land base
- b. irrigation expansion competes with alternative water uses
- c. potential to increase flow of fertilizers, pesticides and sediments into Niger system
- d. introduction of technologies favoring extension of cultivation would increase encroachment on pastoral zone

5. Education/HRD

support for human resources development through direct training, educational reform and improved extension services has positive long-term effects in all sectors

III. GAPS

- A. There is a general lack of a systematic, comprehensive view of environmental and resource management issues and the means to deal with these in a more coordinated manner.
- B. The multiple values of the Park W and surrounding area as well <sup>as</sup> numerous connections with USAID/Niger activities, both on-going and planned, makes increased attention to this area essential.
- C. Attention is needed to ecological aspects of development in the mixed agro-pastoral zone of southern Niger. Despite relatively higher rainfall, the soils-vegetation complex of this zone is more susceptible to degradation. Higher population densities also result in increased grazing, cultivation and deforestation putting greater pressure on the land resource base. AID and other donor interventions have a double-edged potential for both positive and negative impacts here.
- D. With regard to human resource development and environmental issues, there is a strong need for training in relevant specialties, training in interdisciplinary management, and general support for educational reform with an important conservation education component.

USAID  
Niamey, Niger  
March 9, 1984

Mr. Randy Senock  
Peace Corps  
c/o Mark Madland, USAID

Dear Randy,

I enjoyed meeting with you in Niamey and Tahoua and discussing proposed wildlife studies for the Integrated Livestock Project. It was clear that you have developed a rapport with the herders, and have a conception of the importance of wildlife issues to them. I have reviewed the reports and proposals for studies that you provided, as well as the ILP Project Paper, and believe that work along these lines could support the goals and objectives of the ILP and AID's policies. My specific recommendations follow.

Vis-a-vis the issue of livestock depredation by jackals and other carnivores, I believe that it is worthwhile to develop a study for the following reasons: 1) it would address a concern of reported priority of the herders themselves; 2) it would establish baseline data on geographic and temporal factors involved, and provide an indication of the magnitude of livestock losses to predation; 3) it could identify husbandry factors influencing vulnerability to losses; 4) it would provide an estimate of the current effort expended on control and the effectiveness of existing programs; and 5) it may allow specific recommendations to the Direction d'Elevage for increasing the specificity of their control efforts with concurrent reductions in hazards to non-target wildlife species. The scope of such a study should include: 1) development of a standardized depredation report form; 2) development of techniques for distinguishing causes of livestock mortality and species-specific predation characteristics; 3) monitoring of current effort and effects of strychnine placement and impacts on target and non-target species; and 4) open-ended interviews with a cross-section of herders to assess their experiences, husbandry practices, and attitudes toward predation. The study should be developed and carried out in cooperation with CON officials/technicians in the Service de l'Amangement de la Faune as well as the Direction d'Elevage.

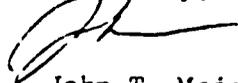
As we discussed, I would consider additional food habits studies to be of only secondary importance because of the inconclusive nature of results of dietary studies. Such studies would not discern between food items representing predation versus scavenging, nor do they offer any insight into the effects of predation on the prey species. On the other hand, negative occurrence of livestock remains from a large, representative sample of scats or stomachs could be significant. I would recommend putting the resources into the herder survey and reports as a more cost-effective means of assessing livestock depredation, which is more a socio-economic problem than a biological problem.

25

The idea of gazelles, an animal well adapted to the arid Sahel, as a supplemental source of protein of value to the herders is intriguing and worth pursuing. At the present time, I would not recommend that you attempt to establish a population figure for the gazelles. I doubt that a figure precise enough to be useful could be accomplished using ground tournees on a limited budget, and the extensive resources required for a properly designed aerial survey could not be justified in the absence of a comprehensive wildlife management plan for the area, which should clearly demonstrate why a population figure is needed at all. Furthermore, the scope of a population survey would probably be beyond the scope of current USAID activities and would be more appropriately supported by other organizations. I would suggest that you take advantage of usual travel in the zone and solicit voluntary incidental observations by project personnel, and map these as a rough sketch of the population distribution that could provide a useful start for more intensive work. You should take advantage, where possible, of opportunities to accompany flights over the zone for other project purposes. More closely related to the ILP project, however, and easily integrated into the suggestions for a predator survey, would be to expand the scope of the survey study by asking the herders about their past and present uses of and attitudes toward other wildlife, such as gazelles. As we discussed, questions would have to be designed cautiously to obtain accurate information in the light of a statutory ban on hunting. This information could be used to assess the validity of the assertion that gazelles might be considered as a supplemental source of protein for the herders, and may help form a base for development of a wildlife management strategy in that area of Niger. In addition, you should be able to collect information on gazelle seasonal habitat use and movements that would be useful in assessing the impacts of herder activities on the gazelles.

I hope these comments are constructive and assist you and others in developing wildlife studies as a relevant part of the ILP. I have tried to suggest the most cost-effective methods for meeting present USAID needs, while at the same time producing information and linkages that could form a base for the development of wildlife management programs and plans in this area.

Sincerely,



John T. Major  
Consultant to AID/W, Environmental  
Planning and Management Project  
International Institute for  
Environment and Development

## memorandum

DATE: March 9, 1984

REPLY TO  
ATTN OF: John Major and Bill Weber, International Institute for Environment  
and Development Consultants to AID/W, Environmental Planning and  
Management Project

SUBJECT:

TO: Observations and recommendations on environmental aspects of  
USAID/Niger activities

Mike Gould, Mission Environmental Officer  
Dayton Maxwell, GDO  
Lance Jepson, ADO

During the past three and one-half weeks, we have had the opportunity to review literature, interview people, and visit field sites associated with several projects identified by the Mission and Jim Sherburne, AFR/TR/SDP. Our objective was to assist the Mission in developing long-range environmental planning through a review of environmental aspects of selected mission projects, to identify linkages among projects, and to consider potential areas for involvement that would support the Mission's development assistance strategy. We examined the Forestry and Land Use Planning Project (683-0230), Integrated Livestock Project (683-0242), and the Niger Basin Authority Project (625-0944). In addition, we reviewed the relationship of Park W to USAID's interests. We also considered certain other programs and projects that were relevant to the above projects or to the general subject of environmental planning and management in Niger. This report summarizes our conclusions and recommendations.

## INTEGRATED LIVESTOCK PROJECT

This project, in the pastoral zone between Tahoua and Agadez, is unlikely to have a negative effect on the environment and should ideally have an overall positive impact. This is partly a function of the resilient nature of the pastoral zone's soils and partly due to planned range management techniques. One concern, however, is that herders will take advantage of project interventions that enhance productivity to further their traditional strategy of numerical maximization, without concurrent acceptance of offtake mechanisms, providing the potential of exceeding the carrying capacity of the range. We recommend that the project personnel monitor closely the relationship between livestock numbers and range capacity to prevent overgrazing and possible degradation of the range, and also ensure that the development of marketing strategies keep pace with production improvements.

The centripetal grazing strategy proposed in the project paper generated considerable interest as a novel approach, and discussions between Jim Sherburne and project personnel resulted in a request for follow-up consideration of the environmental effects of this strategy. Centripetal grazing offers a theoretical potential to increase the efficiency of range use, but is dependent on a complex of social and herd management conditions that are unlikely to be met. Should these conditions be met, we believe there is a potential for positive environmental impacts. Our discussions with project personnel at Tahoua revealed that no suitable sites have yet been found for an experimental grazing trial, and that social and land-tenure systems favor the traditional grazing patterns. It is possible that a trial may be conducted in 1985, if a suitable site is identified. Practical implementation of centripetal grazing seems unlikely in the pastoral zone, and has apparently been de-emphasized as an intervention. Consequently, there seems to be no compelling need for the consultant as suggested in Sherburne's January 26, 1984 memo to USAID/Niger.

The issue of water point development deserves close attention by the project. Our discussions with project personnel indicated their reluctance to become involved with additional water point development, but reported that others were considering this a priority area. We share the caution expressed by USAID on this subject, and recognize the potential for natural resource degradation resulting from poorly-planned water point development. As it affects the overall balance between range capacity and herd size and grazing pressure distribution, the ILP should monitor activities by others in this area, and become involved in the planning process to ensure the soundness of any water point development activities.

Two wildlife-related issues were discussed in the project paper, and we reviewed reports and proposals prepared by Peace Corps Volunteers and others in Tahoua. Herders in the ILP zone reportedly consider livestock depredation by jackals and other carnivores to be a serious problem, and the Direction d'Elevage has responded to some complaints using strychnine baits. However, neither the extent of the problem nor of control efforts is documented. It would seem appropriate at this time for the ILP to systematically collect information on depredation and control efforts in order to determine the extent of reported depredation and respond to the herders' expressed concerns. The issue of considering the value of gazelles to the herders can be addressed at the same time if the predation survey is expanded to determine past and present numbers, distribution, and uses of wildlife, including gazelles. Incidental observations on current wildlife distribution may be recorded during the course of normal travel through the zone by land or air. At this time, more intensive population survey work does not seem warranted until a comprehensive plan is developed that shows the need for such data. Detailed recommendations for these studies are provided in a letter to PCV Randy Senock (copy attached).

## FORESTRY AND LAND USE PROJECT

By design, the FLUP project attempts to promote better land use planning through the development of inventory technologies, demonstration sites, and GON institutional capabilities. The project has recently been narrowed in scope, however, from a more ambitious and comprehensive original design: a change that, while necessary to provide a more realistic and attainable objective, leaves an unfilled need for land use planning on a broader scale. We hope that a successful accomplishment of the project's goals will provide a solid core for future expansion of GON inventory and planning capability.

One of the difficulties encountered in the FLUP project, as well as others, is obtaining qualified counterpart technicians and the successful training of these people to carry out the inventory and planning activities. This project is heavily dependant on ex-patriot expertise. This is a hurdle that must be overcome if a functional GON planning capability is to be produced.

Although FLUP personnel on several occasions emphasized their role as planners and not implementors, we were impressed with the Guesselbodi Foret Classe as a valuable demonstration site. Convenient to Niamey, this area provides a concrete example of the feasibility of recommended techniques for soil, water, and forest conservation and functions as an outdoor lab for educational/extension activities. The forest provides a good example of multiple-use management to attain objectives in fuelwood production, increased agricultural production through agro-forestry, reduced erosion by windbreaks and banquettes, and providing for controlled grazing after a protection period for regeneration.

There is a good library that is frequently used and serves as a reference center. FLUP also has developed some rural extension programs to promote sound forestry. The project should receive continued support in developing techniques and awareness of the value for environmental planning at all levels. Because of the nature of its activities, many linkages can be made to other USAID projects, and consideration of these will help to reinforce related development activities without duplication of effort.

## PARK W AND ADJACENT AREAS

Although the Park is not part of any current Mission projects, USAID has been approached for support of the Park, and the Agency has clearly articulated environmental policies that would dictate consideration of the issues involved. Because of Park W's unique status as Niger's only national Park, its location in the Niger River Basin, its role as a functioning natural ecosystem, its tourism value, and its large phosphate reserves, the Park is linked to some of USAID's current activities. Unfortunately, no comprehensive inventory and management plan for the Park and surrounding areas has been developed, producing the potential for lengthy delays and resource conflicts in the not so distant future as the GON and donors attempt to address the role of the area in any plans for river basin development, forestry and fuelwood production, agricultural development, or phosphate fertilizer production.

Niger's Park W contains 220,000 hectares, and is surrounded by other reserves, buffer zones, and inhabited areas. Although the Park is plagued with problems of drought, poaching, and wildfire, it represents the last stronghold for many species of plants and animals in the country. It is also of primary regional importance as a remnant example of the West African wooded Savanna. In recognition of the value of protecting these natural areas, AID/W has recently begun to examine the role of the Agency in preserving this "Biological Diversity" and should soon develop guidance in this area.

At the present time, the Park is vulnerable to a variety of pressures. Although there is a pressing need for developing the wildlife and tourism potential of the Park, these concerns are only one facet of a comprehensive management planning process needed to establish goals and priorities relating the Park and surrounding areas to the national interests. Some of these interests are in conflict with one another, and the optimal mix of values should be determined as a result of an informed, rational planning process. The resulting multiple-use proposals should then represent a balance of long-term conservation and development interests.

We are aware of the infrastructure already existing within the Park, and of several studies and proposals relating to the Park. Development interests potentially affecting the Park were cited above. We believe that USAID and the GON would benefit from the development of a comprehensive management plan in several ways: 1) the planning process would serve an institution building role within the GON; 2) the resource inventory would provide a firm data base for evaluating the quantity and distribution of resources for planning purposes; 3) management issues could be evaluated against a master plan, rather than piece-meal; 4) essential values of the Park would be identified and protected or perpetuated through mitigative measures; 5) the tourism/wildlife components of the Park could be developed

with assurance that they are recognized values forming an important part of the overall plan; and 6) the inventory and plan would considerably decrease the overlap, expense, and delays encountered through uncoordinated, project by project assessments of the impacts of proposed activities on the Park and surrounding areas.

We believe that the level of interest of the GON and AID/W in such a process would be high. The GON has recently restructured its Ministere de l'Hydraulique et de l'Environnement, and the heads of the wildlife and forestry services have both recently completed graduate training in the U.S. Because of the multi-disciplinary nature of the issues involved, the proposed action would provide an excellent opportunity for relationships between these and other affected agencies to be recognized and developed. The process would offer many opportunities in natural resources training. The project would serve as a clearinghouse and coordinator for studies and issues related to the park.

Clearly, roles could be developed for several assistance agencies, some of which are already involved directly or indirectly with the Park or related work in other areas. We recognize the limitations on USAID/Niger's staff and resource availability, but suggest the Mission consider any opportunities that may arise to facilitate the process. Contact should be made with AID/W to determine the feasibility of identifying and supporting a contractor who could assist with coordination of USAID/Niger interests in projects affecting the park. We would foresee a phased approach consisting of definable steps from very basic and simple to more complex. Initial discussions with GON and donors should establish roles and interests in participating in the planning process. Then, the goals and priorities for the target area should be discussed and agreed upon. Once these crucial administrative steps have been accomplished, inventory and management plan tasks can be developed with increasing specificity according to priority, need, and resources.

The NBA project poses the most complex resource management issues of all the USAID actions considered by our mission. The intention to develop an integrated environmental data base, as well as a dynamic river model, prior to planning interventions is a positive indication of USAID's awareness of this complexity. This approach should help to minimize problems associated with many other river basin development projects in Africa. Although USAID's current involvement with the NBA concerns only research and planning, careful attention should nevertheless be paid to important environmental issues which arise even within these components of the project.

The physical model of the Niger River system is to be developed by the US Army Corps of Engineers, based on their own Phase I investigations in addition to work by the French and other donors. A necessary level of expertise in this area must be presumed and is, in any case, beyond the capacity of our mission to evaluate. We do, however, feel that the sedimentation component of the model is very important and question the sufficiency of a single year's data collection for modeling purposes. Continuous monitoring of tributary discharge and main channel sediment loads would permit regular updating and modifications to make the model more accurately reflect true river system conditions. This, in turn, would allow more accurate calculation of sedimentation effects on potential interventions, particularly dams.

The Stage I Environmental Inventory calls for data collection and preparation in both cartographic and limited written form as a foundation on which to develop a Stage II Assessment. We support this as a sound approach and also recognize that the Stage I effort is not intended to be exhaustive. At the same time, however, our assessment of the data availability situation leads us to strongly recommend that sufficient time and resources be committed to the inventory before proceeding to identification of areas requiring further, more detailed attention in Stage II. Among several reasons for this recommendation, it is first of all clear that much of the required information is not available at the NBA documentation center in Niamey. Its collection will therefore require an extensive search and interview process in each of the principal member states. In addition, significant gaps appear to exist in the available literature on natural vegetation and wildlife within the Basin, from the Guinea highlands through wooded savannas such as Park W and, ultimately, to the moist forests of the delta region. Furthermore, the quality and site-specificity of data on pollution, fisheries, human health and other environmental matters are also in question. While it is possible that sufficient information can be found to complete a preliminary inventory, it is in the long-term interest of the project that certain quality standards be maintained for this product.

An additional concern centers on the choice of a sub-contractor for the environmental inventory and assessment. It is critically important that the organization selected demonstrate the ability to provide a team with the necessary expertise in relevant disciplines (it should be noted

here that virtually every major African ecotype is represented in the Niger Basin: from rainforests to arid steppe, riverine and lake systems, the unique inner delta, and a variety of man-modified agro-ecosystems) as well as a specific familiarity with the problems of African/tropical river basin development. The sub-contractor should also have sufficient independence to permit objective assessments, while at the same time coordinating with others to assure that environmental information can be integrated with data generated by parallel investigations of physical and social factors in river development.

Our final recommendations concern training. First, host country and NBA staff participation in the environmental inventory should receive greater stress than appears in the project paper. Their involvement in the process of its conception, completion and eventual assessment is an essential part of developing the NBA's institutional capacity to effectively deal with the complex environmental issues of river basin development. The mere presentation of a final product would have considerably reduced value in the absence of such active participation. Second, some of those who participate in the inventory and assessment process should then be selected for further advanced training. It is not clear, however, that any such university training is planned in any purely ecological disciplines. Without taking away from the need for engineers and economists, it would be a serious oversight to ignore the need for skilled personnel with a background in ecology. Even more important is the apparent lack of provision for interdisciplinary training. The development and execution of the Integrated Niger Basin Plan will be an exceptionally complex task in resource allocation and optimization. Individuals at the planning and management levels will require integrative skills to deal with this complexity - skills which advanced study in specialized fields are unlikely to provide. It is therefore strongly recommended that some individuals be identified to pursue more interdisciplinary studies in areas such as water resources management. With such training, they should be much more able to bridge the socio-economic and bio-physical spheres and thus serve key functions in the overall planning process.

## EDUCATION AND HUMAN RESOURCE DEVELOPMENT

Constraints imposed by Niger's underdeveloped human resource base and the need for increased inputs in training and education are clearly stated and supported in the approved CDSS. As most USAID/Niger projects already include specific training components, this section will focus on the more general areas of formal and non-formal education. Particular attention will be given to the potential importance of applied conservation education programs for overall resource management in Niger.

The need for reform of the formal education system was explicitly recognized by the GON in the Zinder Declaration of 1982. This found the existing program to be antiquated and called for systematic changes in both its structure and content to make education more relevant to Niger's development needs. Such a scholastic reform would provide an ideal vehicle for the introduction of applied conservation education programs at all levels: primary, technical and secondary. Course content could include issues of deforestation, desertification, appropriate land use and watershed management techniques - all within the context of ecologically sound approaches to sustainable development. The value of developing a conservation education program within the formal school system is twofold. First, the available pool of educated Nigeriens with some foundation of environmental knowledge on which to build through further training is significantly increased. On a more general level, awareness and appreciation of natural resource issues and conservation values are enhanced among the better educated elements of the country, including some who may occupy future leadership positions.

Considering informal education, the goal of a more ecologically aware population is the same, but the target group is larger and the problems of reaching its many segments are more complex. The existing extension education network is fragmented at best. Individual services such as forestry do some education work in their particular fields, and specific donor projects such as the Guesselbodi demonstration site (FLUP) may train their own extension agents. Environmental issues are best presented in conjunction with forestry, agriculture and health information, however, as a comprehensive whole. Unfortunately, an appropriate vehicle for this does not yet exist at the national level. The established "animation" service lacks the institutional capacity, while the planned "development society" units have the potential, but lack a completed infrastructure. Television and radio could be used more in this regard, as could mobile education units using audio-visual techniques which have proven their effectiveness on a trial basis.

Although there is no existing project or even proposal in the area of education, the Mission CDSS clearly places USAID in support of educational reform as a fundamental need in human resource development. The preceding comments and suggestions are intended to bolster that support and accentuate the relevance of conservation education to national development interests. Active intervention by USAID and/or other donors in this sector could result in multiple benefits: development of better-qualified school products for future employment; increased understanding of and receptivity to appropriate technological transfers; and increased popular awareness of and support for conservation efforts.

## LINKAGES

The breakdown of development assistance into individual projects operating within specific sectors is necessary from an administrative standpoint, but must ultimately be recognized as artificial. The functioning system that is Niger is a complex network of interconnections within and between different spheres, and an effective approach to conservation and development requires a more comprehensive view of this dynamic system. Examples of potential linkages between different projects and activity areas are listed below. To the extent that the Mission can institutionalize and coordinate some of these, multiple benefits would accrue, including more efficient use of limited staff and project resources, conflict reduction and the appearance of USAID operations as a model for more integrated approaches by the GON.

### Examples

#### FLUP

- Inventory methodology could be applied to NBA environmental inventory and assessment of comparable ecological areas; also to research and planning for management of Park W and surrounding areas;
- Planned inventory of Tahoua area could be coordinated with larger vegetation biomass survey planned by ILP;
- Demonstration sites of agroforestry and land use techniques applicable to wide variety of donor and government interventions.

#### NBA

- Results from sediment monitoring program could help to quantify or otherwise reflect upstream watershed degradation and erosion, and thus help to identify prime areas for afforestation;
- Stage II environmental assessment could coordinate with other efforts to better understand Park W ecosystem and watershed regulatory role;
- Soils mapping and river model are extremely relevant to any irrigated agriculture plans within the Niger Basin.

#### Park W

- Research on the dynamics of this important remnant natural forest has potential applications to agroforestry efforts in southern Niger;
- Increased understanding of the parkland ecosystem and its component species is essential for any complete cost-benefit analysis of phosphate mining proposals;

#### Agricultural Projects

- Irrigation and some other approaches have potential to relieve pressure on the overall resource base through more intensive production on the existing arable land base;
- Interventions which introduce technologies favoring extension of cultivation would encourage forest clearing and encroachment on the pastoral zone;
- Intensification of agriculture includes likelihood of increasing flow of fertilizers, pesticides and sediment into Niger system.

45'

### Education

-Support for human resources development through direct training, reform of school curricula to include a conservation education component, and improved extension services would have positive long-term effects in all sectors.

### CONCLUSIONS

There is general recognition, both within Mission programs and among its personnel, of the importance of ecological factors in the development equation. Increased attention to specific activities is nevertheless required, as emphasized in preceding sections of this report. We would like to conclude by highlighting four general areas in which the Mission could concentrate future attention on environmental and natural resource issues.

First, there is a need for a more systematic, comprehensive view of environmental matters. Each project seems to operate in its own isolated sphere and there is little or no coordination to determine if there is potential for cooperation or conflict among them. The development of a comprehensive assessment of environmental issues and a coordinated plan to deal with these could greatly improve Mission performance in the area of natural resource management.

Attention is needed to ecological aspects of development in the mixed agro-pastoral zone of southern Niger. Despite relatively higher rainfall, the soils-vegetation complex of this zone is more susceptible to degradation than the northern pastoral zone. Higher population densities also result in increased grazing, cultivation, and deforestation putting greater pressure on the land resource base. USAID and other donor interventions have the potential to facilitate constructive development in this zone if sufficient care is taken to avoid negative environmental impacts.

The multiple values of the Park W and surrounding areas (biological diversity, tourism, watershed protection) in addition to its connection with on-going and planned Mission activities make it a prime area for increased attention. Without the creation of a comprehensive management plan, uncontrolled development of this area will result in unacceptable degradation and destruction of an important natural resource complex. USAID has the capacity and institutional commitment to play an integral role in developing such a plan.

With regard to human resource development and environmental issues, there is a strong need for training in relevant specialties, training in interdisciplinary management, and general support for educational reform with an important conservation education component. The expected long-term benefits of Mission support in these areas are significant.

**APPENDIX II**

**SENEGAL DRAFT REPORT**

**ADDENDUM - LIST OF PERSONS CONTACTED**

LIST OF PERSONS CONTACTED - SENEGAL

USAID/Senegal

John McMahon, Ag. Dev. Office, Cereals II, Farming Systems Res.

Larry Harms, ADO, Land Use Plan, Livestock

John Balis, ADO

Sam Rea, Program Officer

Sarah Jane Littlefield, Mission Director

Dabi Diallo, ADO, Forestry/Energy

Mamadou Ba, ADO, Forestry/Energy

Mamadou Traore, ADO, Cereals II, Farming Systems Research

Roger Jones, Bandia Forest Project

Norm Rifkin, Title III

David Kingsbury, Title III

Amangement du territoire / Ministry de decentralisation

Andrew Stancioff, Project Manager, geo-hydrologist

Grey Tappan, Landsat, vegetation

Marc Staljassens, soils

Ministere de la developpement rurale

Falilu M'Backe Gaye, Sec. Gen.

M. M'Bodji, Director, Societe des terres neuves

**Societe de Vulgarisation Agricole (SODEVA)**

**M. Toure, Director general**

**Benjamin Diouf, Director**

**Ratiba Saad, Agronome**

**Kathy Craven, Economist**

**Ann Sulkovsky, Audio-visual**

**M. Geye, Director, Pout Training Center / CETAD**

**M. Diallo, Delegee regionale - Thies (+ 3 technicians)**

**-----, Delegee regionale - Diourbel (+ 5 technicians)**

**-----, Delegee regionale - Louga (+ 1 technician)**

**-----, Delegee regionale - Sine-Saloun (+ 3 technicians)**

**Amoudou Cisse, Chief SODEVA Louga, Kebiemar, Loige**

MINISTERE DE LA PROTECTION DE LA NATURE

M. Bitey, Secretary du Cabinet, Min. de la Protection de la Nature

Omar El-Hadj Sene, Dir. Gen, Direction des Eaux et Forets

-----, Ass't to M. Sene

-----, Committee representative

Cheikh Savarre, Inspector regional, Diourbel

-----, Chef du secteur, Kebemar, Louga

-----, Chef du secteur, Kaolack, Sine-Saloum

M. Gueye, Thies

Claude Bailley, Forestry Research, CNRF/ISRA

ISRA

Jacques Faye, Director

M. Faye, Technician, Committee Representative

Mankeur Fall, Agronome, Committee Representative

Moustafe Diop, Agronome, Louga

Claude Dancette, Ag/Hydrologist, Bambey

M. Ganry, Agronome, Bambey

M. Diaye, Soils Scientist, Bambey

Leopold Saar, Researcher, Bambey

M. Ange, Agronome, Kaolack

-----, Soils Scientist, Kaolack

M. Camara, Director ISRA, Kaolack

MINISTRY OF PLAN

Marie-Helen Collione, Conseiller

USAID AG SECTOR EVALUATION TEAM

Axel Magnuson

Ron Schwartz

Russell "Skip" Barbour

OTHER

Adnan Probouil, FAO

Chris Kopp, Peace Corps Program Director, Environment,  
Forestry, and Fisheries

REPORT AND RECOMMENDATIONS ON  
SOIL CONSERVATION AND REGENERATION  
IN THE GROUNDNUT BASIN OF SENEGAL

Prepared for USAID/Senegal by:

A. William Weber

John T. Major

International Institute for Environment and Development

Consultants to AID/W

Environmental Planning and Management Project

April 16, 1984

-DRAFT-

The combined effects of an increasing population, declining fertility of soils, and a prolonged period of below normal rainfall pose formidable obstacles to Senegal's ability to feed its people and generate the foreign exchange necessary for economic development. The problem is particularly acute in the Groundnut Basin of west-central Senegal, which includes over half of the country's population and produces the bulk of Senegal's cereals and peanuts. The threat posed by desertification and degradation of these agricultural lands is real, and recognized by farmers, government agencies, and the donor community.

The Government of Senegal considers desertification a priority issue, as indicated by President Diouf's call for a conference on desertification to be held in July of this year. The government is also in the process of reformulating both its agricultural and forestry policies and is expected to include greater attention to soil conservation as an important factor in overall productivity.

Under the auspices of the AID/Washington Environmental Planning and Management Project, we have reviewed the status of soil degradation as well as ongoing and planned actions to ameliorate soil productivity and conservation in the Groundnut Basin. This report summarizes our review of relevant literature, visits to the Basin, and discussions with farmers, field personnel, and administrative staff of SODEVA, ISRA, Direction of Eaux et Forets, and USAID.

63

In this report, we present our views on the elements of a comprehensive, long-term approach to environmentally sound agricultural production in the Groundnut Basin. It includes an analysis of current conditions and constraints, identifies short- and medium-term actions to be taken, and places particular emphasis on the need for a comprehensive, long-term approach to soil conservation and regeneration in the Basin.

## BACKGROUND

The Groundnut Basin is comprised of the administrative regions of Thies, Diourbel, Sine-Saloum, and all but the northeastern sylvopastoral zone of Louga. A predominately rural agricultural population of more than 3 million occupies this area of roughly 40,000 km<sup>2</sup>. Settlement densities surpass 100/km<sup>2</sup> in the Thies-Diourbel-M'bour triangle, but drop to 50/km<sup>2</sup> in Sine-Saloum and 20/km<sup>2</sup> in Louga. If only the arable land base is considered, densities surpass 100/km<sup>2</sup> in both the latter regions and reach levels of 150 and 220 per km<sup>2</sup> in Diourbel and Thies, respectively.

The ecological characteristics of the Basin change as a function of decreasing rainfall from south to north. In areas of remnant natural vegetation, this ecological zonation is evident in the transition from more diverse Parkia woodland in southern Sine-Saloum to the relatively impoverished Acacia steppe of Louga. Over time, however, human settlement and exploitation patterns have transformed almost the entire wooded savanna complex of the Basin into an intensively modified agricultural landscape.

54

While this transformation has been most obvious at the level of vegetative ground cover, it has also had a significant negative impact on soil characteristics. The evolution and current conditions of soils in the Groundnut Basin have been described in detail in several published sources. For the purposes of this report, it will suffice to say that soil degradation has resulted from a combination of factors, including: population growth, deforestation and removal of ground cover, extensive cash-cropping of peanuts, declining fallow periods, chronic drought, and the basic nature of the soil itself (sandy, low organic content) which renders it susceptible to leaching and acidification. While the relative causal importance of these factors may be debated, their combined effect is clear: the soil resource base of the Groundnut Basin has deteriorated to a point where productivity has declined and its future capacity to sustain even the present level of population is in question.

#### CURRENT SITUATION

Although quantitative data are lacking, there is widespread agreement among . . . technicians and researchers that soil degradation, both bio-chemical and physical, is a critical problem across the Groundnut Basin. Sandstorms that swept across the region in late March served to accentuate this fact during our mission. The problem of soil degradation and desertification is also clearly recognized by the government, the donor community, and most directly, the affected rural farming population of the

Basin. This recognition has led to attempted remedial actions on several fronts.

The extension service of SODEVA has been primarily responsible for the dissemination of soil conservation technologies developed by ISRA, the national agricultural research center. These techniques include applications of manure and crop residues to improve soil organic matter levels. This is essential if the soil's retention capacity for water and nutrients is to be increased, or even maintained, over time. Deep plowing greatly increases the effectiveness of manuring.

Numerous forestry interventions have also been initiated in the Basin. In addition to larger plantations, both SODEVA and the Direction des Eaux et Forêts (DEF) have encouraged the development of rural community and village level woodlots. In a related effort, decentralized nurseries have also been supported. There has also been a campaign to favor both the planting and protection of Acacia albida (cadd) in farmers' fields. This multi-purpose tree is an ideal element in any agroforestry approach as its leaves provide fertile organic matter while its roots fix soil nitrogen.

Unfortunately, the effectiveness of the above actions has been seriously limited by multiple constraints. With regard to soil cultivation techniques, most farmers simply lack the means to carry out suggested interventions. Many have insufficient manure reserves and most lack the technical means to deliver it and work it into the soil. The current government financial crisis precludes credit purchases and subsidies to overcome this lack of inputs.

3/10

In forestry, serious land constraints exist, particularly in the most densely settled regions of Thies and Diourbel. Most villages in these areas are unwilling to set aside any potentially arable land for plantation purposes. Within private fields, few tree species are able to coexist like the cadd, and most compete with crops for sunlight, water, or nutrients. There is also competition for time and labor as well as for space, as many tree planting operations coincide with critical farming activities at the beginning of the rainy seasons. In addition, villagers have demonstrated a significantly different set of end-use objectives from those of project planners. In the course of several visits to "fuelwood plantations", we were repeatedly told by villagers that they intended to commercialize the trees at maturity for construction purposes. Officials confirmed that this was in fact the most common end-use of Eucalyntus plantations.

Constraints also exist in the area of research. Limited staff have limited resources to study new techniques or new species more appropriate to changing ecological conditions. Where promising research has been carried out, it is painfully slow to be put into applied use at multiple demonstration sites. All too often, new studies are conducted which fail to build upon and incorporate the results of previous research.

Extension services, too, can be faulted for failure to put new techniques and tree species into field test conditions on a more rapid, broader, and integrated basis. In addition, they have generally not maintained a viable feedback loop to let researchers and planners know what actually happens when farmers or villagers attempt to apply new techniques. But, the greatest shortcoming in the area of extension is the lack of sufficient personnel of sufficiently high quality to disseminate information and follow-up on its application. It is questionable whether the proposed new "mass approach" in this area can make up for this lack.

As serious as they seem, these field-level constraints are surpassed in importance by problems at higher levels of organization. First, there are matters of consistency, continuity, and coordination with regard to field activities. Variables at demonstration sites need to be more tightly controlled, if results are to mean anything (at one site visited, planting of an experimental plot began 26 days after that on the control; in another village woodlot, fencing was installed 5 months after the trees were planted - and grazed upon by local livestock). In addition, increased continuity of actions is needed. Activities now are dispersed, discrete, and rarely seem to build on each other. While single interventions may have an indeterminant impact, the combined effect of multiple actions in a single area should be significant.

Greater coordination within agencies would help to bring about these suggested improvements, but coordination between agencies concerned with soil conservation is also essential. When both SODEVA and DEF agents try to establish woodlots and particularly nurseries in the same area, this is a wastefully redundant use of scarce resources and probably confusing to the local population. Similarly, when one agency becomes aware of either positive or negative attributes of a particular tree species in a given area, this information should be quickly communicated to the others. Unfortunately, this does not happen and shortcuts to more effective actions are thus bypassed. In the course of our tournées in the Basin, an attempt was made to bring the personnel of different agencies together. The resulting discussions indicated considerable potential for increased collaboration; they also indicated that such meetings were rare events.

This failure to effectively coordinate field activities is largely a function of problems at a higher level, that of institutional arrangements. An accord does exist between SODEVA and ISRA under the auspices of the USAID Cereals II Project. This research-extension cell represents a relatively minor component of this project, however, and has not produced significant results. This appears to be largely a function of limited time, resources, and personnel committed to the joint effort.

Eaux et Forets has an indirect relationship with the forestry research division (CNRF) of ISRA, and occasionally provides SODEVA woodlot and nursery programs with seedlings on an informal basis. More commonly, however, the latter relationship appears to be marked by a negative, competitive element. This was most obvious in discussions with higher officials, but was evident at all levels. This can be explained by the fact that both agencies are engaged in similar local forestry actions to which they bring different philosophies, approaches, and sets of expertise. The competitive aspect would be healthier, though, if institutional arrangements for effective collaboration could be established.

Lacking either an official government mandate or a specific project to establish cooperation, USAID has attempted to facilitate institutional collaboration through the creation of an ad hoc interagency committee. Composed of representatives of DEF, SODEVA, and ISRA, the committee has thus far met only 4 times and it is too early to evaluate its performance. Nevertheless, the changing nature of its composition, the lack of decision-making authority on the part of the committee or any of the participants, and continual struggle over issues of institutional "turf" all indicate that an effective coordination mechanism is unlikely to emerge from this arrangement.

The apparent inability to coordinate effective means to deal with soil degradation and desertification in the Groundnut Basin stands in sharp contrast to the broad interest expressed in attacking the problem. This situation leads us to conclude that perhaps the most fundamental constraint to progress lies in the lack of a clearly stated, generally agreed upon

strategic approach to the subject.

## STRATEGIC CONSIDERATIONS

A comprehensive approach first requires recognition of the complex set of factors which enter into the soil conservation equation. A one-dimensional focus on increasing soil productivity through organic inputs and intensified cultivation techniques has little chance of succeeding. Intensification and diversification through agro-forestry are also essential; windbreaks are needed to reduce aeolian erosion and fences to inhibit grazing on crops and young trees; firewood demand must also be satisfied, or women will turn increasingly to burning the manure which should be returned to the soil; and water is a critical factor in all aspects of life in the Basin.

Recognition is also needed of ecological considerations. On one level it is essential that the problems of desertification be dealt with across the entire Basin. If some regions are ignored, then continued degradation in these areas will put added pressures on other regions through the export of people, livestock, and blowing soils. A solid argument can be made, in fact, for the need to take an extended view of the relevant ecosystem that looks beyond the Basin's administrative boundaries to perceive important relationships with surrounding areas. Thus, Dakar's influence on agriculture and forestry practices in the interior as a function of increasing demand

for food and fuel takes on significance for planning purposes. Relations with Mauritania enter into consideration, as reforestation and ground cover restoration efforts in Louga cannot succeed if uncontrolled livestock migration continues from the north. Finally, linkages with the forested and sparsely settled regions to the east and southeast of the current peanut producing areas must be factored into the conservation equation. The clearing and settling of these areas under the auspices of either individual marabouts or the government's "New Lands" programs serves to relieve pressure on the "old lands" of the Basin. This safety valve effect, however, may also serve to reduce incentives to intensify production and conservation techniques in the Basin. It should also be noted that attempting costly and difficult reforestation and conservation measures in the Basin is absurd if deforestation and degradation are not brought under tight control along the eastern front. Failure to effectively manage the land and forest resource base of this area will almost certainly result in conditions approaching those in the current Basin in the not-so-distant future.

On another level, ecological considerations lead to a more stratified approach. Environmental conditions and people's relationships with the land vary across the Groundnut Basin, and intervention strategies should vary accordingly. In Louga, low rainfall (less than 300 mm) and light sandy soils combine to seriously limit the productive potential of the land. Defensive interventions in the form of forestry plantations, windbreaks, live fences, and sylvo-pastoral approaches are therefore likely to be more effective than intensified cultivation techniques.

Lower population densities in the region also permit more land to come under forest cover. In the Sine-Saloum, higher rainfall results in greater productive potential. And, although the more heterogeneous mix of soils includes significant saline and laterite formations, the arable land base is considered to be less degraded than elsewhere in the Basin. These factors, in combination with a moderate population density, result in greater potential for improved productivity through both improved cultivation techniques and agro-forestry applications. More large-scale forestry interventions are appropriate in the non-arable saline depressions and laterite pans. In the central Thies-Diourbel region, marginal rainfall, a deteriorating soil base, and extremely high population densities make some form of intervention essential. Yet, these same factors also seriously limit the range of options. A creative integration and intensification of agriculture, forestry, and livestock activities would seem to offer the greatest potential. Finally, at the eastern edge of the Basin, a combination of protection and controlled sustainable-yield exploitation is most appropriate for the remnant natural forests of Louga, Sine-Saloum, and Senegal Oriental.

While the "extended ecosystem" concept is important for planning purposes, the more stratified approach presented above has obvious practical applications with regard to intervention strategies. To take effective action, potential donors and government agencies should focus their limited resources on a particular set of problems in a restricted geographical area. In the following section, arguments are given for USAID/Senegal and its interagency partners to concentrate initial interventions in the Thies-Diourbel region.

## Zone of Optimal Intervention: Thies-Diourbel

Our selection of the Thies-Diourbel zone for initial, concentrated attention is based on several factors. First, this region can be characterized by a balance between its need and its potential for soil regeneration. Louga has considerable need for remedial action, but the potential for such action to do more than just slow or halt current trends is low. Sine-Saloum on the other hand, has considerable potential to increase soil productivity as a result of interventions, given higher rainfall and lower population:land ratios, but the need for intervention is not so high. It is in the Thies-Diourbel core area that the two come together. Deterioration of the dior soil base in this central zone is considered to be significant, a situation made worse by declining rainfall over the past 15 years. Rainfed agriculture is nevertheless a viable activity in the zone and one that could be significantly enhanced through a combination of increasing soil organic matter content and various agroforestry interventions. Further, it is simply not possible to ignore the fate of 1.4 million people who live in this region.

Thies-Diourbel also presents certain advantages with regard to existing institutional arrangements. Under the USAID Cereals II project, SODEVA and ISRA have already established a working agreement for collaboration on research/extension efforts. These include joint demonstrations of soil regeneration techniques. In discussions with all levels of field personnel

in both Thies and Diourbel, there was general agreement that this cooperation could be improved and that DEF forestry actions could also be integrated within an expanded working agreement. It should also be pointed out that the training centers for both DEF and SODEVA agents are in Thies, while the ISRA research station at Bambey is in Diourbel. Finally, the SODEVA-directed audiovisual center at Pout could also play an important role in conservation education, as discussed in a later section.

Besides this concentration of concerned GOS institutions in Thies-Diourbel, numerous complementary projects with a conservation orientation are either approved or already in progress in the region under USAID auspices. In addition to the Cereals project, these include Title III projects on village woodlot development, dune stabilization, forestry research and promotion of energy efficient stoves. Potentially relevant WID activities have also been developed in the region and Peace Corps has a major presence in the fields of forestry and animation/extension. On a more general level, the Land Use Planning Project (Direction de l'Amenagement du Territoire) is in the process of developing natural resource inventory maps and could focus special attention on the central part of the Groundnut Basin. The active presence of these institutions and complementary programs should facilitate the need to better focus and coordinate conservation and reforestation efforts in the Thies-Diourbel region.

65.

A further argument for intervention in the selected region concerns the kind of activity required there. While on-going farming and forestry activities need to be continued and expanded, environmental and population factors combine to favor the development of a major new emphasis on agroforestry efforts. On-farm tree plantings, multi-purpose windbreaks, and living fences are all appropriate for conditions in Thies-Diourbel. They are also technologies with which USAID has considerable experience, including expertise developed under comparable Sahelian conditions (e.g. Maajia Valley, Forestry and Land Use Planning projects in Niger), which could be readily applied to the current situation in the central Basin.

Finally, Thies-Diourbel offers the potential for expansion in several directions. Techniques which prove successful in the core area could be easily extended into contiguous sectors of Louga and Sine-Saloum, where ecological conditions would be most comparable. Future availability of additional resources could also permit greater attention to a problem which we consider of top priority: the protection and controlled exploitation of remnant woodlands on the eastern edge of the Basin.

The establishment of a comprehensive, coordinated approach to soil regeneration and reforestation in Thies-Diourbel, not to mention potential expansion to other sectors of the Groundnut Basin, requires development of a long-term program. It also requires the commitment to carry out such a program in the face of potentially slow and uncertain economic returns on investments. While the latter is a matter for Senegalese and US policy makers to decide, we conclude with a presentation of a general strategy and detailed recommendations for the incremental

66

development of a long-term soil conservation program.

## RECOMMENDATIONS

### General

An incremental, evolutionary approach to the development of a long-term soil regeneration and reforestation program in the Groundnut Basin is essential. Current conservation actions are dispersed and generally uncoordinated, yet it will take time (at least 2 years) before a comprehensive project can be designed, approved, and implemented. In the interim, adaptations and combinations of existing projects (Cereals II, Title III, Amangement du Territoire) represent the most viable means of bridging this transition period.

Institutional arrangements should also be allowed to evolve, though some initially agreed upon coordinating structure and direction for this process must be established. The principal institutions necessary for a multi-faceted program are already present in Thies-Diourbel, as described earlier. Yet cooperation which does not yet exist cannot be forced. In addition, institutional arrangements must necessarily remain in flux until some major GOS policy decisions are formulated and announced over the coming months. Currently available information indicates that these could significantly alter the focus and function of SODEVA (possible decrease in funding, personnel, change in orientation) and DEF (creation of a new Direction of Soil Conservation and Reforestation). The planned conference on

desertification, called for this July by President Diouf, should also serve to focus and possibly re-orient the government's overall thinking and planning about this critical subject.

Despite this uncertainty, some general institutional arrangements can be proposed to initiate action:

1) The Cereals II project should be extended and reoriented to focus more specifically on soil and forest conservation and with an increased emphasis on extension work, particularly audio-visual. Within this restricted framework, a cooperative agreement should include DEF participation in addition to the existing SODEVA/ISRA arrangement.

2) A mechanism for effective coordination should be established at the regional level. This could be a committee of DEF Inspectors, SODEVA Delegates, and appropriate ISRA representatives <sup>that</sup> ~~which~~ would meet regularly and could include representatives of other complementary programs (PVO's, Peace Corps, WID, etc.) on an ad hoc basis. This approach brings together those who know field conditions best and is also in line with GOS emphasis on decentralization. The availability of a USAID representative to dedicate at least a part-time effort to work at this regional level could greatly facilitate both communication and coordination.

3) The existing Interagency Committee should continue to function, but with increased emphasis on technical matters. Particular field decisions should be left to the regional coordination committee, and broader policy considerations left to higher level administration officials. The most valuable role for the current committee lies in promoting the collection and exchange of technical information both within and among the different agencies concerned with soil conservation and reforestation. The committee should also continue its efforts to develop more effective, long-term cooperation and coordination between institutions.

#### Specific

Certain actions at the specific project level can and should be taken before the current summer planting season begins. These include:

4) Immediate identification and protection of the DEF plantation at Sambe as an agroforestry and soil conservation demonstration site. Pressure is building from the local community to take over the 2.5 ha area, with its mature stands of cadd and cashew trees, for farming purposes. DEF's arguments to maintain the plantation would be greatly enhanced if it could be shown that this site will be actively exploited for demonstration purposes. This is also an ideal site to conduct a collaborative effort between DEF, SODEVA, and ISRA. According to DEF officials, this action must be taken in the next few weeks.

5) ISRA and SODEVA need to tighten demonstration site standards and improve control of experimental variables. Even the modest efforts begun under this cooperative program have the potential to provide valuable results and increased understanding. Slack experimental procedures, however, could greatly diminish the value of this work.

6) Decisions should be made on which subjects are most important for audi-visual education programs. Filming can then begin this year with the initial stages of demonstration activities and follow through to the harvest season or beyond. Such material can then be edited for use the following year. Specific suggestions of AV programs are provided below.

The following categorized recommendations conclude our report. Particular actions are presented which should be considered as part of any interim and/or long-term approach to soil conservation and reforestation in the Groundnut Basin.

#### research/inventory

7) Development of a bio-physical inventory could be accomplished through a reorientation of the Land Use Project. A tentative proposal has been made to develop a Geographic Information System model for the central Basin. If adequate resources exist, we believe this would be a useful application of the techniques developed in the original project and would permit area frame sampling of crop productivity, assessment of progress in reforestation, and identification of areas needing special attention.

8) Existing studies, reports, evaluations, maps, etc. should be compiled and made available at a centrally located documentation center. Those cited in the references list represent a minimal base necessary for effective work in this area.

9) Reconsideration should be given to the possibility of establishing a Production Systems Research Center at Bambey. This could serve both Thies and Diourbel and greatly assist conservation interventions. Should this region continue to be overlooked, consideration should be given to how the Kaolack multi-disciplinary team could be of assistance.

#### forestry/agroforestry

10) Agroforestry approaches<sup>s</sup> and private plantations on or around farm fields should be emphasized, particularly in the Thies-Diourbel region. Primary stress should be given to the protection and planting of Acacia albida. This approach is already accepted by much of the population, and, in fact, nursery production lags behind demand. Research and extension emphasis should next focus on means of protecting young cadd which are both effective and acceptable to the people. Finally, much more attention is required to address the value of and need for windbreaks and living fences. These have considerable potential to ameliorate soil erosion and tree and crop protection problems.

But, greatly increased research, demonstration, and extension efforts are required to fully realize the multi-purpose potential (fodder, firewood, food, protection) of these structures.

11) Forestry should reorient its strategy toward species and approaches adapted to marginal lands and conditions. First, because the entire Basin is becoming increasingly marginal as a result of misuse and declining rainfall; second, because villages can often only afford to set aside their worst lands for woodlots. In this regard, we strongly recommend a reconsideration of the current emphasis on Eucalyptus camuladensis in the Groundnut Basin. This species has proven unable to produce as expected in most of the Basin where rainfall is now less than 450 mm. Its impact on both soil water balance and fertility is also increasingly thought to be negative. Research and demonstration should focus on other species with greater potential. Research should also begin on species adapted to saline conditions for planting in abandoned basins of the Nyiayes as well as the tann soils of Sine-Saloum.

12) More attention should be given to the compatibility between tree species planted and end-use objectives for community woodlots. If the restoration of soil fertility is the goal, then a leguminous species may be most appropriate. If firewood is to be produced, then Prosopis, neem, or various shrubs could be planted. Eucalyptus serves neither objective and is almost always sold as commercial timber.

13) Women's interests and involvement are essential in the development of woodlots and private plantations, particularly where firewood issues are concerned. Research is needed to determine levels and sources of firewood consumption, including burning of manures and crop residues. Next, women's preferences for firewood species should be determined. Possible interventions include women's collective woodlots, but attention should also be given to private plantings of appropriate shrubs and trees as part of windbreaks, fences, household enclosures, etc.

14) Local nurseries have shown potential within on-going projects. This potential could be increased by diversification of species and a sequential approach which provides different types of trees for different stages in a community's long-term reforestation effort (e.g. shade species first, then firewood and construction wood, then fruit trees, etc.). Strong consideration should also be given to "maraichage" development where sufficient water sources exist for complementing nursery needs.

15) An analysis of the role of payments, subsidies, provision of food, and other inducements to practice reforestation is needed. The practice of two different policies in this regard on the part of SODEVA and DEF offers a good basis for comparison. Depending on results of such a study, a policy of differential subsidy rates might be developed. Species being promoted for conservation purposes could be more heavily subsidized, while Eucalyptus or fruit tree seedlings could be sold at cost, or profit in the case

of private nurseries.

16) With regard to all forestry interventions, more emphasis should be given to quality factors - diversity, appropriate end use, survivorship - than to those of quantity - number of trees, hectares, or villages. A reorientation of project goals and evaluation procedures could play an important role in reversing the current accent on the latter.

17) Much greater attention should be given to the protection of natural forests and woodlands. Where some exploitation of these is judged necessary, a sustained yield multiple-use strategy is most appropriate. The practice of clearing natural forests for Eucalyptus plantations should be halted immediately.

18) Training of forestry personnel seems necessary in two areas. First, the multiple-use management of natural forests and diverse agroforestry approaches do not seem to be practiced very widely in Senegal. Second, institutional capacities for extension work in forestry need to be better developed, particularly within DEF if the proposed Soil Conservation and Reforestation Direction is approved. In both of these areas, training in comparable Sahelian areas would be more applicable than US training, though ~~some~~ advanced degree training in the US might be desirable at some point.

## cultivation techniques

19) Recent research at ISRA has demonstrated considerable potential for compost to increase soil fertility in marginal areas of <sup>Dicurbel</sup> ~~Thies~~. This technique should pass to demonstration fields as soon as possible. In addition, tests should be conducted to compare the two different composting methods favored by ISRA and SODEVA.

20) The effectiveness of several technical interventions in increasing soil productivity is well established. Further study of constraints to adaptation of these techniques is needed to assess why they have not been widely adapted.

21) More research and demonstration activities under true farming conditions are needed to determine the value of various plowing techniques as well as the benefits of variable levels of manure applications. This is critical since most farmers cannot afford to maintain an animal traction team, nor do they have access to the recommended 10 tons of manure per hectare.

22) Research and demonstration should be conducted in a variety of ecologic and socio-economic contexts to obtain more realistic results. Tests should continue over a long period of time, as available evidence from ISRA is starting to indicate that restoration of fertility and productivity increases may not become apparent until after at least 5-6 years.

23) Emphasis should be placed on those techniques requiring least reliance on subsidies or provision of inputs unless associated credit programs are well established. In the absence of the widespread and guaranteed presence of these program, approaches which are able to be adopted and sustained over time by a significant proportion of all farmers should be stressed.

#### extension

24) Extension agents need to be able to approach the general population with a broad selection of techniques, species, and/or programs which would permit much greater flexibility. Options could then be selected on the basis of their appropriateness for a given site or situation (e.g. what can a farmer do with less than 10 tons of manure, with a horse-drawn plow; what could be planted in windbreaks or fences if a village doesn't have land for a woodlot?).

25) Extension education should be viewed as not only providing the best technical information to the farmer or planter, but also as an opportunity for agents, researchers, and planners to learn from these people what works, what doesn't, and why. Further development of this 2-way communication link is necessary.

26) As more demonstration sites are developed, increased effort should be made to provide the means for interested people to visit these sites and discuss what is seen. New vans recently delivered to SODEVA should help with this exchange process.

27) As mentioned earlier, it is essential to get women involved with conservation and reforestation efforts, particularly where firewood is a central issue. Extension agents of SODEVA and DEF do not seem to have paid much attention to women's interests and potential contributions in this area.

audio-visual programming

Audiovisual approaches to education and the dissemination of technical information should become central elements in the overall conservation effort. This is especially necessary given GOS plans to reduce field extension agents and to switch to a policy of mass education and "autoencadrement". The AV center at Pout, under SODEVA auspices, has considerable potential in this regard. The following recommendations are intended to help realize this potential.

28) AV programs should be developed that are relevant to the problems of soil conservation and reforestation. These could include:

- Groundnut Basin/regional ecology and overview of the problem;
- the problem and potential solutions at the level of a village or rural community;
- agroforestry approaches that families could adopt;
- evolution of the development of a demonstration field or plantation;
- filmed sessions of peasants (with or without officials) discussing the pros and cons of conservation activities they have attempted to carry out.

Unfortunately, current SODEVA plans do not call for the production of any of these, or comparable programs, at the Pout AV center this year. We therefore conclude with a strong

recommendation that this oversight be corrected and that the full resources of this center be applied to the critical problems of soil regeneration and reforestation in the Groundnut Basin.

## SUMMARY

The combined effects of population growth, deforestation, extensive cash cropping of peanuts, poor land management practices, and chronic drought have resulted in serious deterioration of the soil resource base in Senegal's Groundnut Basin. Declining productivity due to land degradation and ~~desertification~~ desertification poses serious risks for this critical area, which supports more than half of the national population and accounts for nearly 65% of its cereals and 75% of its peanut production.

This problem is clearly recognized by USAID and other donors, the Senegalese government, and increasingly, the affected rural populations. Actions taken thus far include the promotion and demonstration of cultivation techniques to increase soil fertility and water retention capacity through the addition of organic matter, the development of village woodlots and nurseries, and the protection and planting of the multi-purpose Acacia albida tree in agroforestry combinations.

The effectiveness of these actions, however, has been limited by multiple constraints. Farmers often lack the means to carry out suggested actions, forestry interventions compete with agriculture for land and labor, and the research/extension components of projects have suffered from a lack of consistency and continuity. Organizational problems become

more serious at the level of cooperation between agencies. The recently created interagency committee (SODEVA, ISRA, DEF, and USAID) represents an initial attempt to promote greater cooperation among the principal institutions concerned. Its informal status and lack of a clearly defined and agreed upon set of goals, however, makes the committee's task very difficult:—

What is needed is a comprehensive strategy that takes into account the complex correlations between factors in the soil conservation equation. This involves recognition of relationships within and beyond the boundaries of the recognized Groundnut Basin system. It also recognizes ecological differences within the Basin which allow development of more stratified and focused intervention strategies. From this, the following recommendations for actions are made.

First, the Thies-Diourbel region is identified as a zone of optimal intervention based on a combination of factors, including need, potential, existing institutional arrangements, USAID capacity to provide appropriate assistance, and possibilities for eventual expansion of efforts to contiguous areas of concern.

Second, an incremental approach is called for to bridge the gap between the current stage of dispersed and uncoordinated actions and the implementation of a more comprehensive program. Adaptations and combinations of existing projects (Cereals II, Title III, Land Use Planning) represent the most feasible transition vehicles. Institutional arrangements should be expanded to include the principal agencies concerned (ISRA, SODEVA, DEF). Current uncertainties over the future form and function of these institutions, however, suggest that arrangements

40

be sufficiently flexible to permit eventual changes.

With regard to interagency coordination, a regional committee is suggested as a more appropriate approach to field level collaboration. The existing Interagency Committee would continue efforts to develop a higher level mechanism for coordination, but also concentrate more on exchanges of technical information.

Finally, specific recommendations are made for actions which should be considered as part of any interim or long-term approach to soil conservation and reforestation in the Groundnut Basin.

95

**APPENDIX III**

**RWANDA - REVISED RUHENGERI ENVIRONMENTAL MANAGEMENT PROPOSAL**

PROPOSED

RUHENGERI ENVIRONMENTAL MANAGEMENT PROJECT

RWANDA

AN ETMA-SPONSORED ACTIVITY

UNDER THE AUSPICES OF THE

U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT

AND

THE SOUTHEAST CONSORTIUM FOR INTERNATIONAL DEVELOPMENT

28

MAY 21, 1984

PREPARED FOR OAR/R BY:

A. WILLIAM WEBER

JOHN T. MAJOR

INTERNATIONAL INSTITUTE FOR ENVIRONMENT AND DEVELOPMENT

CONSULTANTS TO AID/W

ENVIRONMENTAL PLANNING AND MANAGEMENT PROJECT

93

## INTRODUCTION

The purpose of this project is to assist the Prefecture of Ruhengeri in establishing an adequate environmental information base from which effective regional resource management strategies and interventions can be developed. To that end, four types of activities will be undertaken. First, existing data will be collected on biological, physical, and human resources in the Prefecture. Following assessment and analysis of this comprehensive data base, priority areas for further research to fill remaining information gaps will be identified. Also based on the original analysis, specific interventions will be initiated to alleviate critical environmental problems. Finally, local training and institution-building activities will be supported as key elements in the process of developing de-centralized, regional capacities to effectively deal with environmental matters. This will be achieved in cooperation with the newly created Prefectural Commission on Forests and Environment, as established by Article 14 of the 1984 revised national forest laws, and the Ministry of Agriculture, Livestock and Forests.

## BACKGROUND

Intensified land use resulting from high population growth and economic development activities has led to serious environmental problems in all areas of Rwanda. These in turn threaten to undermine the potential for sustained agricultural production and economic growth as the nation's natural resource base is degraded. Nowhere in Rwanda is the balance between resource productivity and degradation more precarious than in the Ruhengeri Prefecture.

Four of the 12 principal agro-ecological zones of Rwanda are present in Ruhengeri. As a whole, they represent one of the most productive regions in the country. In addition, the region contains a major high-altitude wetlands which controls water flow into Rwanda's two largest interior lakes. This hydrological system represents a productive fisheries resource, generates critically important electricity at the Ntaruka site, and generally regulates downstream flow in the principal regional watershed. The other major source of the Mukungwa watershed is the Virunga montane forest park, which is also Rwanda's primary tourist attraction and an important source of foreign revenue.

---

This document is a revision of an earlier proposal for a Cooperative Regional Demonstration Project in the Ruhengeri Prefecture.

Although this impressive array of natural resources continues to serve a variety of productive and protective functions, the regional resource base is widely recognized as acutely stressed. The Virunga Reserve has experienced the clearing of more than half of its forested area over the past 25 years and its lower limit continues to be subjected to systematic exploitation for firewood and bamboo poles. Local plantations are insufficient to satisfy the demand. Similarly, the Ruhengeri wetlands have undergone considerable exploitation, thus threatening their critical role in regional watershed regulation. Water resources in general have also been diminished in both a quantitative and qualitative sense. In the northern lava zone, an outdated water delivery system can no longer supply the current population in this densely populated region, which otherwise lacks permanent year-round water sources. Serious health problems occur as a result of this situation. Water quality problems also result from the disposal of mining wastes, as well as from the recent introduction of schistosomiasis into the Ruhengeri lakes. Finally, serious questions have been raised about erosion and declining fertility with regard to the regional soil resource base.

Widespread and growing recognition of the environmental problems in Ruhengeri is a positive factor in the overall regional conservation equation. A significantly increased effort to better understand and manage these problems, however, is an essential next step if ecological relationships in the Prefecture are not to become completely imbalanced. The development of an environmental information base, regional institutional capacity, and effective intervention and management strategies should be of critical importance in this regard.

#### GOAL AND OBJECTIVES

The primary goal of this project is to assemble and assess a regional environmental information base for the Ruhengeri Prefecture from which natural resource management and intervention plans can be developed.

Five principal objectives have been identified to ensure the attainment of this goal. The first is to compile an inventory of existing information on the natural resource base of the Ruhengeri region. The second objective is to conduct a survey of local populations to determine: 1) socio-economic conditions; 2) agricultural and land use practices; 3) current uses of soil, water and forest resources; and 4) perceptions of natural resource needs and environmental problems. The third objective is to analyze the data collected to determine priorities for further research to fill critical information gaps and to identify interventions which would ameliorate environmental conditions in the Ruhengeri Prefecture. The fourth objective is to strengthen the institutional capacities of the newly created Prefectural Commission on Forests and Environment, in collaboration with the

AS

Ministry of Agriculture, Livestock and Forests to effectively address regional environmental issues. The final objective is to provide a model for extension to other areas of Rwanda and Africa through the development of a methodological approach to regional environmental assessment and planning.

#### PROJECT ACTIVITIES AND IMPLEMENTATION SCHEDULE

The REM project is to be carried out in two 18-month phases. Each of these will include multiple elements, some of which are intended to overlap or link the two phases. The Phase I activities (financed by the AFR/RA ETMA project) are nevertheless designed as a completely self-contained project so as to not be contingent on the approval of a Phase II funding (financed as an AID/Rwanda bilateral project). It is stressed, however, that implementing Phase II will significantly enhance the project's overall effectiveness through the intervention activities and the continuing process of developing regional institutional capacities.

#### PHASE I

Following a 2-3 month period of pre-project organization in the U.S., the Project Coordinator should come to Rwanda in January 1985. While waiting for the Ruhengeri Office to be established and equipped, initial contacts should be made with members of the Prefectoral Commission, other important regional and central government officials, and representatives of cooperating organizations and projects. During this period, organizational work should also begin on the project's first major activity, the introductory regional seminar.

This seminar should take place by the end of the third month after the Coordinator's arrival in-country. Its principal objectives are to present the project goal and planned activities and to begin the essential process of communication and collaboration among the interested parties. To this end, seminar participants should include representatives of the Prefectoral Commission, appropriate GOR ministries and offices, and other projects in the area which could have an impact on the environment. Topics for presentation and discussion should include: the need for environmental assessment and management in the Prefecture; effective means of communication and collaboration; the potential for sharing limited technical and financial resources in the region; and strategies for passing from information gathering to intervention activities. To allow for sufficient discussion of these subjects, and possible field visits, the seminar should be scheduled over a period of several days and should take place at a site with suitable conference facilities.

Following the completion of the seminar and the publication and dissemination of its major recommendations intensive work should begin on the information gathering stage of the project. Under the combined direction of the Project Coordinator and the principal PCFE counterpart, government ministries, the national university and research centers, donor organizations, NGO's, and private sector sources should all be tapped for information necessary to the development of a regional data base. Primary responsibility for the collection of existing information should be given to designated contacts within collaborating GOR ministries and institutions. Short-term consultants from the U.S. or available locally (minimum 12 months budgeted) will help with this process by synthesizing and assessing the available data in their fields of expertise. They will also be expected to identify critical information gaps, priority problem areas and potential intervention strategies. Where original research is known to be required from the beginning, such as the regional socio-ecological assessment or certain water quality studies, consultants will also collaborate with project staff and appropriate GOR representatives to implement these investigations.

All data will be collected on a regional basis, but wherever possible should be further organized by either agro-ecological zones or individual communes. In particular, the proposed socio-ecological survey will concentrate on individual communes which are representative of either specific zones or sets of environmental problems. While the final choice of sample communes should be left to the PCFE to decide, likely target areas include Cyeru, Butaro, Kidaho, Kinigi, Mukingo, Cyabingo, Nyakinama and the urbanizing center of Ruhengeri. This selection reflects the weighted importance of the lava and eastern highlands zones both in terms of their size and populations and the priority environmental problems identified by the 1983 CRDP Mission.

The socio-ecological survey is intended to provide primary data on local populations' uses of and attitudes toward their natural resource base, as well as their perceptions of environmental problems and solutions. In addition, other consultants and counterparts will be expected to focus their attention, including field trips, on the selected sample communes so that their bio-physical resource inventories may be integrated with the human-ecological data base. Finally, parallel surveys of existing natural resource policies, management practices, and regional development plans will be conducted.

To complete the primary information base, land use maps will be developed from the most recent aerial photo series (scale = 1:20,000). These will be produced for the selected sample communes initially, with other areas of the Prefecture to follow, cost permitting. Photos, other equipment, and the services of a Rwandan cartographer will be paid for out of the "Research" budget category.

The comprehensive regional information base is scheduled to be completed by the end of the first year of the project. The collected data will then be analyzed for trends in natural resource degradation, depletion, and restoration. Projections of these trends will also be made based on anticipated future population growth, land availability and other relevant factors.

By month 15 of the project, all data analysis and assessment will be completed and a written report on the state of the Ruhengeri Environment produced. This report is to include basic data in graphic and tabular form, projections, and maps, as well as a written text describing environmental conditions. The latter should include critical information gaps, and identify priority environmental problem areas. A range of options for dealing with these problems should also be suggested.

Approximately one month after the environmental report is distributed, a second regional seminar/workshop should be held under the auspices of the PCFE, with technical and financial support provided by the REM project office. Participants should include those who attended the first seminar as well as others identified in the course of the past year's work. Following presentation of the principal findings and recommendations, discussions should focus on priority areas for attention and the most effective means of intervention. Upon completion of this seminar/workshop, a final report of its proceedings and recommendations should be published and widely disseminated.

The final two months of Phase I should be used to develop proposals for the implementation of recommendations. Some of these should be funded and executed under Phase II of the REM project, provided necessary financial support has been secured. Other activities will be described for presentation to appropriate GOR and/or donor organizations. Any large-scale interventions, such as water source development, should be presented for multi-donor support. During this time, an evaluation should also be conducted to assess Phase I operations and to provide justification for funding of proposed Phase II activities.

## PHASE II

Specific activities for the second 18 month period will evolve from the Phase I inventory and assessment, as described above. The Prefectoral Commission, in collaboration with appropriate GOR ministries, local authorities and the REM office staff will establish research, intervention, and additional action strategies in the first half of year two. More than 560,000 dols U.S. are budgeted to help finance these activities and to continue the process of developing a regional capacity to manage environmental problems.

99

Thirty thousand dols U.S. are specifically earmarked for research, while another 100,000 dols U.S. are to be available for initiating on-site interventions. Some possible examples of the latter include:

1. Sustained-yield management of bamboo resources in the northern Ruhengeri lava zone;
2. Extension of agro-forestry techniques developed by AID and other donors to appropriate areas of the Prefecture, with particular attention to high-altitude species;
3. Development of environmental education materials and programs aimed at the general Ruhengeri public;
4. Appropriate erosion control techniques; and/or
5. Improved local water supply development in the lava zone (a likely multi-donor project).

In addition to the above-mentioned funds, budgeting allowances have been made for the provision of at least 12 months of additional short-term technical assistance and 4 years of associate-level technical assistance (Peace Corps Volunteers) to help implement whatever activities are decided upon.

Continued support will also be provided throughout Phase II for the further development of the PCFE's capacity to manage regional environmental matters. This will include REM office assistance in up-dating the Phase I data base and incorporating new research findings into projections. Project staff will also help, where necessary, to develop new project designs and assist in finding donor contributions toward their execution.

A priority activity for Phase II will be the institutionalization of a pre-project environmental review process. Under this system, all development projects proposed for the region would pass through the Prefectural Commission to determine their potential environmental impact. In this way, potentially harmful effects of development activities could be identified and mitigated before the proposed projects are implemented. Under current conditions, these negative impacts are generally recognized after implementation, when it is too late to reverse them.

Training of personnel will also constitute an important Phase II activity. Hands-on experience of the kind begun in Phase I will continue to be of primary importance. In addition, however, a limited amount of U.S. training is foreseen for qualified individuals. One study tour to an African country dealing with comparable issues of natural resource degradation in a densely populated highlands environment (e.g. Kenya or Tanzania) is also planned. Finally, several commune-level workshops are planned to serve a double function of providing training for local cadres and stimulating community involvement. Both are essential for Phase II interventions to be successful.

GA

The REM project office should plan to have worked itself out of a job and pass on its functions to the PCFE by the end of the third year. While separate projects begun under REM will undoubtedly continue under separate financing, the central office should cease to exist in its original form. A major effort is required to assure that this eventual integration of REM functions occurs in an evolutionary and non-disruptive manner in the course of Phase II.

#### COOPERATING INSTITUTIONS AND ORGANIZATIONS

A comprehensive approach to natural resource management requires considerable communication and collaboration among numerous institutions and organizations. The REM project intends to develop a multi-tiered network of institutional linkages to facilitate this objective.

**PCFE/MINAGRI.** The most direct linkage will be with the Prefectoral Commission on Forests and Environment in Ruhengeri. This newly-created structure provides the most effective institutional mechanism for regional planning and action. As outlined in articles 14 through 19 of the 1984 Forestry Law, its charter is broad enough to cover virtually all environmental and land use management matters in the Prefecture. Its proposed composition of technical experts, local leaders, and citizen representatives is also ideal for the broadly based approach of the REM project.

The PCFE is, in turn, linked to the central government structure of the Ministry of Agriculture, Livestock and Forests. Thus the REM project will also collaborate closely with this Ministry, particularly through the office of the Director General of Forests and its Division of Land Use Management. Other MINAGRI offices concerned with this project include those of Rural Engineering, Soil Conservation, and the national agricultural research institute ISAR.

**OTHER GOR.** For environmental matters which fall outside the realm of MINAGRI, the Forestry Law identifies the Ministry of the Interior as the responsible umbrella organization through which the PCFE should work. Particular resource issues, however, will also directly concern several other GOR agencies. For those which relate to the Virunga forest, the Office Rwandais du Tourisme et des Parcs Nationaux (ORTPN) must necessarily be involved at all stages, from data collection to potential interventions. Environmental problems arising from rapid urbanization in Ruhengeri town similarly require that the PCFE collaborate with the office of Urban Environment and Health within the Ministry of Social Affairs. Issues related to the mine waste disposal and runoff require consultation with the ministry of Natural Resources. Finally, numerous problems involving water resources are likely to concern the Ministry of Public Works.

US AGENCIES. The REM project is also intended to cooperate with other USAID projects within the Prefecture. Both the Agroforestry project and Cropping Systems project in the eastern sector of the Prefecture should be able to contribute to and profit from the development of the regional environmental data base. In addition, the agroforestry expertise developed in Cyeru should lend itself to extension to comparable areas of the Prefecture as part of the REM Phase II effort. Where possible, an effort will also be made to share the costs and benefits of short-term technical assistance among the different projects. Direct collaboration is also foreseen with two additional AID projects: MCH/FP Fertility Survey and the National Agricultural Survey. In particular, these national level programs can provide information essential to the development of the regional data base.

Other U.S. government agencies are possible sources of technical assistance on a cost-shared basis. These include the Soil Conservation Service, National Park Service, U.S. Fish and Wildlife Service, and several centrally funded environmental programs in AID/W (Forestry Support Program, Environmental Planning and Management, Biologicval Diversity). The Peace Corps program is also a possible source of appropriately skilled, sub-project managers for certain Phase II activities.

OTHER. Communication among other donor organizations and the PCFE/REM office is similarly essential. Initial contacts between the AID Agro-forestry project and the Swiss and German Forestry programs have already been established and these should be built upon by the REM project. In addition, contacts should be developed with other donor projects already, or soon-to-be, established in the Prefecture. These include programs supported by FED (potatos), Canada (agricultural production), and FAO (high altitude maize). Finally, the groundwork for cooperation between the REM project and the internationally supported Mountain Gorilla Project has been established. While tourism and wildlife protection are beyond the realm of the REM program, the MGP's preliminary efforts to resolve local resource use conflicts and develop popular conservation education programs provide an important base upon which Phase II activities could possibly build.

## PROJECT ADMINISTRATION

The first phase of the project will be funded through an AFR/RA program, Environmental Training and Management in Africa (ETMA). The management of the project will involve three principal parties: 1) The office of the AID Representative in Rwanda, 2) The Southeast Consortium for International Development, SECID, and its Africa-wide project, ETMA, and 3) the Government of Rwanda. Responsibility for the execution of the project must rest with the AID and SECID field staff. SECID/US will provide technical and management backstopping.

1. OAR/Rwanda. The AID office in Rwanda is responsible for all AID activities in Rwanda, whatever the source of funding, and is thus responsible for the execution of both phases of the REM project. The OAR project manager for other projects in the Ruhengeri Prefecture will also serve in that capacity for the REM project. It will be his/her responsibility to review work plans and to assure that project objectives are being met. Coordination of the REM effort with other AID financed projects will be a major concern of the AID project manager.

2. SECID/US. SECID through its ETMA project will provide the U.S. backstopping for this project. SECID/ETMA's responsibilities are the following:

a. To ensure that this project is both conceptually and procedurally executed in conformity to the above agreement;

b. To be responsible for technical guidance and periodic evaluation of the project's progress. This involves briefings and coordination with AID when modifications of the original project design are necessary. Decisions regarding technical activities, modifications of project design and evaluation will be reviewed with the in-country project director;

c. To field all long-term and short-term personnel. This requires advertising, recruiting, qualifying, briefing, and contracting personnel according to the needs and timing requested by the ETMA project office in Rwanda. Special attention should be given to adequate French language capability of all personnel hired. An FSI rating of at least 3 should be required;

d. To procure most material needed to support the field project office including foreign-made automobiles which will require procurement waivers;

e. To determine the suitability of any training programs planned for in the U.S.;

f. To make annual budget requests to AID based on the project's progress and financial pipeline;

g. To channel AID funds and account for their use. This responsibility requires annual audits of all project accounts, including those in-country. In order that the accounting systems in the field and U.S. offices be compatible, SECID must set up the accounting system, making it conform to both the U.S. and Rwandan banking systems;

h. Create a revolving fund to supply the field office with adequate access to project funds. Because of the relatively poor communications between Rwanda and the U.S., the most flexible procedures should be adopted, with the field office having reasonable discretionary powers. The project director in-country should determine a yearly operating budget and allocate accordingly on a reimbursable basis.

3. ETMA Field Office. The ETMA/REM office in Rwanda bears the major responsibility for the proper execution of the project.

The office's functions are:

a. To serve as the technical arm of the GOR Prefectural Commission on Forests and Environment to assure that all project elements are properly executed in the field;

b. To work closely with the SECID office to assure that all necessary technical personnel are fielded in a timely manner to carry out the series of tasks outlined in the project;

c. To draw up the findings of the technical studies for presentation to the Commission and Ministry of Agriculture;

d. To train designated counterparts in all functions of the office;

e. To help select qualified GOR participants for U.S. training;

f. To organize in-country training seminars and conferences;

g. To work closely with the Committee to set up a viable coordinating mechanism for the project and then for environmental affairs in general;

h. To provide necessary logistic support to all short-term and long-term personnel needed to execute the project;

i. To make all necessary arrangements to coordinate activities with other donors already in the field, especially AID;

j. To aid the GOR in drawing up technical documents as part of their request for donor financing of interventions identified by the project; and

k. To provide periodic reports to AID, GOR and SECID program directors.

This field office should be considered a temporary mechanism through which the REM project elements are executed. The office is not meant to become an entity in and of itself, but must "self-destruct" as the project functions are gradually merged into the GOR Committee on Forests and Environment.

Staffing requirements for the office are as follows :

- Project Coordinator
- Part-Time Assistant
- Administrative Assistant/Typist
- Part-Time Accountant
- Driver/Mechanic

The project field coordinator serves two major functions: 1) the substantive and technical head of the office as well as 2) the manager of the office. This role must always be considered a development role of promoting useful changes in the GOR's management of its resources. The training of designated government counterparts in the project office is of primary importance and every effort should be made by the coordinator to divest himself of as many duties as possible once the trainees are able to assume the responsibility.

The field coordinator will be assisted by a part-time local hire staff person, whose primary responsibility will involve operation of the computer data base and instructing Rwandan personnel in its use.

The project field coordinator will be supported by a Rwandan administrative assistant who must coordinate the logistics of the office and perform general secretarial work.

A part-time accountant will also be required to keep the fiscal records in order, by keeping a journal of expenses, issuing monthly financial statements on the status of project funds, and reconciliation of the various local bank accounts.

The driver should be in charge of keeping the project vehicles in good order and hiring temporary drivers when the need arises.

In addition, the project coordinator should have enough discretionary power to hire added local administrative help as well as local qualified consultants who might perform some of the technical work.

4. GOR. The primary responsibility for the GOR is the institutionalization of integrated resource management into development decision making. This is to be achieved through the Commission on Forests and Environment in Ruhengeri in collaboration with the Ministry of Agriculture. The GOR is expected to identify appropriate counterparts at the regional and national levels to work with the project. Details of working relationships will be developed as part of an evolutionary process.

## 6.0 THE RUHENGERI ENVIRONMENT

### 6.1 General Setting

The Ruhengeri Prefecture is situated in the north-central highlands (1500-4500m) of Rwanda. It is one of ten administrative subdivisions within the country and covers an area of 1687 km<sup>2</sup>, or 6.6% of the national territory. The prefecture itself is divided into 16 communes (Figure 6A).

Ecologically, the Ruhengeri region is almost a self-contained watershed system. From a horseshoe-shaped rim of mountain ridges to the north, east and west, numerous watercourses empty into the central Mukungwa River basin. More than 90% of the Prefecture is drained by this network, which then flows south into Rwanda's principal river system, the Nyabarongo-Akagera.

Within the relatively limited area, a high diversity of biogeographical sub-divisions is found. In addition to the multiple afro-montane zones of the Virunga forest, four major agro-ecological regions have been identified within the prefectural boundaries. The latter are characterized by massive modifications of the landscape by a large, rapidly growing, and primarily rural population. Numerous environmental problems stem from the efforts of this population to further exploit and develop the existing natural resource base of the region.

### 6.2 Climate

The Ruhengeri region is characterized by a generally cool, humid climate. Average annual temperatures vary from 18°C in the lower Mukungwa valley to below 15°C at the base of the Virunga volcanoes (2700m). Snow is common at the highest summit of the volcanoes, Mt. Karisimbi (4507m).

Average rainfall increases from a low of 1100mm annually in the east, to 1200-1600mm in the central zone, and up to 2100mm within the Virunga forest. Rainfall is distributed bimodally, with a short wet season from September-December followed by the principle rains (40-50% of total) between February and May. The major dry season lasts for 60 days (July-August) in the mountainous north and up to 95 days (June-September) in the drier zone east of Lakes Bulera and Ruhondo. Moderate temperatures and reduced insulation are believed to maintain evapotranspiration well below precipitation levels, and prolonged drought is not considered a significant threat to the area.

### 6.3 Mukungwa Watershed

The abundant rains of northern Rwanda nourish an 890 km network of waterways in the Ruhengeri Prefecture. In addition, permanent lakes cover 7897 ha or nearly 5% of the region. Approximately 90% of the prefecture comprises the Mukungwa watershed (Figure 6B). The Mukungwa drains all but the southeast corner of Ruhengeri. It is fed by numerous sources, of which three may be identified as primary.



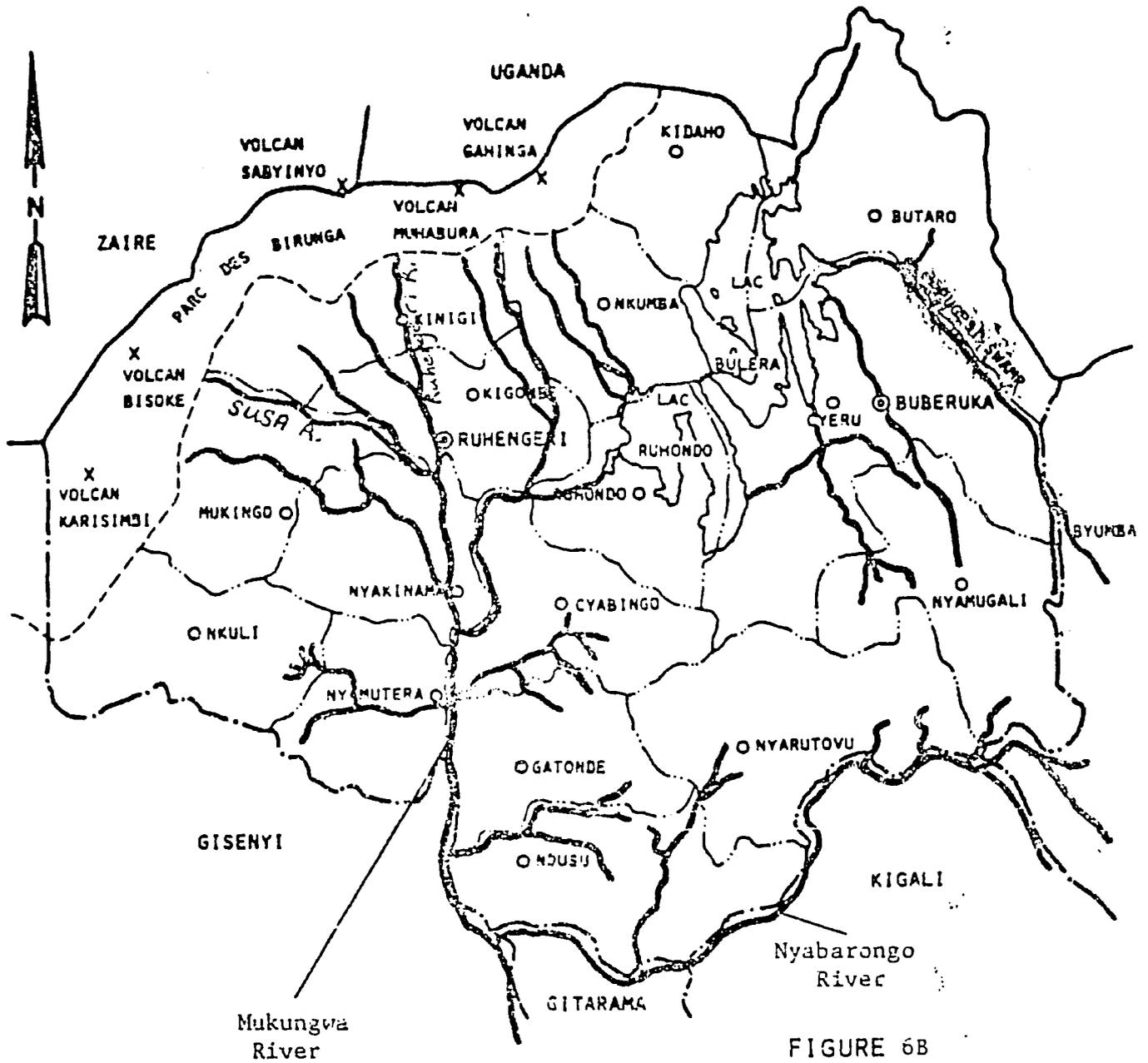


FIGURE 6B  
RUHENGERI PREFECTURE

- INTERNATIONAL BOUNDARY
- - - - - DEPARTMENT BOUNDARY
- ..... COMMUNE BOUNDARY
- - - - - NATIONAL PARK BOUNDARY
- ⊙ DEPARTMENT CAPITAL
- ⊖ SUB-DEPARTMENT CAPITAL
- COMMUNE

The longest, most regular and most abundant source of the Mukungwa begins in the high altitude wetlands of eastern Ruhengeri. The Rugezi River drains a 4535 ha Cyperus latifolius-peat bog complex between the communes of Cyeru and Butaro before emptying into Bulera-Ruhondo lakes complex. Formed during the Pleistocene, when the Virunga chain rose up and dammed all north-flowing rivers, Bulera (52 km<sup>2</sup>) and Ruhondo (26 km<sup>2</sup>) are Rwanda's first and third largest interior lakes. At its outlet in the commune of the same name, Ruhondo's waters first pass through an electrical generating station before joining the Mukungwa.

The other principal sources of the Mukungwa are less regular than the Rugezi-Ruhondo system, but nevertheless contribute significantly to its flow, particularly during the rainy seasons. The first of these is the Ruvumu-Rwebeye network of streams which drains the eastern sectors of the Virungas between Mts. Sabyo and Muhavura. Originating in the montane rain forest, these streams receive year-around runoff from their humid surroundings, but much of the water filters down into volcanic substrate before reaching the densely populated lava plain. This water then resurfaces and flows into the Mukungwa in southern Kigombe commune.

The third major source of the Mukungwa is the Susa River and its tributaries which drain the Virungas from Mt. Karisimbi to Sabyo. These watercourses are also prone to disappear underground during periods of low rainfall, but again resurface before joining the Mukungwa at the junction of the communes of Nyakinama, Nyamutera and Cyabingo. (One additional source originates outside the Ruhengeri Prefecture. The Giciye River flows from the Gishwati Forest to the west and empties into the Mukungwa just north of its juncture with the Nyabarongo. Parts of southeastern Ruhengeri, meanwhile, are not drained by the Mukungwa but rather make up part of the Base-Nyabarongo watershed.)

The Mukungwa hydrological network represents a primary resource to the residents of Ruhengeri Prefecture. In addition to providing critical surface water supplies to the population, the seasonal fluctuations in flow create ideal conditions for agriculture on plentiful, fertile valley bottomlands. Fishing is also a moderately important economic activity in the lakes and larger rivers. Beneficial effects extend beyond the prefectoral level as well, as the Nyabarongo carries water from the region across the entire country and eventually into the Victoria Nile system.

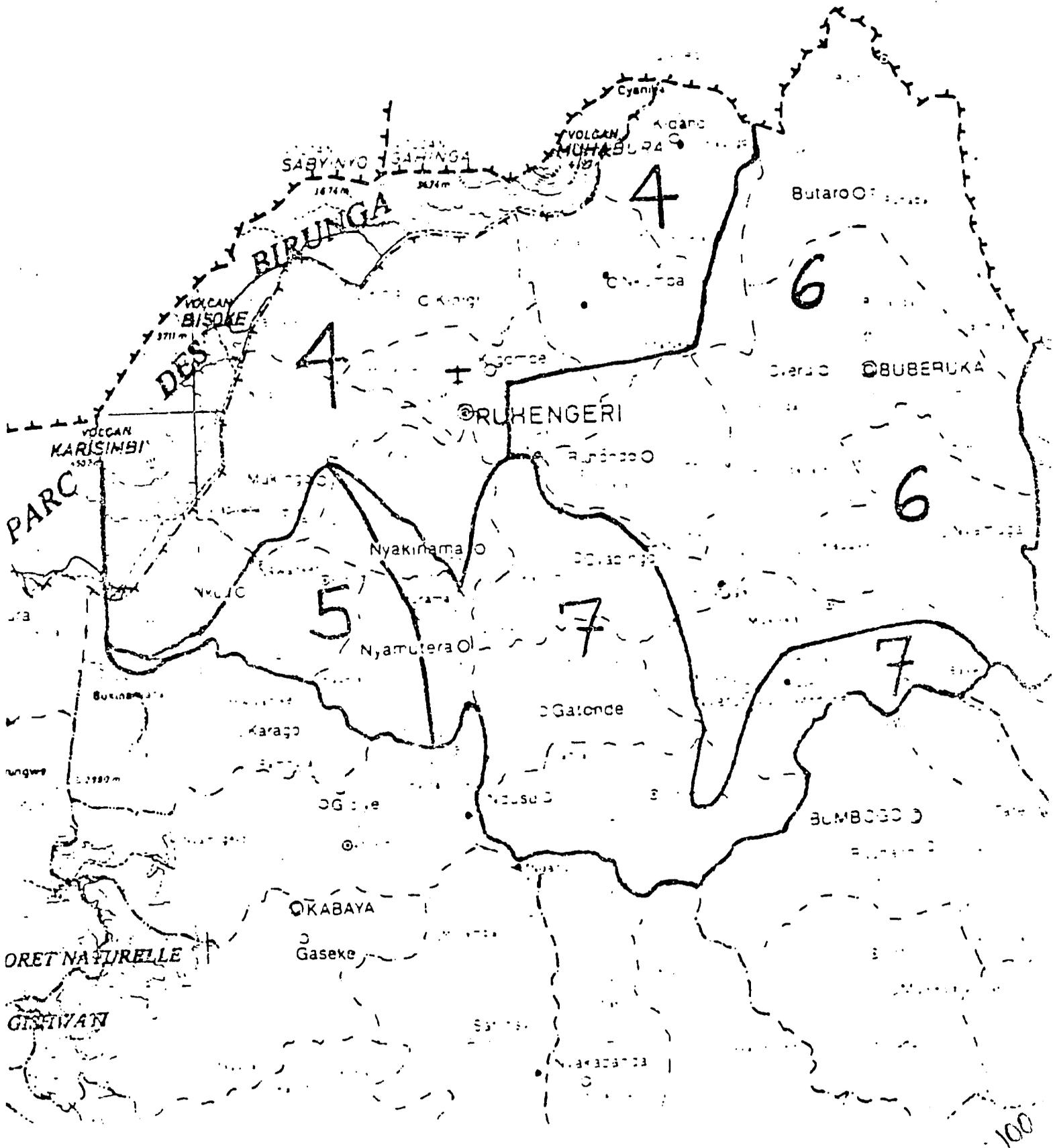
Localized problems of water supply remain, however. Despite its abundant rainfall, the Ruhengeri network of watercourses is the least extensive in the entire country. Even more serious, the entire northern lava zone is subject to chronic surface water shortages due to subterranean seepage. Finally, water quality and related health issues represent generalized regional concerns.

#### 6.4 Ecological Zones

The Ruhengeri Prefecture may be subdivided into five principal ecological zones. One of these may be described as a naturally occurring biogeographical unit; the other four are best understood with primary reference to their human ecological attributes. The zones are represented in Figure 6C and described in general terms below.

79

Figure 6C



The Virunga Afro-montane Zone (4A). The Virunga range is currently protected by a multinational conservation area covering approximately 400 km<sup>2</sup>. Administrative responsibility for the area is shared by Zaire, Uganda, and Rwanda. Rwanda's Parc National des Volcans (PNV) comprises the entire southern slope of the range and now totals no more than 15,000 ha (SOMIRWA 1982). Roughly 87% of the park lies in the prefecture of Ruhengeri.

The PNV environment is characterized by cool temperatures and moderately high rainfall (1800-2100mm/year), which decreases slightly from west to east. Its rugged topography of eroded volcanic peaks rises from 2500m at the park's lower limit to more than 4500m on Mt. Karisimbi. While activity continues in the Zairian sector of the range, the Rwandan volcanoes are essentially dormant; the most recent lava flow occurred on Muhavura in the 1950s.

The overall Virunga ecosystem is a representative subset of the East African montane biogeographical region (Spinage 1972, White 1981, Hedberg 1951). Characteristic vegetation zones are differentiated primarily by altitude in addition to localized variations due to exposure, aspect, slope, and microclimate. The principal zones are: (1) that which is dominated by bamboo (Arundinaria alpina), between 2500-3000m, and (2) the Hagenia abyssinica-Hypericum revolutum forest zone between 2700-3200m. Above that altitude, subalpine communities of Senecio johnstonii and Lobelia lanuriensis predominate, giving way to an afro-alpine zone of limited plant growth above 3800-4000m.

The two lower zones are not only richest in abundance and diversity of plants, but also in animal species. The natural fauna of the Virungas includes over 100 avian species as well as forest dwelling leopards, hyena, antelope, buffalo and elephants. Four types of primates are also present, including the golden monkey (Cercopithecus mitis kanddti) and mountain gorilla (Gorilla gorilla beringei). While this afro-montane fauna is less diverse than that found in lowland tropical forests, there are rare, endangered and regionally endemic species.

The values of the PNV reserve are multiple. First, biogeographers see the Virunga ecosystem as a natural laboratory in which to study issues of extinction, colonization, and evolution on an isolated 'terrestrial island'. Montane wildlife, particularly the rarer species such as the mountain gorilla, has been studied by an international group of scientists working from the Karisoke Research Center over the past 15 years.

Second, the PNV is also important as a reservoir of genetic diversity, the value of which has been highlighted in numerous recent scientific publications. Virtually no research has been done in this area, yet to study local uses of forest products (food, medicine) the entire flora has unquestionable value.

Third, steadily increasing tourism in the Virunga region is a source of foreign exchange. Visitation rates and resultant income for the PNV have increased since the inception of a tourism development program in 1979. Park entry fees, however, are only a small portion of total tourism income. PNV visits now generate millions of dollars in gross tourism revenues and represent a major source of critically important foreign currency. At the local level, tourism has also increased employment opportunities but it is unlikely that a significant percentage of total tourist revenue remains in the region.

A final undeniable but less quantifiable value of the Virunga forest environment concerns its critically important role in water catchment. Heavy rainfall, protective vegetative cover, absorbant litter, porous soils and reduced evapotranspiration all combine to increase water retention and groundwater levels in the montane forest zone. Thus, although the PNV constitutes only 0.5% of Rwanda's total land area, it is said to represent more than 10% of the country's effective catchment area (Spinage 1972): a significant contribution to the well-being of the surrounding human population.

The Lava Zone (4). Rwanda is subdivided into 12 agroecological zones (Delepiere 1982, 1973). One of these is the extensive lava plain which completely surrounds the PNV and extends as far as 20 km to the south. In Ruhengeri Prefecture, this lava zone covers roughly 360 km<sup>2</sup>, or 21% of the total area. It includes the entire commune of Kinigi, virtually all of Mukingo, Nkumba and Kidaho, and major parts of Kigombe, Nyakinama and Nkuli (Figure 6C).

Mean altitude of the lava zone is 2200m. Annual rainfall averages 1500mm. The soils from which the region derives its name are extremely fertile, high-base status soils of volcanic origin (Andepts), mixed with more shallow lithosols on steep slopes and organic histosols in certain valley bottoms. In general, the relief is quite moderate. This combination of relatively favorable environmental factors has made the lava zone one of Rwanda's most productive agricultural areas.

The lava zone landscape lacks remnant natural vegetation and wildlife. Instead, one finds a patchwork mosaic of cultivated fields, dominated by corn and potatoes, mixed with peas, pyrethrum and some wheat at the highest altitudes. Below 1900m the more traditional Rwandan crop mix of beans, sorghum and bananas predominates. The land base of 360 km<sup>2</sup> also supports a livestock component which totals more than 30,000 Equivalent Animal Units (cattle, sheep and goats combined). Animal population densities are particularly high in the communes of Nkuli, Mukingo, and Kidaho.

In many ways, the lava zone is one of the most favored in all of Rwanda, which explains its extremely high human population density. Yet certain ecological factors have also combined to constrain development in this area. First, the high altitude limits the agricultural potential of the otherwise rich soil. While certain varieties of potato and corn are highly productive, other traditional staple crops give below average harvests. This limited agriculture base in northwestern Ruhengeri is a fragile subsistence operation.

A second major problem is the lack of water, because this region has no permanent watercourses. Prior to 1950, the lava zone around the PNV was occupied by few people due to a critical lack of surface water. During the 1960's an extensive network of water adductions was constructed which permitted greater occupation and exploitation of the land. It also resulted in the conversion of more than half of the PNV to agricultural land. Current human and livestock population levels, however, have now surpassed the capacity of the water delivery systems, and water is again in critically short supply.

Finally, land itself is a critical limiting factor. Almost all available land is in near-permanent agricultural production. This has caused a decline in grazing lands and has resulted in overstocking of remaining pasture. Land for

development of fuelwood plantations and communal woodlots is also in short supply. The large gap between wood supply and demand is bridged primarily by illegal exploitation of the Virunga forest.

The Buberuka Highlands (6). This is the largest zone in Ruhengeri and covers most of the eastern half of the prefecture. It includes the entire communes of Butaro, Cyeru and Ruhondo, almost all of Nyamugali, and parts of Nyarutovu, Ndusu and Kigombe (Figure 6C). The Rugezi wetlands and Lakes Bulera and Ruhondo are also located in this zone.

The Buberuka highlands have an average elevation of 2000m, showing a general downward slope from east to west. Mean annual rainfall is approximately 1200mm. Oxisols represent the dominant soil order in this region, interspersed with lithic entisols on quartzite ridges. Vertisols predominate in the Rugezi valley. Despite certain chemical deficiencies, the Buberuka soils are generally quite good for agriculture. They are also subject to extremely high erosion, however, if not properly managed.

Most Rwandan staple crops will grow in this zone, but yields from bananas, beans, sorghum, and sweet potatoes decrease with increases in altitude. Corn, peas, and potatoes produce well at higher elevations, where some wheat and barley are also grown.

The primary ecological constraints to development in Buberuka stem from land shortages in the face of high human population pressure. Delepierre (1982) includes this zone among those facing the most serious erosion threats in Rwanda. This is largely due to the fact that increasingly marginal, steeply sloped lands are being brought into cultivation without adequate anti-erosion measures. Agricultural practices have also seriously reduced land available for grazing and wood production. All of these issues are to be addressed by the AID Mixed Cropping and Agro-forestry projects proposed for the communes of Cyeru, Butaro, and Nyamugali. Important problems of water quantity and quality are also associated with development in and around the Rugezi wetlands and Lakes Bulera and Ruhondo.

The Central Plateau (7). This northern extension of one of Rwanda's largest agroecological zones covers all or most of the communes of Gatonde, Cyabinga and Ndusu, as well as parts of Nyarutovu, Nyamutera, and Nyakinama (Figure 6C). It includes the lower valley of the Mukungwa and is also partly drained by the Base-Nyabarongo system.

This is the lowest elevation zone in the prefecture, dropping below 1500m in the Mukungwa valley and never surpassing 1800m. Rainfall averages 1200mm annually. Soils are comparable to those of Buberuka, with oxisols of good agricultural potential predominating. Erosion risk remains high, but somewhat lessened due to more moderate relief.

Lacking any appreciable natural vegetation, banana plantations emerge as the principal plant cover in this elevation zone. Beans and sweet potatoes also do well, while corn and Irish potatoes decline in area. Coffee becomes important as a cash crop.

In addition to generalized problems of erosion and heightened competition for alternative uses of a limited land base (343 km<sup>2</sup> of potential agricultural land), much of the central plateau region is relatively isolated. The lack of an adequate road network reduces access to markets and thus forces the local population to orient production toward subsistence.

The Zaire-Nile Divide (5). The largest zone in Rwanda, the Zaire-Nile Divide forms only a small part of southwestern Ruhengeri Prefecture. No communes are entirely contained within this zone, but parts of Nyamutera, Nyakinama and Nkuli are included (Figure 6C).

Elevation rises steeply from 1900m to nearly 2500m in the extreme west, and an average rainfall of 1600mm drains entirely into the Mukungwa system. Soils evolved under recent forest cover (oxisols mixed with humus) have a neutral pH and fair agricultural potential. Bananas and beans give way to potatoes and peas at higher altitudes. Eucalyptus predominate on hillsides.

This region suffers from some of the more severe problems encountered in the Ruhengeri Prefecture. Despite significant tree plantations, erosion danger is extremely high in this steeply sloped zone. Livestock grazing accelerates this problem by breaking up the soil, yet the contribution of organic fertilizer from these animals represents a potentially important resource for cultivation. Dry season water shortages are an additional problem which places stress on the land's capability to support an extremely dense local population. Finally, residents of this zone also suffer from an inadequate communication network.

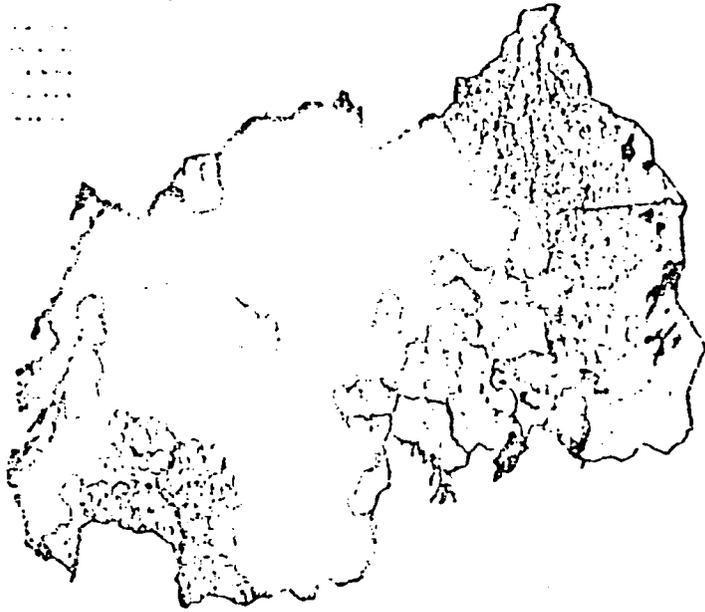
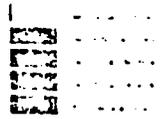
#### 6.5 The Human Resource Base

In 1978, Ruhengeri's population of 531,927 occupied a land base of 1687 km<sup>2</sup> at an average density of 315 per km<sup>2</sup> (Figure 6D and Table 6.1). This was one and one-half times the national figure of 189/km<sup>2</sup>, which already is the the highest national density ratio in Africa. Estimates for 1983 are 614,000 people in Ruhengeri; or about 520 persons/km<sup>2</sup> of cultivable land. Within the prefecture, population pressure on the land is greatest in the high altitude Lava and Zaire-Nile Divide zones and less severe in the Central Plateau and Buberuka.

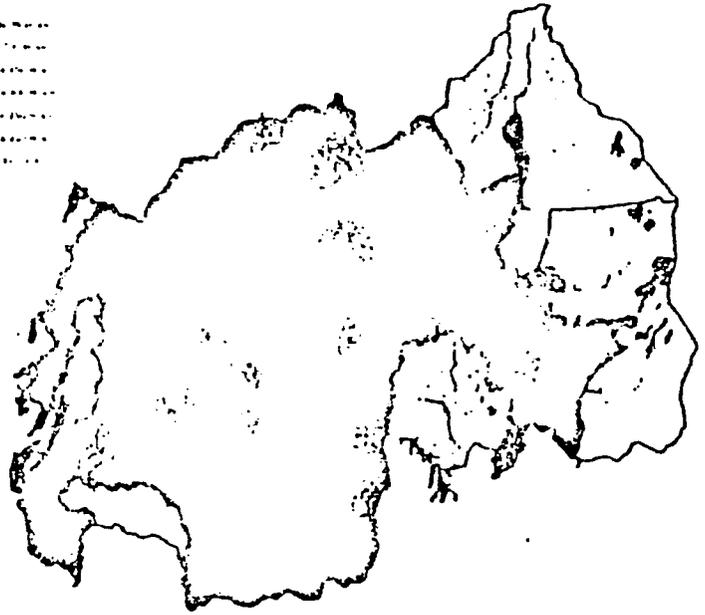
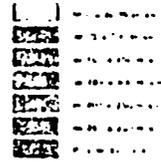
Figure 6D traces the evolution of population densities in the 16 communes of Ruhengeri between 1948 and 1978 (source: Atlas du Rwanda). All but Butaro, Cyeru, Nyarutovu and Ndusu had surpassed 320/km<sup>2</sup> by 1978 and several were over 400/km<sup>2</sup>. This increase has been most notable in the Lava zone.

Population statistics indicate that Ruhengeri grew relatively slowly during most of the 1970s: 1.9% annum versus a 38% national average (Table 6.1). This figure, however, is almost entirely a function of emmigration and does not accurately reflect the region's natural reproduction rate. In fact, Ruhengeri has the highest fertility rate in the country, at 9.9 infants per female (MINIPLAN 1982). A study of migration into the southern Bugesera region in the 1970's (IAMSEA 1981) showed several tens of thousands of these immigrants were from Ruhengeri. It is of interest to note that Bugesera immigration dropped off rapidly as the region filled up by 1978; after which time the Ruhengeri population again began to increase more rapidly. The Ruhengeri population

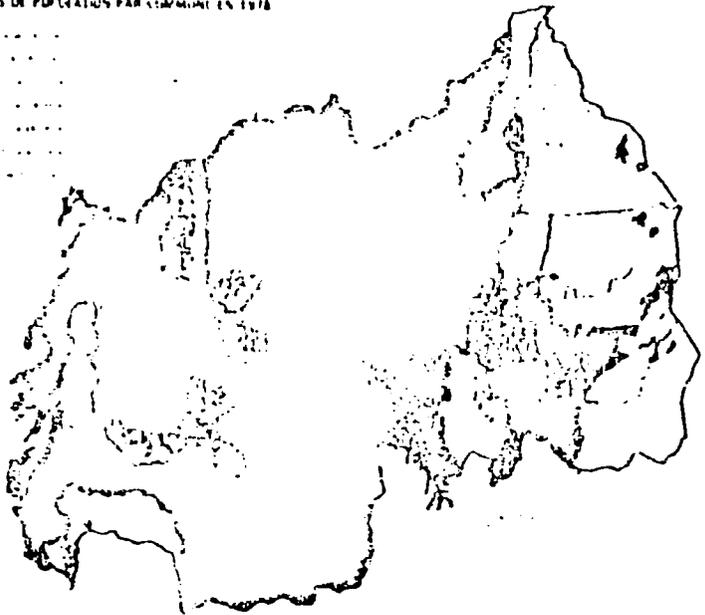
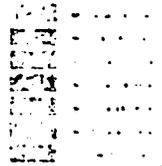
LES DENSITÉS EN 1970 (habitants par hectare) par les communes de 1970



LES DENSITÉS DE POPULATION PAR CANTON EN 1970



LES DENSITÉS DE POPULATION PAR COMMUNE EN 1970



DENSITÉS DE LA POPULATION SEULEMENT AGRICOLE EN 1970

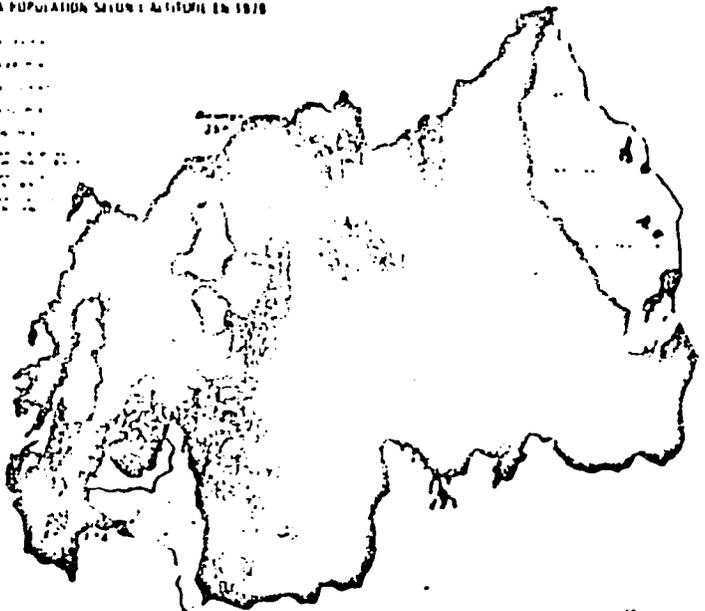


Figure 6D

TABLE 6.1

## RWANDAN POPULATION STATISTICS

PREFECTURE	TOTAL AREA (km <sup>2</sup> )	ARABLE LAND (km <sup>2</sup> )	1978 POPULATION	DENSITY/km <sup>2</sup> TOTAL/ARABLE	1983 POPULATION	DENSITY/km <sup>2</sup> TOTAL/ARABLE	POP. GROWTH RATE 1970-70/1978-83
BUTARE	1073.2	1362.3	602,550	322 / 442	692,726	370 / 508	2.2% / 2.8%
BYUMBA	4820.0	1576.0	521,351	108 / 331	624,353	129 / 396	5.0 / 3.7
CYANUQUU	1735.6	792.2	333,187	192 / 421	415,501	239 / 525	2.6 / 4.5
GIKONGORO	2030.6	904.7	370,596	183 / 376	394,067	194 / 400	2.1 / 1.3
GISENYI	1640.0	1032.3	488,882	298 / 474	575,538	351 / 557	3.1 / 4.2
GITARANA	2160.0	1539.4	606,212	281 / 394	698,351	323 / 454	3.4 / 2.9
KIBUNGO	4113.7	1286.5	361,249	88 / 231	476,631	116 / 370	5.5 / 5.7
KIBUYE	1338.7	777.7	336,508	251 / 433	304,548	287 / 494	5.2 / 2.7
KIGALI	3178.7	1973.3	698,442	220 / 354	925,436	291 / 469	8.2 / 5.8
RUHENGERI	1686.9	1181.0	531,927	315 / 450	613,950	364 / 520	1.9 / 2.9
RWANDA	25,595.8 57.5	12,505.4	4,830,984	189 / 306	5,801,102	227 / 464	3.8 / 3.7

## 6.6 Environmental Trends and Problems

The efforts of a large, rapidly growing population to satisfy its basic needs and pursue development has put considerable pressure on the limited land, water and renewable natural resource bases of the Ruhengeri Prefecture. Existing information permits a general analysis of resultant environmental trends in four critical problem areas.

Conservation of Natural Areas. The montane ecosystem within the Parc National des Volcans (PNV) is the only remaining significant natural area in the Ruhengeri Prefecture. It also represents a national and international resource of primary importance, as described above. Nevertheless, the Virunga environment has been diminished and degraded in a number of ways over the past 25 years.

Encroachment, or conversion of parkland to cropland, has occurred on a major scale in the PNV. In 1958, 7000 ha were taken from the central and eastern sectors for agricultural purposes. In 1969, an additional 10,000 ha were cleared from the central and western sectors for settlement and cultivation. Each of these large-scale conversions were carried out as a planned development project: the first for general agricultural development under the Belgian Colonial administration; the second, a pyrethrum production scheme financed by the European Development Fund.

The two major clearings plus some minor encroachments over the past 11 years have resulted in the loss of more than half of the PNV's original area (Figure 6E). Much of the area converted was under bamboo cover, but this lower montane forest zone also contained a greater diversity of tree and plant species than that which now remains. The impact on wildlife of this forest destruction was undoubtedly significant. Furthermore, recent studies have suggested that regional water supplies have declined as a direct result of this deforestation (SOMIRWA 1982).

Less noticeable forms of encroachment, such as the cutting of wood and bamboo, tend to degrade the forest environment over time. Similarly, illegal hunting decreases faunal abundance and, in the case of rare species like the mountain gorilla and leopard, has endangered their continued existence in the Virungas.

Some positive trends have helped offset the problems described above. First, an international conservation project has cooperated with the GOR since 1979 to improve park security, promote tourism, and develop public conservation education programs. This project has reduced poaching, generated tourism revenues sufficient to offset current alternative development proposals, and spread awareness of wildlife and forest preservation values. Second, the GOR has recently signed an agreement establishing the PNV as part of the International Biosphere Reserve system. This not only represents a public commitment to conservation, but could also help the GOR to obtain assistance, through the UN Man and Biosphere Program, for further park preservation efforts.

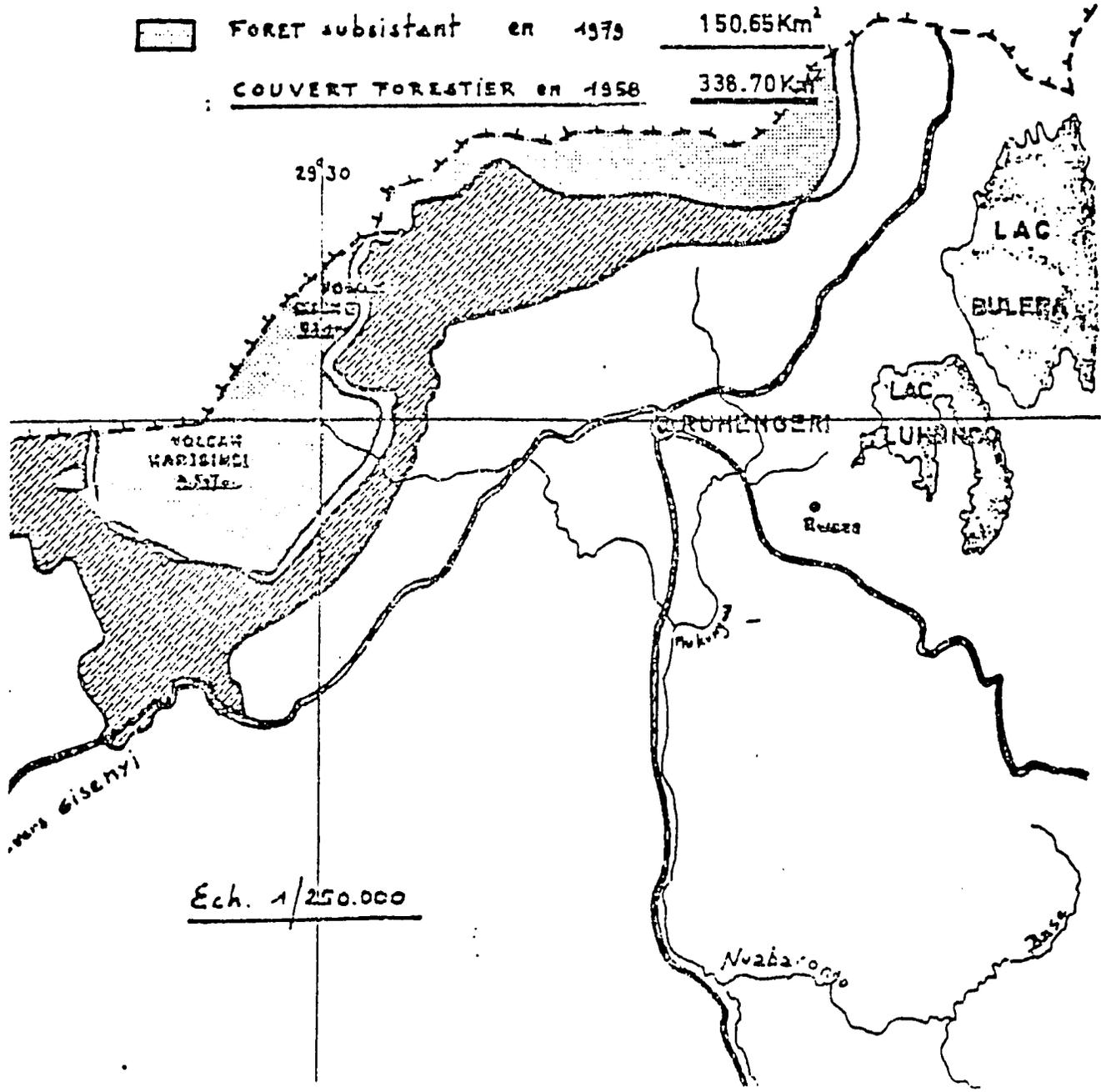
Figure 6E

# Carte de la REGION DES VOLCANS

## Evolution du Couvert végétal 1958-1973-1979

ETABLIE pour la Cie GEOMINES par l'A.I.D.R. RWANDA.

	FORET détruite entre 1958 et 1973	174.70Km <sup>2</sup>
	FORET détruite entre 1973 et 1979	13.35Km <sup>2</sup>
	FORET subsistant en 1979	150.65Km <sup>2</sup>
<u>COUVERT FORESTIER en 1958</u>		<u>338.70Km<sup>2</sup></u>



Ech. 1/250.000

100

Soil Degradation. The magnitude of this problem was officially recognized by the declaration of 1983 as the Year of the Soil in Rwanda. Soil erosion and loss of fertility are generalized concerns across Rwanda, including the Ruhengeri Prefecture. Although good quantitative data are lacking for all areas, the Zaire-Nile Divide (ZND) and Buberuka regions of Ruhengeri appear to face the most serious soil loss and degradation problems. The ZND zone in particular has soils of only average fertility and suffers considerable mechanical erosion due to its combination of rugged relief and high rainfall. In the Buberuka region initial soil fertility is higher and rainfall lower than in the ZND, but soil structure and steep slopes create a high risk of erosion.

In the southern Mukungwa valley, erosion risk is considered to be slightly less than in the preceding zones, yet still quite high. This problem could be further exacerbated by the extension of coffee cultivation: an erosive crop if not properly managed. Similar problems are associated with increased cultivation of corn in the higher elevation zones: an important consideration given current plans to increase corn production in northern Ruhengeri.

Only in the Lava zone is mechanical erosion considered to be of negligible importance. While the thinner lithic soils on steep slopes still require appropriate management, soil structure and the generally moderate relief combine to reduce erosion risk. Attention should still be given to soil fertility due to the intensive, multiple season cropping practiced in the region; yet in this area as well, the volcanic soils are less threatened than those in other areas.

Between 1974 and 1980, the Rwandan people constructed or rehabilitated 16,000 km of terraces and hedgerows, effectively protecting 288,550 ha or 23% of all agricultural land. Although figures for the Ruhengeri Prefecture are lacking, it is certain that a positive counter-trend of prevention measures is in progress to combat the problem of erosion. In addition, government programs have encouraged farmers to more effectively combine and integrate their livestock with agricultural production to maintain soil fertility. All efforts to deal with soil degradation, however, will be put to severe tests in coming years as agricultural production must increase greatly to keep pace with population increases.

Fuelwood Plantation Deficit. At the national level, Rwanda is in a serious deficit situation with respect to fuelwood supply and demand. Wood accounts for 80% of all energy used and total domestic consumption surpasses three million tons per annum. At the same time, annual sustainable yields from existing plantations and private woodlots total only 1.10 million tons - a shortfall of 63%. If sustained cropping of national forests and parks is included in calculations, consumption still exceeds demand by almost 50%. It is therefore clear that the existing capital of planted and natural forest stocks is being steadily depleted to satisfy demand (Openshaw 1983, World Bank 1982).

Although detailed information for the Ruhengeri Prefecture and its subzones are not yet available from the recently completed national forestry survey, preliminary indications are that the regional supply-demand situation is equally bad, if not worse, than at the national level. The extremely high human population densities in the region result in heightened competition between agricultural and forestry interests for the same limited land base. The problem is particularly keen in the Lava zone where virtually all available land has excellent cultivation potential, whereas more steeply sloped terrain in other zones lends itself more directly to forestry uses.

Throughout the prefecture, communal land is lacking for fuelwood plantations, so small-scale woodlots and mixed agro-forestry projects are now being encouraged by the government. Hundreds of thousands of trees have been planted by individuals and communal work groups over the past several years, and an AID agro-forestry project is currently being planned for the communes of Cyeru, Butaro, and Nyamugali. In the long-run, these massive planting programs may actually satisfy demand; in the interim period of 10-15 years, however, critical fuelwood shortages will continue to exist and contribute pressure to exploit the remnant natural forests. Inadequate tree cover also allows erosion and numerous problems concerning water resources.

Water Supply and Quality Issues. Problems related to the quality, control, and quantity of water supplies are also of primary importance in the Ruhengeri region. In the northern Lava zone, water supply itself is a critical limiting factor. The lack of year-round rivers and lakes makes its population extremely dependent on an old, poorly maintained water delivery system. The current population greatly exceeds the capacities of this system to provide regular, adequate supplies of potable water. The problem seems particularly acute in the commune of Kidaho. While less generalized, local water supply shortages also occur on a seasonal basis in parts of the other three zones.

Water control and management is a major issue in the Buberuka region with regard to the Rugezi wetlands. Several major development projects have been proposed for that area, and appreciable modifications of the marshlands have already been carried out by a local population practicing raised-field agriculture. No studies have been conducted to determine the ecological impact of wetland conversions on the Rugezi system itself, nor on Lakes Bulera and Ruhondo. Experience from elsewhere would indicate that major modifications of the Rugezi wetlands would cause a greater seasonal variability of water levels in the marshland and resultant flows into the downstream lake and river system. Agriculture in the Rugezi valley and hydroelectric production at the outlet of Lake Ruhondo could be adversely affected by such changes.

Water quality, as well as quantity, has also suffered from increased population growth and associated economic development activities. Lakes Bulera and Ruhondo have recently experienced an invasion of schistosomiasis, a debilitating tropical disease transmitted by a snail vector to humans in water environments. Schistosomes are rarely found as high as 1900m, but outside workers from infected lowland areas apparently introduced them through their feces while working on the Ntaruka dam. Malaria has also increased dramatically in recent years, though causal factors remain uncertain. Waterborne diseases such as bacillary dysentery have broken out in several parts of the prefecture, especially during periods of surface water shortages.

Finally, point-source pollution of Lake Bulera and certain tributary waterways caused by upstream mining operations could pose serious environmental health risks. Although no studies of the highly visible mine tailing runoff sites have yet been conducted, it is known that an important by-product of wolfram mining is arsenic. The distribution and diffusion of this highly toxic chemical in the rivers and lakes should be monitored. Its potential for uptake by plants and eventual concentration in wildlife and human consumers should be carefully studied.

The nature and causes of the environmental problems presented above are appropriate subjects for further investigation, as are the linkages between them. More detailed analysis of these issues should lead to identification of priority actions to strengthen on-going efforts to mitigate or resolve them. The Ruhengeri CRDP includes several inputs intended to achieve this goal.

## APPENDIX II.

## PROPOSED SHORT-TERM TECHNICAL ASSISTANCE

A total of twenty person-months of technical assistance is budgeted for the 3 year lifespan of the REM project. At least ten of these will be used to support the Phase I inventory and assessment, as described below. All consultants are expected to have appropriate advanced degrees, relevant foreign experience, and French skills equivalent to an FSI-3 rating.

### 1. Computer Specialist

#### Work Objectives

- To provide pre-project assistance in the selection of appropriate hardware and software systems to satisfy data collection and analysis needs.
- To provide initial training of REM personnel in use of the computer, word processor, and other programs.
- To develop standard format for all data entries to the inventory base.
- To determine the best means for integrating existing data bases (Agriculture Survey; Forest Use Survey) into REM inventory system.
- To assist with data manipulations and projections at the end of Phase I.

#### Special Qualifications

- Familiarity with Geographic Information Systems or Natural Resource Inventory Computer systems.

#### Time Period

- One week pre-project
- Four weeks during month 2
- Four weeks during month 13 or 14

## 2. Socio-ecologist/Anthropologist

### Work Objectives

- Oversee collection and organization of demographic and socio-economic data relevant to Phase I inventory.
- Assess through questionnaire survey techniques popular uses of natural resources, attitudes toward resource conservation, and perceptions of environmental problems in selected sample communes.
- Develop questionnaire with REM/PCFE staff, select and train enumerators, oversee survey execution, and perform necessary analysis.
- Provide written report of survey findings and recommendations for further research and intervention options.

### Special Qualifications

- Familiarity with relevant human ecological contexts, as well as social systems.

### Time Period

- 10-12 weeks during the first summer of the project to take advantage of university students' availability.

## 3. Agricultural Economist

### Work Objectives

- Oversee collection and organization of agricultural data for inventory purposes.
- Design module on farming practices and budgets for inclusion in socio-economic survey.
- Assess costs of continuing environmental degradation in the agricultural sector.
- Assess benefits of various intervention strategies.
- Provide written report of findings and recommendations for further research and intervention options.

### Special Qualifications

- Familiarity with ecological, as well as economic, aspects of agricultural development.

### Time Period

- 4 weeks, to precede or overlap with a socio-ecologist during months 4-7

#### 4. Soils Scientist

##### Work Objectives

- Oversee collection and organization of soils data (including ETMA erosion study and the new Ruhengeri Soils Classification Maps) for inventory purposes.
- General assessment of soil suitability and erosion susceptibility in selected sample communes.
- Provide written report of findings and recommendations for further research and intervention options.

##### Special Qualifications

- Familiarity with African highlands soils.
- Knowledge of forestry-soils relations.

##### Time Period

- 4 weeks in month 4

#### 5. Agroforester

##### Work Objectives

- Oversee compilation of data on existing forestry operations in Ruhengeri.
- Assess AID agroforestry efforts in Cyeru and Swiss programs around the Nyungwe montane forest to determine suitability of applying these techniques and species elsewhere in Ruhengeri.
- Determine social and ecological feasibility of agroforestry interventions in the lava zone, including bamboo management.
- Provide written report of findings and recommendations for further research and intervention options.

##### Special Qualifications

- Familiarity with high-altitude agroforestry systems and species.
- Experience with bamboo production and management techniques.

##### Time Period

- 4 weeks, month 5

## 6. Wetlands-Lakes Ecologist/Water Resources Manager

### Work Objectives

- Oversee collection and compilation of existing data on the lakes and marshes of Ruhengeri.
- Describe physical and biological attributes of the Ruhengeri wetlands and downstream lakes system and assess the potential impacts of development activities on this resource base.
- Identify priority environmental problems affecting the wetlands-lakes complex.
- Provide written report with findings and recommendations for further research and intervention options.

### Special Qualifications

- Familiarity with both wetlands and lakes in high-altitude tropical environments.

### Time Period

- 4 weeks, month 10

## 7. Water Engineer

### Work Objectives

- Oversee collection and compilation of existing data on water use and availability in Ruhengeri.
- Assess water shortage situation in sample communes of northern lava zone.
- Assess potential for tapping water resources in Volcanoes National Park.
- Develop proposals for necessary further research and intervention options to alleviate water problems in the lava zone, including cost estimates.
- Provide written report of findings and recommendations.

### Special Qualifications

- Experience with montane and volcanic environments.

### Time Period

- 4 weeks, month 10 (to overlap with Water Ecologist/Resource Manager)

## 8. Urban Environmentalist

### Work Objectives

- Oversee collection and compilation of existing data on Ruhengeri town, including population, health, and sanitation statistics.
- Assess priority environmental problems associated with current and projected urbanization trends in Ruhengeri.
- Provide written report of findings and recommendations for further research and intervention options.

### Time Period

- 4 weeks, month 11

## 9. Parks Manager/Tropical Ecologist

### Work Objectives

- Oversee collection and compilation of existing data on the montane ecosystem of the Volcanoes National Park (VNP).
- Describe major values of VNP, especially as these relate to the overall Prefectoral environment.
- Assess management problems of VNP (in consultation with MGF and ORTFN personnel), with particular attention to conflicts concerning the surrounding population (e.g. wood, water, and wildlife issues).
- Assess ecological impacts of tourism on park and surrounding environment.
- Provide written report of findings and recommendations for further research and intervention options.

### Special Qualifications

- Familiarity with tropical montane environments.

### Time Period

- 4 weeks, month 6

The number of consultant months outlined above surpasses the total foreseen in the REM budget. It is expected that the cost of some of this additional technical assistance can be shared by other AID projects in the region, centrally-funded AID/W programs, and/or other cooperating U.S. agencies.

Phase II consultancies cannot be described until specific research and intervention activities are decided upon. Similarly, detailed descriptions of associate technical assistance positions (Peace Corps sub-project managers) must await the completion of Phase I.

## APPENDIX III

## BUDGET

	YR 1	(18 mo.) ( '000s)	YR 2	YR 3	TOTAL
<b>TECHNICAL ASSISTANCE</b>					
Coordinator support	100,000	(150)	100,000	100,000	300,000
Consultants	96,000	(120)	96,000	48,000	240,000
Assoc. TA	0	( 0)	10,000	2,000	12,000
Overhead	40,000	( 60)	40,000	40,000	120,000
<b>ADMIN/OFFICE</b>					
Rent	10,000	( 15)	10,000	10,000	30,000
Equipment	6,000	( 6)	0	0	6,000
Computer/software	12,000	( 12)	0	0	12,000
Photocopier	3,000	( 3)	0	0	3,000
Ditto	0	( 0)	1,500	0	1,500
AV unit	500	( .5)	0	0	500
Vehicles (2)	30,000	( 30)	0	0	30,000
gas/maint/ins	5,000	( 8)	6,000	7,000	18,000
Admin. Ass't.	3,000	(4.5)	3,000	3,000	9,000
Driver/mech	2,000	( 3)	2,000	2,000	6,000
Other staff	3,000	(4.5)	3,000	3,000	9,000
Operating/misc	10,000	( 15)	10,000	10,000	30,000
<b>TRAINING</b>					
Reg'l seminar	10,000	( 20)	10,000	0	20,000
Communal workshops	0	( 0)	4,000	4,000	8,000
Counterpart per diem	5,000	( 5)	5,000	0	10,000
US training	0	( 0)	12,000	0	12,000
Study tour	7,500	(7.5)	0	0	7,500
<b>RESEARCH/ INTERVENTION</b>					
Research	20,000	( 20)	30,000	0	50,000
Demonstration activities	0	( 0)	50,000	50,000	100,000
<hr/>					
<b>TOTAL</b>	<b>372,000</b>	<b>(498)</b>	<b>392,000</b>	<b>279,000</b>	<b>1,044,000</b>

**APPENDIX IV**

**CAMEROON REPORT**

AN ENVIRONMENTAL RECONNAISSANCE SURVEY OF CAMEROON

By John Major and Paul Brace

International Institute for Environment and Development

1717 Massachusetts Avenue N.W.

Washington, D.C. 20036

July 21, 1984

## CONTENTS

1. ACKNOWLEDGEMENTS	3
2. INTRODUCTION	3
3. URBAN STRATEGY	6
4. SIXTH PLAN	9
5. REGIONAL APPROACH	10
6. SECTORAL ISSUES	13
a. Health	13
b. Housing	15
c. Water Resources	16
d. Forests	17
e. Agriculture	20
f. Fisheries	22
g. Tourism and Parks	23
h. Transportation	25
i. Industry	25
7. TECHNICAL TRAINING AND PROFESSIONAL FORMATION	26
8. PUBLIC EDUCATION	28
9. ENVIRONMENTAL MANAGEMENT	28
a. Information	29
b. Research	30
c. Policies	31
d. Implementation	32
8. STATE OF THE ENVIRONMENT	34
9. CHALLENGE AND OPPORTUNITIES	38
APPENDIX I Tentative Timetable for Recommended Follow-up Actions	39
Budget and Inputs	40
APPENDIX II Selected References	41
APPENDIX III Government Agencies	44
APPENDIX IV Persons Contacted	46

## ACKNOWLEDGEMENTS

The International Institute for Environment and Development and the members of the environmental planning team for Cameroon wish to express their very sincere appreciation for the cordial reception, encouragement, effective assistance, and logistic support received from the USAID Mission and in particular from Mr. Winfield Collins, Environmental Officer.

It was a pleasure to work with the many Cameroonian Government officials who gave freely of their time and expertise in a spirit of high professional exchange for which we are grateful. We are indebted to Mr. Claude Mathieu, of the National Planning and Development Office, whose knowledge, insights, and tireless efforts on our behalf have opened wide a window on Cameroon.

We hope that in turn, our involvement with them may contribute its modest part to the collaboration between our countries.

## INTRODUCTION

The Environmental Planning and Management (EPM) Project, of the Joint Environmental Service between the International Institute for Environment and Development and the International Union for Conservation of Nature (IUCN), has been designed to respond to the growing demand from developing countries for assistance in addressing a wide range of environmental and natural resource management problems. Funded by the U.S. Agency for International

Development, the EPM Project was called upon to field a Country Environmental Profile (CEP) team consisting of Dr. John Major and Paul Brace, at the request of the Government of the United Republic of Cameroon and the USAID Mission from June 4 to 22, 1984. This visit was the latest in a continuing effort of USAID to provide technical assistance in the environment and natural resources field, and followed the highly successful National Seminar on the Development of the Environment sponsored by the USAID Environmental Training and Management in Africa (ETMA) project, which was held in Yaounde from November 15 to 23, 1983. In January 1984, Dr. James Sherburne, Africa Bureau Environmental Advisor, visited the Mission and discussed assistance available through the centrally funded EPM project.

The Ministry of Urbanism and Habitat, through the Ministry of Plan and Territory Management, requested the CEP team to work with two counterparts from the Division of Territory Management, Mr. Claude Mathieu, Conseiller Technique, and Mr. Kenneth Karoua Njeba, geographer, to develop a strategy and approach for addressing the environmental problems of a rapidly urbanizing society in an agriculturally based country. Early in the ensuing consultations, Government of Cameroon officials, as well as the USAID Mission, suggested an orientation, supported by logic, that looks for many of the problems and solutions regarding the urban environment far beyond the city limits: population growth in the urban area results mainly from migration from rural areas, which also supplies the resources needed to sustain urban populations;

the major threat to natural resources comes from urban activities and resource exploitation to support the growing population in these areas. Attention should therefore be given to both the urban and rural pictures.

This report presents the findings and recommendations of the CEP team based on their 3-week visit to Cameroon, discussions with scores of government officials and others, and review of reports and publications. With the limited time and resources available, it was not possible to pursue all leads and develop extensive documentation for an environmental analysis of Cameroon. The team recognizes that much expertise in the form of both personnel and the written record were not tapped during this exploratory mission. However, the CEP team became acquainted well enough with the problems and resources available to develop an approach and recommendations for assisting the Government of the United Republic of Cameroon in designing a strategy for long-term, comprehensive environmental and natural resource planning and management. In addition to country-wide environmental issues, the report specifically addresses the problems of urbanisation of particular concern to GURC and USAID. In simplified outline, this report covers:

- a) environmental issues, their causes and consequences;
- b) need for a national policy or system of policies addressing these issues and what is necessary to formulate these policies;
- c) directions these policies could take;
- d) potential means and strategies to implement them.

## URBAN STRATEGY

Officials from many government agencies have expressed alarm at the growth of the two large urban centers of the country: Douala, the port, and Yaounde, the capital. Douala, with an estimated 700,000 population, and Yaounde, with 500,000, have a much higher growth rate, estimated at 7%, than the national average of 2.4% (Fifth Five-Year Economic, Social and Cultural Development Plan, 1981-1986) This growth is mostly due to migration from rural areas; only a small proportion is from natural growth and migration from middle size cities and foreign countries.

Douala, the old international metropolis where commercial and industrial activities of the country are concentrated, and Yaounde, the national capital whose prestige, milder climate, beautiful setting, and easy access are obvious magnets, can both be expected to continue to grow at the expense of the rest of the country. This growth is, in fact, practically inexorable and should not be considered, in itself, a disaster to be avoided altogether. Many positive aspects can come out of it. What is at stake, however, is to even maintain, much less improve in the course of this growth, the precarious quality of life existing there now. The squalid living and working conditions found now in large areas of the two cities will only expand with the continuing influx of migrants. Enormous housing, sewer, water, road and other community investments will be necessary. Critical, then, is the speed with which this infrastructure can be

practically provided. At what rate can these cities absorb additional population, without complete chaos occurring that would seriously hamper the cities' economic function, and also probably their political stability?

Closely related to this absorption concept is the rate of job creation in the two cities, more illusory than real for much of the migrating rural population. Planned employment expansion, coupled with carefully directed urban growth so as to limit encroachment on the fragile surrounding natural areas, and an aggressive infrastructure development program could preserve and improve the quality of the environment and of the life of the urban dwellers. One aspect of urban quality of life which is amenable to planned interventions is public health programs.

But at the same time, the rate of growth (especially from immigration) of the two metropolitan areas must be slowed down. An urban growth strategy should be formulated and means applied to implement it. As a major component of such a strategy a serious effort could be made to create employment in secondary cities, with resource bases developed to sustain this employment. An investment in infrastructure and community facilities, less heavy than in the two metropolitan centers, would still bring higher standards of living, accommodate growth, and somewhat reduce the strong appeal of the two big cities.

Major and secondary growth centers should be established among the 42 cities between 10,000 and 70,000 in population listed in

the 1976 census, scattered in all ten provinces, and in the 17 smaller towns established as seats of departments (the census showed no city over 70,000 except for the two metro centers).

Developing, as well as industrialized countries have included programs for the creation of new towns in their urban growth strategies. Such programs could be considered in special cases and conditions (such as the deep port proposal), but it would appear that, generally, a secondary city development program would be more suited to the Cameroon situation.

A system of incentives and disincentives, with some regulatory aspects, could be designed to carry out the adopted strategy and complement the investment priorities. A currently proposed project of development of medium-size towns by the Fond europeen de developement seems to go in this direction.

The role of individual behavior and population dynamics in rural communities must be recognized and taken into account: the evolution from barter to monetary economy, the individualistic young vs. the autocratic old, the traditional family production unit vs. the urban jobs, the exposure to modern technology and tastes, and many other factors of migration. Academic research and government programs should address these issues and develop solutions congruent with the social diversity found in the country - Catholic, Protestant, Moslem; French and English languages; tribal, sedentary, nomadic, desert, and forest

cultures.

An urban growth strategy, with its multi-agency components, could be best articulated and presented in the context of the forthcoming Sixth National Plan of economic and social development, yet to be formulated.

#### SIXTH PLAN

Cameroon is reaching the end of its Fifth Plan and is turning its attention to the preparation of the Sixth Plan. This national management tool for policies, priorities and investments over each five year period since independence is well established and has force of law. The Plan is passed by the National Assembly and promulgated by the President.

It was estimated that the Fifth Plan is achieving 60 to 70 % of its objectives. This is considered a good result, considering that the Plan aimed more at an ideal or maximum mark than at a minimum. Despite the utopian rather than practical approach followed in its conception, the Plan had a very positive influence on national development. As the government sharpens its definitions of policies and objectives, and its ability to execute them, the Plan could evolve to a 90% or better achievement goal, with nevertheless, a built-in flexibility for contingencies.

The role of the Plan is very important in setting the national

course for the next five years and initiating creative solutions to identified problems, from within the government agencies responsible for implementing programs. To generate synergistic effects, the Plan must be more than a national accounting exercise, it must advance new ideas and foster interagency cooperation. The drafting of the Plan for 1985-1990 will commence soon. It appears critical that the Sixth Plan zero in on what its predecessors have only marginally dealt with: environmental and resource management and comprehensive regional development. It should address these topics in an integrated approach and at different levels: policies, objectives and implementing measures; nationally, regionally, and sectorally; and with reference to research, skill formation, and public involvement. This coverage should be included in: a) a full-fledged chapter on environmental and natural resource management and comprehensive regional development; and b) an environmental section in each sector chapter. The effort devoted to a State of the Environment report, described later, would constitute a direct input into the Sixth Five-Year Plan.

#### REGIONAL APPROACH

The Government of the United Republic of Cameroon has placed its top political priority on creating a strong union out of its ethnically diversified people. It also had to concentrate its efforts on the difficult task of creating de novo a national administration. It is not surprising, therefore, to find in place

a weak regional structure. The union seems to be on solid footings, and government is fully functioning within its fiscal constraints.

Cameroon is described as a microcosm of the African continent. In such a biophysical and social spectrum, no cohesive approach to physical and human resources and environmental management can be designed on a generic scale. Scattered rather than systematic efforts were made to resolve problems at a regional scale, among them: a (partial) river basin, the Mission d'études pour l'aménagement de la vallée supérieure de la Benoue, a provincial organism, the Comite provincial de la lutte contre la secheresse; a coastal zone study, the Mission d'études d'aménagement du littoral; a multi-national group, the Commission d'aménagement du Lac Tchad; a United Nations project, the Sahel Office (UNSO); and the 5th Plan's term of reference to three regions, the South Cameroon, North Cameroon, and West Cameroon, as a notion rather than a working tool. None of these efforts have resulted to date in comprehensive, integrated plans and implementing programs.

The provincial system (with a recent increase in the number of provinces from 6 to 10) seems to serve for administering the 42 departments rather than as a base for regional development decisions.

In the course of the Sixth Plan, serious consideration should be given to defining logical geographic units for the entire national territory. These units should be given power and means

to study, plan, coordinate, put into action development and environment programs, and be a key to the implementation of the Sixth Plan. Definition of these units would probably involve a combination of the following factors: hydrography (river basins), landscape provinces, natural resource regions, ethnic population groups, regional economies, administrative divisions, and others. In defining the boundaries of these regions, it will be recognized that each sectoral interest sees its needs best served by a distinct regional division pattern. Compromises must be reached, however, to achieve the primary objective of establishing a workable framework for comprehensive (meaning integrated multi-sectoral) development policies, plans and programs.

Regional commissions should be established, whose role would be, among others, to:

- best reflect the remarkable diversity of the nation in the planning process;
- promote a balanced growth among regions, realizing human and natural resource potentials;
- carry out national development and environment policies;
- establish and implement local development and environment policies;
- coordinate public and private investment in the various sectors and government agencies for the most effective results in the long term;
- ensure that government actions and government control of private

actions reflect the concern of the population and relate closely to their well-being; and

- provide mechanisms for the participation of local officials and citizens in the development process and its benefits.

## SECTORAL ISSUES

A regional and multi-disciplinary approach permits integrating solutions in a more effective system and a clearer understanding of the many interactive effects of development. But, this approach needs to be supported by thorough knowledge of, and strong capability to deal with, each distinct component of development and environmental management.

This section discusses briefly a few of the issues that came to the attention of the authors regarding various sectors. The discussion, illustrative only and not necessarily reflecting a judgement on priorities, covers the following topics: health; housing; water; forests; fisheries; tourism and parks; and transportation.

### Health

Efforts to improve the quality of life should logically start with reducing the occurrence of premature death and of painful and crippling diseases. The projected urban growth, with its population concentration, liquid and solid wastes, and demand on

the water supply, will multiply exposure to health hazards. Together with polluting industrialization, increased regional mobility, and difficulty of vector control, it can expand endemic and epidemic conditions in runaway proportions which Cameroon health officials are quite aware of.

The health delivery organization, closely tied to the local administration system, appears effective in its medical care aspects. Reported weaknesses are in environmental health: lack of consciousness of sanitary practices by the populations, low public investment in waste disposal facilities and operations, lack of health officials involvement in the design and conduct of programs of other agencies of government (urbanism, education, agriculture, fisheries, industries, etc.) that affect environmental health. An example given for the need for closer interministerial coordination to resolve interactive effects, is the estimated 40% increase in the occurrence of malaria attributable to hydro-electric development and dam construction.

But fundamental to correcting all these weaknesses is the desperate need for trained specialists in many fields, such as laboratory technicians, teachers, health inspectors or sanitary engineers, without whom policies, research, investments, and regulations cannot accomplish their purposes. Both as an incentive and as an outlet for this training, budgetary provisions for this staffing must be ensured in each appropriate ministry.

## Housing

Requirements for shelter seem to have been perceived as an issue by the government only recently. This may have been due to the availability of land, the mild climate, and the resourcefulness of the population in self-help building, with native traditions, skills and materials. The absence of construction materials such as plaster and cement, and relative scarcity of commercial timber and steel, have perpetuated the traditional construction practices. Except for corrugated metal replacing thatched roofs, the houses built today are still individual and handmade with earth-filled walls of wood or bamboo slats.

The still modest government housing programs for low income people focus investments on roads, storm drainage, water and electrical distribution, and concrete floor slabs. Small plots for individual, duplex and row houses are made available on lease-purchase and some other arrangements. Technical assistance, floor plans, construction materials (cement, basic plumbing, light timber roof frame, doors and windows, and corrugated metal sheet roof) are furnished at low cost. Work is performed by the purchaser and friends and relatives, including making earth bricks or concrete blocks, pit and septic tank.

Housing programs need to be accelerated, as sections of Yaounde and Douala in overcrowded, dense and unsanitary shanties are expanding under the rapid migration of squatters from rural

areas. The government expects that access to ownership and security of tenure, not commonly available, will encourage property maintenance and improvement, starting with a low public - private investment level.

This construction activity is not without creating environmental damage in the hills surrounding the capital. Loss of trees and vegetative cover, and road cuts lead to wind and water erosion, slope instability, and eventual land slides and visual degradation. Land development standards such as zoning for appropriate uses, following land carrying capacity determination, mitigation measures, and public open spaces, need to be utilized to minimize this damage. Housing financing and land use policies and legislation seem to need strengthening.

#### Water Resources

Water is a major management issue, whether there is too little, causing droughts; or too much, causing drainage problems and floods; whether it is used industrially and becomes toxic in the process; or is used domestically and becomes a disease transmitter. Water is a resource with strong continuity and linkage characteristics capsulized in the term "water cycle". Many disciplines must contribute to the treatment of the diverse aspects of its development - i.e. meteorological, geological, bacteriological, chemical, engineering, etc.

To be clean, plentiful and accessible, water calls for enormous investment and complex management measures, involving inventory,

retention, watershed protection, flow regulation, ground water recharge, surface and ground water quality control, transportation and rational allocation for agricultural, wildlife, domestic, and industrial uses.

Comprehensive policies and integrated programs are evidently indispensable for effective development and utilization of this limited resource. The governmental organization structure should reflect this need, rather than the present wasteful dispersal of efforts. A water resource agency, preferably at the cabinet level, appears necessary to properly carry out a task critical to the country, combining functions presently divided among a number of agencies. The establishment of a national water resources coordinating council is a first step to consider in that direction.

### Forests

Cameroon's dense forest resource, generally the zone south of 6°30' N, offers a potential value for wood products, secondary forest products, touristic values, and serves as a genetic pool of great diversity invaluable in medicinal and agricultural research. Extensive commercial exploitation of the forests has been hindered until now by the lack of infrastructure necessary for harvest, transport, and processing of forest products.

Shifting agriculture, involving the clearing of land to produce a crop for one or two seasons until the soil is exhausted and the

field abandoned, threatens an increasing area of the natural forest. As population pressures increase, the fallow period necessary for renewal of the soil becomes insufficient for sustainable production, and the area becomes degraded. One source estimated that in 20 years, more than half of the forest would be gone, and in 50 years, none would be left except those in parks and reserves.

The forest law has established a goal of protecting 20% of the forest area as state classified forest. Presently, only about half of this amount has been so protected. Even under this classification as state forest, several levels of management and protection exist, and some of these lands are developed for plantations or agriculture and represent a further erosion of the natural forest resource. Indeed there is consideration of declassifying some lands which have been so altered from the natural state to no longer be managed as a classified forest.

Clearly, there is a critical need for accelerated development of forest inventory, protection, and management plans if Cameroon's forest resources are to be rationally developed in an environmentally sound manner. Of prime importance is the identification of additional forest areas to be classified so as to provide the mandated 20% state forest. These areas should be selected to provide representation of the range of forests evolved in Cameroon, and situated with future human needs for forest products, recreational, watershed, and other values in mind. Undue delay in classifying these lands will only further

restrict the opportunities and choices in the future.

Basic inventory, mapping, mensurational data, and research are needed to provide the data necessary for developing exploitation and management plans. Quantitative estimates of commercially valuable timber and fiber standing crops and their rates of renewal are needed in addition to development of maps and administrative limits for management purposes. Silvicultural and harvesting techniques must be developed to permit exploitation of forest products while minimizing damage to the fragile ecosystem and ensuring renewability of the resource. Regulatory standards for harvest operations should be developed and enforced to ensure reasonable care is exercised in road building, harvest, transport, and site protection.

The need for better information and management strategies have been recognized in Cameroon for some time. In fact, progress is being made on several fronts in surveying the extent of the country's forest resources. Efforts are being made to establish the Korup Forest Reserve as the country's first national park in the rainforest ecotype.

Research is being conducted on genetically superior trees for plantations for wood and fiber production. While much work is in progress, information on these projects and preliminary data are widely scattered. To facilitate planning and policy development, information on the status of forests and forestry in Cameroon

should be compiled into a single comprehensive volume in a format permitting annual updating to reflect new information and changes in the resource base. Ideally, the process of developing this document will help determine priority needs for research and development. Specific management plans should be formulated under a general policy to promote both multiple-use, sustainable production and perpetuation of the natural forest ecosystem. Careful planning should produce more benefits with less costs for Cameroon in both the short and long term.

### Agriculture

The Cameroon government has reaffirmed the importance of agriculture in the nation's future, and has wisely indicated its intention to pursue development of this sector and not be diverted by the lure of oil riches that, while providing a welcome boost, cannot be relied upon for sustained growth and support of the country's population.

Cameroon enjoys agricultural self-sufficiency, a goal many of neighbors are desperately trying to attain. Warning signals, however, have appeared that suggest steps must be taken to address threats to this balance in the face of a growing population, a more urban distribution, increasing pressure on the available land, and harsh drought or declining fertility conditions making production difficult.

The range of problems confronting agricultural productivity in

Cameroon reflect the geographic and climatic diversity of the country. The northern portion of the country shares the problems of the Sahelian drought and fuelwood shortages with its neighbors. Although not plagued by the same type of problems facing the drought stricken Sahel, agriculture in the southern tropical rainforest zone shares the loss of fertility traditionally maintained by extended periods of fallow for regeneration due to excessive pressure for land and a consequent shortening or abandonment of the fallow periods.

Some of the solutions proposed for agricultural problems depend upon the availability of diverse genetic material needed for developing new varieties best suited to a particular set of conditions. Cameroon should take special care to protect the rich biological diversity found within its borders so that these raw materials will be available for immediate and future use.

The Agricultural University at Dschang, one of USAID's largest projects, is being patterned after the Land Grant University system so successful in the U.S. This system of promoting and developing higher education, extension, and research has trained personnel and developed techniques of great value in agricultural and natural resource sciences. The emphasis on applied research is certainly relevant to the priorities of a developing nation. Other disciplines, such as forestry, fisheries, and wildlife, should consider associating their programs in one way or another with this Land Grant University system. The present system of higher education seems to leave a

large gulf between elite intellectual pursuits and technical, applied problems. The University at Dschang should provide an attractive environment for some of Cameroon's better students to obtain an education and develop research that will help ensure a sound future for the nation.

### Fisheries

In order to meet its projected goal for increasing fish production to provide protein for its people, Cameroon must come to grips with environmental problems threatening attainment of this goal on several fronts. Hard data on both fishery production and stock estimates are lacking. However, the limited data available were used as input to a model developed by FAO, which indicated that the current marine production was at or slightly above the Maximum Sustainable Yield (MSY). Fishery managers are hopeful that more detailed species-specific data will allow them to better tailor regulations permitting more liberal use of underfished stocks while protecting those that cannot endure more fishing pressure. Better data and modern methods of population analysis are urgently needed to provide managers with basic tools to increase yields while ensuring that MSY is not exceeded.

In addition, only 20% of the coastline is fishable with present gear, and it is hoped that advances in techniques and equipment will expand the potential sphere of operation.

Industrial development in the littoral zone poses a potential

threat to the fishery resource. The relatively small portion of Cameroon's coastline considered fishable also happens to be the zone of active petroleum exploration. The best available technology for spill containment should be adopted to minimize damage to the fishery in the event of an accidental oil spillage. Toxic wastes and pollution threaten both inland and marine fisheries. Numerous fish kills related to industrial effluent have been reported, and the lack of pollution abatement equipment and strict control of pesticide application make it likely that fish are accumulating residues of contaminants which may have implications for human health. No studies have yet been done to test for concentrations of toxic substances in the fish or the environment. Such testing and identification of pollutant sources must be initiated to ensure that both the quality of fish as well as quantity are adequate for human consumption.

#### Tourism and Parks

Cameroon is in an enviable position to promote its image of "Africa in Miniature" for tourism and recreation. Indeed, the diversity of ecosystems provides a wealth of flora and fauna representing desert, savannah, montane, and rainforest habitats. At the present time, only the savannah parks have developed the access and infrastructure for tourism. The Fifth Plan addresses some of the constraints to further develop both international and domestic tourist trade. It appears likely that tourism in Cameroon has a bright future as ease of travel and accommodations

are improved.

Cameroon's drawing card may well be the combination of its diversity and the attraction of ecosystems that are becoming increasingly rare elsewhere, most notably the tropical rain forests and montane forests. The savannah parks of East Africa may well have more drawing power for mass tourism, but it is likely that a market can be developed catering to more sophisticated, well-educated naturalists who have probably already visited the savannah and desire to experience an ecosystem heretofore inaccessible to most people. Encouragement of scientific research and the production of films and publications will probably increase the awareness and interest of the public in visiting parks representing these ecosystems.

At the present time, all of Cameroon's parks are located in the savannah, though the Korup Forest Reserve is in the process of being upgraded to a national park. As argued in the previous section on forests, a high priority should be given to identifying and protecting areas representing the breadth of ecosystems found in Cameroon before they become irreversibly degraded or altered. Infrastructure development can proceed at some time in the future as demand develops and resources can be obtained.

Development of conservation education curricula and an emphasis on national heritage are important components in increasing appreciation of parks by Cameroonians, and in developing the

domestic tourist trade. Promotion of these concepts should help to ensure the recognition of the national, as well as the international, values of parks for present and future generations.

### Transportation

Because of the relatively limited development and impact of transportation in all its forms - rail, highway, air, and water - it has not been the subject of serious concern in Cameroon. But, as the country develops, dramatic improvements in transportation are likely to follow. The direct and particularly indirect impacts of transportation on the natural environment and the way of life of people must be carefully anticipated and monitored. These impacts should become a major function of the planning and design of facilities and operations (roads, railroads, ports, airports, public transportation), equal to economic and engineering factors.

### Industry

Environmental consequences of manufacturing, mining, and energy production were briefly discussed in other sections. As the cause of most pollution, these activities must be planned with the greatest care. Tanning and other leather treatment, fertilizers and pesticides, soap and detergent, brewery, canning, slaughterhouse, petroleum extraction and refining, aluminum

processing, etc., all activities essential to modern society, have, because of their wastes on land, in water, and in air, disastrous direct and indirect effects on the fauna, flora, and people exposed to them.

The public infrastructure needed to dispose of these wastes is costly. Their impacts can be reduced by siting, design, and operation of industrial facilities on the basis of environmental criteria. Attempts to ignore or minimize environmental control costs of industrial development only delay payment of these costs, in one way or another, by the community - at high interest rates.

Although Cameroon is at a relatively early stage of its industrial development, serious cases of pollution have been reported in a number of places. Douala combines some of the worst environmental characteristics of underdeveloped and industrialized cities.

#### TECHNICAL TRAINING AND PROFESSIONAL FORMATION

The critical need for trained technicians and qualified professionals in the development of the country is emphasized in the sections on Health and Environmental Management of this report. There are a number of programs in higher education institutions of Cameroon that include some aspects of environmental disciplines. These are, however, only adjunct or optional. Without creating new university units, a program in

environment could be created using the resources and facilities of existing institutions, such as the Universities of Yaounde, Douala, and Dschang, and Polytechnique School. Diplomas of various levels could still be awarded in engineering, agronomy, biology, geography, and other traditional disciplines, with a major in environmental, urban and regional planning and management. Simultaneous enrollment of students to several institutions, and faculty cross-overs could achieve well-rounded curricula not possible under the current compartmentalized system. This requires coordination and integration of university education and technical training into a national system which, in today's world, is indispensable to create the management and professional cadres capable of coping with complex development issues.

Other specific actions should be considered for strengthening this education strategy, such as:

- create courses in environmental health, forest management, ecology, and other specialized and generalized topics;
- send students to appropriate U.S. and other foreign universities;
- invite U.S. and other foreign professors and lecturers to teach at Cameroon institutions;
- actively recruit promising students and professors;
- sponsor on the job training programs and continuing professional education.

## PUBLIC EDUCATION

Cameroon officials have ascribed to practices and behavior of the public many environmental problems, such as soil depletion and transmission of diseases. To respond to this situation, emphasis should be given to the coverage of such topics in primary and secondary education programs. Beyond the school years, citizens of all ages should also be exposed to education in environmental topics. The establishment of an extension service in each of the country's 42 departments or districts would bring enormous potential benefits. The plans for the expansion of the Agricultural University of Dschang include an extension program. Besides farming practice courses, this program should include health and sanitation, conservation and ecology, nutrition and other environmental and social topics. Close cooperation among universities, primary and secondary schools, and local governments will be essential to achieve an effective, low-cost extension program.

## ENVIRONMENTAL MANAGEMENT

The concern for environmental quality is fairly recent, and the institutions necessary to address this concern have not yet been established in Cameroon, although a number of activities directed at discrete aspects of environmental quality have been undertaken. This section discusses some general bases for

environmental management information, research, policies, and implementation.

### Information

A data base is not an end product but serves different purposes in environmental management, such as:

- to clearly identify present and future problems;
- to conduct studies and research;
- to formulate standards, policies, and legislative proposals;
- to implement programs;
- to evaluate proposed public and private actions;
- to educate school children, students, and citizens.
- to identify expertise and establish networking

Management of information, its selection, collection, analysis, dissemination, etc., should be targeted along the lines of these purposes. It lacks this targeting today, and therefore misses a possible greater effectiveness.

Raw data, maps, narrative reports, and other documents on Cameroon baseline conditions or on relevant environmental topics are already quite extensive, but not readily accessible. A documentation center, still modest, was started by the national MAB Committee. This effort should be strengthened, in cooperation with universities and specialized organisms such as the Centre Geographique Nationale. This center should perform a

clearinghouse function, beginning with a source for environmental references, and eventually a depository for environmental documentation of diverse origins. Seminars held in connection with the clearinghouse could assist in publicizing its value to all those involved in the environment. The center could also take the lead in investigating and introducing practical, systematic application of satellite imagery - remote sensing - computer graphics for environmental information, and in coordinating the use of resources from French, Canadian, U.S., and other sources.

### Research

A variety of research activities relating to the environment of Cameroon have been undertaken by government agencies and by foreign and international organizations. But this year, with the impetus given by the AID-sponsored environment seminar, a comprehensive, multidisciplinary research program solely focused on the environment was launched by the national MAB Committee. With a Cameroon government appropriation of about \$80,000, this is a small but important step that could lead to more substantial involvement, as supporting professional competence increases, and specific, attainable problem-solving, rather than purely descriptive, objectives are identified.

This research program should be accompanied by a systematic coordination of the various studies conducted outside, particularly by semi-public organisms and by universities, which should be encouraged to participate more actively in national

environmental research. The results of completed, on-going, and planned research would yield increased benefits if properly integrated within national goals. Monitoring of environmental conditions and of their evolution over time should be initiated as part of a research program.

### Policies

The need for clear, action-oriented policy directions is the most often cited priority of government officials, in order to formulate and carry out an environmental program. Policies are needed for drafting new legislation and pollution control standards, evaluating development proposals, and for rational and consistent decision-making in general. The framework within which to establish such policies should be comprehensive, encompassing the development, management, and protection aspects of natural resources, human resources, and urban growth. It should integrate environmental quality and economic development objectives in the same time frame reference. Policies can best be formulated by each ministry, synthesized by the Ministry of the Plan, and debated and adopted as part of the Five-Year Plan process.

Care needs to be taken to harmonize new policies with existing legislation, or to replace it, when appropriate. One of the MAB research projects for this year is directed at existing environmental laws. Results from this project could be a valuable contribution to this objective.

## Implementation

Of the four programmatic components - information, research, policies, and implementation - discussed in this section, the last one, implementation, is the most critical, yet perhaps the weakest link and the one which will require the most effort.

Much thought has been given to pressing issues and to what ought to be done. The extensive study, "2000", for instance, urged adoption of national demographic policies and of measures to reinforce family roles and stability. Today, four years later, there is no evidence of follow-up action on these recommendations.

Obstacles to implementation are many. Some possible problems include:

- There is not sufficient or adequate information, research, and policies, as discussed above.
- There is not enough qualified staff to carry out good ideas to execution.
- The necessary funds are not available.
- There are not sufficient or adequate legislative and regulatory provisions.
- The administrative provincial and departmental structure is not equipped to handle it.
- Environmental quality objectives are perceived as opposite to those of economic development, particularly by large industrial

and agrobusiness interests.

-The awareness and concern of government officials are not sufficiently communicated to, and supported by, the public.

-Traditional attitudes, based on past conditions, are resistant to change.

Removal of these seemingly overwhelming obstacles will require sustained and concerted efforts. Certain directions should be considered for these efforts, such as:

-Establish an intensive education and training program for environmental technicians and professionals.

-Reorient the urban planning process to be more comprehensive and action-oriented, and integrate the implementation phases into the process, making the planners accountable for the technical and control as well as conceptual aspects of development.

-Install a regional development structure with regional authorities covering the whole of the national territory, responsible for studies, plans, and implementation.

-Associate more closely the private and public agents of development and production with the planning and management agencies.

-Institutionalize the analysis and evaluation of development proposals (projects and programs), so as to: a) select from a range of alternatives based on the knowledge of their consequences or induced effects as well as on their primary objectives and costs/benefits (environmental and social impact assessment); and b) internalize environmental costs, and

incorporate mitigation measures in the original project design.

## STATE OF THE ENVIRONMENT

Officials of the Cameroon Government have indicated that they consider the preparation of some form of "State of the Environment" report a priority. A "bilan" in French, this would determine baseline conditions, determine trends in economic development which impact natural resources, analyze problems, report on accomplishments, set priorities, and even give directions for future actions. Such an approach falls within the concept of Country Environmental Profiles (CEP's), developed by USAID and it was suggested that it could constitute a topic for AID assistance.

A comprehensive knowledge and understanding of the environmental situation is indeed a prerequisite to policies and actions. It is, however, an ambitious undertaking requiring time, data, and expertise that translate into delays and heavy investments. It also calls for intimate knowledge of local conditions, and a complex coordination effort. A practical approach that would bring about the most benefits at the least costs should be considered:

1. The State of the Environment study should be undertaken without further delay. The climate for it is here now, the need is clear, much information is already available.

2. It should be prepared by each individual agency, ministry, or representative of sectors whose activities have an impact on the environment or which have environmental responsibilities. It would be a self-assessment exercise raising the level of consciousness of staff and management, and would constitute their report to the President, National Assembly, and the Nation, on their environmental charges.

3. The report should not be a one-shot effort, but an on-going process and a yearly document, used to check progress and the course of each agency and the nation toward achieving their goals to improve the environment, and to sometimes correct the course. A continuing process recognizes that the State of the Environment is anything but static, and any assessment, especially in Cameroon, is fast outdated.

4. The State of the Environment, while giving an analytical picture component by component, must reflect its holistic nature by integrating these components and recognize and take into account interactions. Furthermore, findings and conclusions must be in a form directly useful to the decision-makers in the day to day and long term aspects of national development. The task of coordination, integration, synthesis, evaluation, and interpretation for comprehensive development planning falls logically on the Ministry of Planning and National Development, which was assigned the lead agency role and overall responsibility for environmental affairs by the President in

February 1984. The agency could facilitate the preparation of the report by: setting the outline of its contents and editorial policy, scheduling the process, assisting each agency, reviewing the resulting sections for consistency and completeness, and providing an overview preface and a conclusion. In addition, this agency could promote inter-agency coordination by organizing and chairing a committee charged with the synthesis of the individual reports, and promoting exchange such as that fostered by the presence of the CEP team.

The involvement of each Cameroon government agency in the process would constitute in itself a valuable capability building and self-reliance effort. U.S. technical assistance could still be considered in an effective support role for the State of the Environment. Such assistance could be provided in the following form:

1. Upon completion of the various draft segments of the Report by each responsible agency, a U.S. expert would assist in their analysis and evaluation, and the preparation of an overall review and synthesis in Yaounde.
2. The U.S. team leader would transmit specific requirements for the composition of a team of technical experts to Washington, and would be responsible for the logistics of arranging the team's travel to Yaounde and providing briefings

and introductions to the host-country counterparts.

3. The team would convene in Yaounde for a meeting with the technical representatives of the agencies responsible for the report, to establish the working relationships between American and Cameroonian experts and officials.

4. This group meeting would be followed by one-on-one meetings of individual U.S. and Cameroon experts and officials, with field visits appropriate to each sector.

5. A final meeting of the U.S. and Cameroon groups would produce a review of intersector, interagency issues, and comprehensive evaluation and recommendations, which would be used in the preparation of the final report.

Rather than an exhaustive report on each environmental sector, this first annual attempt would start modestly. These major points should be covered: issues, policies and objectives; accomplishments; obstacles and problems; and next year's targets. It is important that it be completed rapidly, so as not to lose what is perceived as a momentum at this time, and not disappoint current expectations. Comprehensive coverage of all sectors - not superficially but only in their most urgent and critical aspects, and with references to more detailed existing documentation - could be completed in draft by government agencies in a six-month period, and USAID involvement as described above would start at that point.

## CHALLENGE AND OPPORTUNITY

Following its struggle for independence, the country, in its drive for nationalism, unification, and development, is increasingly able to focus upon the value of its human and natural resources, and the need to manage them wisely. Cameroon has a desire for stability, and a concept of steady and long term modernization and improvement of living standards. It has resisted adopting a rapid economic growth policy that would lead to "high grading" or "mining" of natural resources, social disruption and financial bankruptcy.

With its strong and centralized structure, the government has a responsibility and an opportunity to demonstrate that a well conceived plan of development can achieve improved economic well being as well as an improved social and physical environment. There are solutions to environmental problems. Preventive or prophylactic activities are considerably less costly in the long run than curative ones. But preventive solutions must not be interpreted as preventing development.

The country, through its government, is master of its destiny. It cannot afford anything but the best in development for its people and their "cadre de vie". If not seriously affected today, it may well be tomorrow. The time to act is now; time to answer the question posed recently in a national radio broadcast: "What kind of Cameroon do we want to bequeath to our children?"

## APPENDIX I

### TENTATIVE TIMETABLE FOR RECOMMENDED FOLLOW-UP ACTIONS

September 1	AID/W Review and approval of Cameroon report
September 10	Central funding commitment to endorse proposed levels of support for pilot Phase II Profile (or State of the Environment Report)
September 15	Report pouched to USAID/Yaounde Cable dispatched to USAID/Yaounde expressing support of proposal and outlining central assistance
October 1	USAID/Yaounde Transmittal of report to GURC Planning Office; Request for Concurrence and Timetable for Technical Assistance Team; Recruitment of Team Leader and Identification of Potential Team Members
December 1	Completion of Cameroon Sectoral Reports by Experts of each Ministry
January 1	Compilation of Preliminary "State of the Environment Report" by Planning Office
January 1	Arrival of Technical Assistance Team Leader to assist USAID and GURC personnel with review of Preliminary Report and Development of team composition and scopes of work.
January 15	Transmittal of request from field for specific technical team composition
February 15	Arrival of team for 3 week assignment assisting GURC counterparts with review and revision of preliminary State of the Environment Report
March 15	Completion of revised report by technical experts Final editing and preparation for publication by Planning Office and U.S. Team Leader
April 15	Report (or Profile) completed and ready for translation
July 1	Translation completed, publication in French and English begins

## BUDGET AND INPUTS<sup>1</sup>

### PERSONNEL

Team Leader, 4 months	
Consulting Fees @ 200 /day	\$16,000
Per diem @ 75/day	9,000
2 Round trip air	2,000
In country travel	1,000
Miscellaneous ODC	1,000

Technical Specialists, 8 man-months	
Consulting Fees @ 200 / day	32,000
Per diem @ 75/day	18,000
8 Round trip air @ 1000	8,000
In country travel @ 500/ person	4,000
Miscellaneous ODC @ 250/ person	2,000

TRANSLATION COSTS	5,000
-------------------	-------

<u>PUBLICATION COSTS</u>	<u>10,000</u>
--------------------------	---------------

TOTALS	106,000
--------	---------

<u>OVERHEAD (@50% OF TOTAL COSTS)</u>	<u>53,000</u>
---------------------------------------	---------------

GRAND TOTAL	159,000
-------------	---------

<sup>1</sup>Preliminary estimates for planning purposes only. It is assumed that USAID/Cameroon will provide the usual logistic support, such as vehicles and drivers, secretarial support, communications, embassy privileges, and introductions. The Government of the United Republic of Cameroon is expected to provide counterparts, some in-country travel, access to information, and contribute to publication costs. The actual cost of the mission may be reduced by combining some of the technical assistance needs with other USAID and GURC project requirements.

## APPENDIX II

### SELECTED REFERENCES

Private Sector: The Tortoise Walk: Public Policy and Private Activities in the Economic Development of Cameroon. March 1983.

U.S. Agency for International Development, Evaluation Special Study No. 10, by James P. Roush, Auché Lemelin, and Michael P. McLindon (USAID)

Country Development Strategy Statement FY 1984: Cameroon. October 1982, U.S. Agency for International Development (USAID)

Cameroon: Country Development Strategy Statement FY 83. January 1981, U.S. Agency for International Development (USAID)

Rapport de Synthèse sur les Perspectives de Développement à l'An 2000. June 1980. Direction de la Planification, Ministère de l'Économie et du Plan, République Unie du Cameroun

Cameroon. January 1983. U.S. Agency for International Development, by The Futures Group, Resources for the Awareness of Population Impacts on Development (USAID)

The Fifth Five-Year Economic, Social and Cultural Development Plan, 1981-1986. November 4, 1981, Ministry of Economic Affairs and Planning, United Republic of Cameroon

Draft Environmental Profile on United Republic of Cameroon.

January 1981, U.S. Agency for International Development and National Park Service, by University of Arizona, Tucson, Arizona (USAID)

Resource Inventory of North Cameroon, Africa. 1978, U.S. Agency for International Development and Fonds d'Aide et de Cooperation (France), with U.S. Dept. of Agriculture, and French ORSTO and SCET, by Donald H. Fulton, James E. Bower, Paul D. Landry, Jean Boulet, Guy Escoffier and George B. McLeroy (USAID)

Premier Seminaire National sur la Gestion de l'Environnement:

Realites Camerounaises. December 1983, Comite National Permanent de l'Homme et la Biosphere; Delegation Generale a la Recherche Scientifique et Technique, Republique Unie du Cameroun. 6 vols.:  
Compte-rendu des travaux; Concepts generaux; Pollution;  
Desertification; Environnement Rurale; Urbanisation-  
Industrialisation

"Le Cameroun dans la fièvre de l'urbanisme; Yaounde en pleine expansion" by Abui Mama Eloundou, Developpement et Cooperation, No. 1, 1984

Compte-rendue des groupes de travail sur la preparation des contrats de recherches en environnement. April 1984, Comite national permanent de l'Homme et la Biosphere, Ministere de l'Enseignement Superieur et de la Recherche Scientifique,

Republique du Cameroun

Amenagement du Territoire: Bilan-Diagnostic; Perspective. January 1980, Direction de la Planification, Ministere de l'Economie et du Plan

Atlas du Cameroun. 1960-1972, Office national de la recherche scientifique, Institut des sciences humaines, Republique Unie du Cameroun (USAID)

The distribution of protected areas in relation to the needs of biotic community conservation in west and central Africa. IUCN, Gland. December 1979 (draft) (USAID)

Atlas Aerien du Cameroun; Campagnes et Villes. 1983, Dept. of Geography, University of Yaounde (World Bank Yaounde Office)

Area Handbook for the United Republic of Cameroon, 1974. U.S. Government Printing Office, by the American University, Washington, D.C.

Summary Presentation of the Long Term Food Plan. Ministry of Economic Affairs and Planning, March 1961 (USAID)

## APPENDIX III

### GOVERNMENT AGENCIES WITH PRIMARY ENVIRONMENTAL CONCERNS

#### Ministere de l'education superieure et de la recherche scientifique

##### Direction de la recherche scientifique

Man and the Biosphere National Committee

Institut de recherches medicales

Institut de recherches agronomiques

Institut de recherches zootechniques

#### Ministere de l'urbanisme et de l'habitat

Direction de l'urbanisme (Projets urbains-FAC, MAETUR, etc.)

Direction des domaines

Direction du cadastre

Direction du logements

#### Ministere du plan et de l'aménagement du territoire

Direction de la planification

Direction de la cooperation economique et technique

Direction de l'aménagement du territoire (MEAL, MAGZI, etc.)

Direction de la statistique (Programmation, etc.)

#### Ministere de l'equipement

Direction des routes

Direction de la construction

**Ministere des mines et de l'energie**

Direction des mines et geologie (inspection des etablissements classes etc.)

Direction de l'energie et eau (assainissement, adduction d'eau urbaine, etc.)

**Ministere des transports**

Direction de la meteorologie

Direction de la marine marchande

Direction des ports

**Ministere de l'elevage**

Direction des peches

**Ministere du commerce et de l'industrie**

Direction de l'industrie (Service de protection de l'environnement, etc.)

Delegation generale au tourisme,

Direction des parcs et de la faune, etc.

**Ministere de l'agriculture**

Centre national de developpement des forets

Office national de regeneration des forets (etudes des sols, etc.)

**Ministere de la sante**

Direction de la sante publique

Direction de la planification et des statistiques

Direction de la medecine preventive (Service d'epidmiologie, etc.)

## APPENDIX IV

### LIST OF PERSONS CONTACTED

Basil Amougou, Service de protection de l'environnement,  
Direction de l'industrie, Ministère du commerce et de l'industrie  
(MCI)

M. Aubertin, Conseiller technique, Division des services  
techniques, Mission d'aménagement des terrains urbains et ruraux  
(MAETUR), Ministère de l'urbanisme et de l'habitat (MINUH)

Victor Balinga, Charge d'études, Ministère de l'enseignement  
supérieure et de la recherche scientifique (MESRS)

Pierre Bienkue, Ministère des mines et de l'énergie (MME)

Giberling Bol Alima, Ministre, MESRS

Marc Bopelet, Directeur, Direction de la recherche scientifique,  
MESRS

Winfield Collins, Environmental Officer, USAID/Cameroon

William Cooper, Representative, Cameroon Office, The World Bank

Jean Louis Dogmo, Doyen de la faculté des lettres et sciences  
humaines, Université de Yaounde

Brian Duncan, International Center for Aquaculture, Auburn  
University, Alabama

Samuel Edimo Ngalle, Directeur, Direction des études de la  
planification et des statistiques, Ministère de la santé

M. Grison, Chef du centre des recherches forestières, Yaounde

Stanley Handleman, Human Resources Development Officer,  
USAID/Cameroon

Kenneth Karawa Njebe, Cadre à la direction de l'aménagement du  
territoire, Ministère du Plan et de l'aménagement du territoire  
(MPAT)

Joseph Kouli, Department of fisheries, Ministry of Livestock,  
Fisheries, and Animal industries (MLFAI)

Jean Marie Madou Ndengue, Chef de division, Direction de  
l'aménagement du territoire, MPAT

Patrice Mandeng, Directeur, Direction de l'industrie, MCI

Denis Marchal, Chef, Projet urbain -FAC, Direction de l'urbanisme, MINUH

Claude Mathieu, Charge d'etudes, Direction de l'aménagement du territoire, MPAT

M. Mbondji, sous directeur, Sous direction de la programmation, MESRS

Joseph Mbui, Secrétaire general, Ministère de l'éducation national

Steve Meyers, Fish farm project, MESRS, Limbe

Herbert Miller, Deputy Director, USAID/Cameroon

M. Mongoue, Chef des services d'enquete, Direction de l'urbanisme, MINUH

Jean Monkouri, Directeur general adjoint, Office national de regeneration des forets, Ministère de l'agriculture

Elizabeth Morfaw, MME

Gotlieb Moukia Mbome, Director, Department of Fisheries (MLFAI)

Alexis Nga Owana, Chief, Services de protection de l'environnement, Direction de l'industrie, MCI

Nkeng Nguty, Sous directeur, MME

Michel Njiensi, Secrétaire permanent, Comité national de l'homme et la biosphere (MAB), MESRS

Joseph Okala, Sous directeur des activités minières et techniques, MME

Dominique Oloa, Directeur, Mission d'études et d'aménagement du littoral, MPAT

Owona Onguene, Directeur des parcs et faune, Delegation generale au tourisme, MCI

Oscar Onogo Ondiga, MME

Mahabat Paba Sale, Conseiller technique, Direction de la recherche scientifique, MESRS

Benedict P. N. Satia, Deputy Director, Department of fisheries, MLFAI

M. Sende, Chief, Division des programmes, MAETUR, MINUH

Angelbert Temgona, Directeur de plantations

M. Vallet, Doyen, Faculte des sciences naturelles, Univ. de  
Yaounde